Appendix F

Ecology

Appendix F1: Bird Survey Data 1
Appendix F2: Bird Survey Data 2
Appendix F3: Marsh Fritillary Habitat Appraisal Form
Appendix F4: Plant Species Lists
Appendix F5: Peatland Survey Reports
Appendix F6: Bat Survey Report
Appendix F7: Aquatic Ecology Report
Appendix F8: Guidance Documents

Appendix F1

Bird Survey Data 1

Table 1: Brown and Shepherd Survey Dates

Cluster	Visit Number 1	Visit Number 2	Visit Number 3
Ballynakill	1/11/2012	22/1/2013	21/3/2013
Windmill	25/10/2012	18/1/2013	19/3/2013
Drehid	25/10/2012	15/1/2013	18/3/2013
Hortland	30/10/2012	24/1/2013	22/3/2013
Derrybrennan	2/11/2012	28/1/2013	26/3/2013
Cloncumber	2/11/2012	30/1/2013	21/3/2013

Table 3: Brown and Shepherd Survey Results Ballynakill

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Chaffinch_CH	39	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Blackbird_B.	3	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Magpie_MG	5	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	House Sparrow_HS	4	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Wren_WR	1	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Jackdaw_JD	3	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Woodpigeon_WP	181	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Hooded Crow_HC	5	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Pied Wagtail_PW	1	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Robin_R.	1	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Fieldfare_FF	12	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Great Tit_GT	2	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Coal Tit_CT	2	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Blue Tit_BT	1	
Ballynakill	6	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Redwing_RE	37	
Ballynakill	4	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Snipe_SN	8	
Ballynakill	4	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Jackdaw_JD	2	
Ballynakill	4	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Blackbird_B.	3	
Ballynakill	4	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Wren_WR	2	
Ballynakill	4	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Woodpigeon_WP	38	
Ballynakill	4	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Meadow Pipit_MP	2	
Ballynakill	4	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Skylark_S.	1	
Ballynakill	4	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Redwing_RE	24	
Ballynakill	9	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Woodpigeon_WP	9	
Ballynakill	9	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Wren_WR	1	
Ballynakill	9	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Starling_SG	48	
Ballynakill	9	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Jackdaw_JD	8	
Ballynakill	9	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Rook_RO	172	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Ballynakill	9	B & S Winter	21/03/2013	CH	Showers	8/8	Moderate	F2	09.30	12.00	Blackbird_B.	2	
Ballynakill	1	B & S Winter	01/11/2012	ED							Robin_R.		
Ballynakill	1	B & S Winter	01/11/2012	ED							Blackbird_B.		
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Robin_R.	28	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Wren_WR	40	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Woodpigeon_WP	115	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Rook_RO	125	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Lesser Redpoll_LR	18	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Chaffinch_CH	10	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Hooded Crow_HC	2	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Jackdaw_JD	10	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Blue Tit_BT	1	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Great Tit_GT	14	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Jay_J.	1	Heard only
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Goldfinch_GO	3	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Blackbird_B.	20	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Goldcrest_GC	4	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Coal Tit_CT	1	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Mistle Thrush_M.	1	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Magpie_MG	12	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Meadow Pipit_MP	4	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Dunnock_D.	1	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Redwing_RE	8	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Linnet_LI	3	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Long-tailed Tit_LT	100	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Kestrel_K.	1	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Siskin_SK	5	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Starling_SG	3	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Fieldfare_FF	26	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Pied Wagtail_PW	2	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Reed Bunting_RB	8	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Buzzard_BZ	2	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Peregrine_PE	1	30m
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Snipe_SN	22	
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Sand Martin_SM		
Ballynakill	1, 2, 3, 4, 5, 6, 7, 8, 9	B & S Winter	01/11/2012	DML	None but for in morning		Excellent	F0	08.30	16.40	Badger		
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Starling_SG	1000	800-1000 birds
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Woodpigeon_WP	550	
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Chaffinch_CH	8	
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Linnet_LI	43	
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Blackbird_B.	3	
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Robin_R.	2	
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Greenfinch_GR	4	
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Lesser Redpoll_LR	16	
Ballynakill	7	B & S Winter	01/11/2012	CH	Showers	3/8	Good	F1	15.00	16.30	Sparrowhawk_SH	1	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Hooded Crow_HC	3	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Lesser Redpoll_LR	3	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Blue Tit_BT	1	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Redwing_RE	48	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Blackbird_B.	4	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Fieldfare_FF	2	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Woodpigeon_WP	548	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Sparrowhawk_SH	1	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Coal Tit_CT	4	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Snipe_SN	2	
Ballynakill	8, 9	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	15.10	16.40	Starling_SG	29	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Woodpigeon_WP	167	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Rook_RO	75	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Jackdaw_JD	42	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Magpie_MG	3	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Robin_R.	3	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Wren_WR	7	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Hooded Crow_HC	4	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Chaffinch_CH	47	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Jay_J.	3	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Dunnock_D.	1	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Starling_SG	110	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Skylark_S.	34	Good numbers of skylark at T3
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Redwing_RE	14	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Stock Dove_SD	1	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Goldcrest_GC	2	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Blackbird_B.	5	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Coal Tit_CT	3	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Great Tit_GT	1	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Linnet_LI	14	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Buzzard_BZ	1	
Ballynakill	1, 2, 3, 4, 5	B & S Winter	01/11/2012	CC	Occasional showers	8/8	Excellent	F3	14.10	16.00	Cormorant_CA	1	
Ballynakill	3, 5	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	13.48	14.15	Starling_SG	90	
Ballynakill	3, 5	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	13.48	14.15	Woodpigeon_WP	200	
Ballynakill	3, 5	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	13.48	14.15	Rook_RO	30	
Ballynakill	3, 5	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	13.48	14.15	Hooded Crow_HC	5	
Ballynakill	3, 5	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	13.48	14.15	Wren_WR	1	
Ballynakill	3, 5	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	13.48	14.15	Chaffinch_CH	2	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	House Sparrow_HS	4	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Robin_R.	5	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Chaffinch_CH	16	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Hooded Crow_HC	10	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Jackdaw_JD	2	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Rook_RO	90	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Starling_SG	30	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Coal Tit_CT	3	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Pied Wagtail_PW	1	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Blackbird_B.	9	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Wren_WR	2	
Ballynakill	6	B & S Winter	01/11/2012	AB	Occasional showers	8/8	Excellent	F3	14.25	15.30	Fieldfare_FF	30	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Rook_RO	18	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Jackdaw_JD	7	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Blackbird_B.	12	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Robin_R.	2	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Wren_WR	3	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Mallard_MA	2	Flew overhead
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Woodpigeon_WP	6	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Snipe_SN	2	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Starling_SG	17	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Skylark_S.	2	
Ballynakill	9	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Buzzard_BZ	1	flew across site from tree at 11m
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Chaffinch_CH	8	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Jackdaw_JD	7	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Woodpigeon_WP	1	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Robin_R.	3	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Blackbird_B.	6	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Blue Tit_BT	3	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Coal Tit_CT	2	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Pied Wagtail_PW	9	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Lesser Redpoll_LR	16	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Grey Wagtail_GL	1	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Hooded Crow_HC	1	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Goldfinch_GO	2	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Robin_R.	15	
Ballynakill	8	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Buzzard_BZ	2	Both seen together. Flew across site & perched 1-9m
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Rook_RO	29	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Mistle Thrush_M.	1	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Chaffinch_CH	3	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Magpie_MG	2	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Blackbird_B.	9	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Woodpigeon_WP	14	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Jackdaw_JD	3	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Reed Bunting_RB	5	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Dunnock_D.	1	
Ballynakill	1	B & S Winter	22/01/2013	CH	Mist	8/8	Moderate	F3	10.00	16.00	Robin_R.	2	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Blackbird_B.	36	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Rook/Jackdaw	28	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Starling_SG	35	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Woodpigeon_WP	23	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Magpie_MG	2	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Hooded Crow_HC	2	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	House Sparrow_HS	2	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Pied Wagtail_PW	2	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Wren_WR	8	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Robin_R.	8	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Chaffinch_CH	38	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Redwing_RE	208	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Great Tit_GT	3	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Pheasant_PH	1	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Woodcock_WK	1	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Coal Tit_CT	3	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Teal_T.	4	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Song Thrush_ST	1	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Skylark_S.	7	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Blue Tit_BT	3	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Dunnock_D.	3	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Goldcrest_GC	1	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Bullfinch_BF	1	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Fieldfare_FF	22	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Yellowhammer_Y.	3	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Reed Bunting_RB	3	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Stock Dove_SD	1	
Ballynakill	2, 3, 4, 5, 6, 7	B & S Winter	22/01/2013	BP	None	2/8	Moderate	F3	10.15	15.45	Meadow Pipit_MP	1	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Jackdaw_JD	8	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Rook_RO	83	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Chaffinch_CH	12	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Wren_WR	8	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Robin_R.	5	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Great Tit_GT	2	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Blackbird_B.	14	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Skylark_S.	2	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Woodpigeon_WP	24	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Magpie_MG	2	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Snipe_SN	2	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Goldcrest_GC	6	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Song Thrush_ST	2	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Jay_J.	1	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	House Sparrow_HS	7	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Coal Tit_CT	3	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Dunnock_D.	2	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Fieldfare_FF	26	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Redwing_RE	30	
Ballynakill	3, 4	B & S Winter	28/02/2013	CH	None	7/8	Good	F1	12.00	14.30	Starling_SG	55	

Table 4: Brown and Shepherd Survey Results Windmill

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Chaffinch_CH	3	
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Blackbird_B.	2	
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Woodpigeon_WP	8	
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Hooded Crow_HC	4	
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Robin_R.	3	
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Raven_RN	4	
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Meadow Pipit_MP	1	
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Goldcrest_GC	1	
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Buzzard_BZ	2	Flying 10-50m
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Snipe_SN	2	Off site on adjacent intact bog
Windmill	2, 4	B & S Winter	25/10/2012	BP	Occ light mist	8/8	Good	F1	10.22	11.40	Golden Plover_GP	3	In block 1, 3, 4
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Chaffinch_CH	8	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Blackbird_B.	2	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Wren_WR	7	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Goldcrest_GC	3	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Robin_R.	6	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Woodpigeon_WP	2	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Sparrowhawk_SH	1	Over scrub at edge of bog then over bog
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Meadow Pipit_MP	1	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Raven_RN	3	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Grey Wagtail_GL	1	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Lesser Redpoll_LR	7	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Blue Tit_BT	1	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Mallard_MA	4	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Lesser Black-backed Gull_LB	16	
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Golden Plover_GP	200	Circling N of site (off site)

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Windmill	1, 3	B & S Winter	25/10/2012	AB	Misty	8/8	Good	F1	10.22	11.40	Buzzard_BZ	2	Over scrub at edge of bog. Also seen by BP
Windmill	1, 2, 3, 4	B & S Winter	18/01/2013	CCr	Continuous light rain	8/8	Excellent	F2	09.30	12.30	Wren_WR	4	All birds in woodland edge
Windmill	1, 2, 3, 4	B & S Winter	18/01/2013	CCr	Continuous light rain	8/8	Excellent	F2	09.30	12.30	Dunnock_D.	1	All birds in woodland edge
Windmill	1, 2, 3, 4	B & S Winter	18/01/2013	CCr	Continuous light rain	8/8	Excellent	F2	09.30	12.30	Redwing_RE	33	All birds in woodland edge
Windmill	1, 2, 3, 4	B & S Winter	18/01/2013	CCr	Continuous light rain	8/8	Excellent	F2	09.30	12.30	Blue Tit_BT	1	All birds in woodland edge
Windmill	1, 2, 3, 4	B & S Winter	18/01/2013	CCr	Continuous light rain	8/8	Excellent	F2	09.30	12.30	Lesser Redpoll_LR	1	All birds in woodland edge
Windmill	1, 2, 3, 4	B & S Winter	18/01/2013	CCr	Continuous light rain	8/8	Excellent	F2	09.30	12.30	Blackbird_B.	7	All birds in woodland edge
Windmill	1, 2, 3, 4	B & S Winter	18/01/2013	CCr	Continuous light rain	8/8	Excellent	F2	09.30	12.30	Robin_R.	1	All birds in woodland edge
Windmill	1, 2, 3, 4	B & S Winter	18/01/2013	CCr	Continuous light rain	8/8	Excellent	F2	09.30	12.30	Goldcrest_GC	5	All birds in woodland edge
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Blackbird_B.	6	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Chaffinch_CH	3	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Great Tit_GT	2	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Blackbird_B.	2	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Woodpigeon_WP	2	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Redwing_RE	23	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Wren_WR	4	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Coal Tit_CT	1	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Blue Tit_BT	1	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Robin_R.	2	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Starling_SG	12	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Jackdaw_JD	1	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Goldcrest_GC	1	
Windmill	1,2,3,4	B & S Winter	18/03/2013	CC	Occ showers	8/8	Good	F0	9.00	11.00	Magpie_MG	1	

Table 5: Brown and Shepherd Survey Results Drehid portion of Drehid-Hortland

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Blackbird_B.		
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Chaffinch_CH		
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Wren_WR		
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Blue Tit_BT		
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Great Tit_GT		
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Buzzard_Bz		
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Lesser Redpoll_LR		
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Fieldfare_FF		
Drehid	5, 6, 7, 8	B & S Winter	25/10/2012	CH	None		Moderate	F0	10.00	15.00	Redwing_RE		
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Rook_RO	39	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Mistle Thrush_M.	2	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Jackdaw_JD	3	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Wren_WR	2	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Robin_R.	5	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Blue Tit_BT	1	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Dunnock_D.	1	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Redwing_RE	20	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Blackbird_B.	2	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Woodpigeon_WP	3	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Hooded Crow_HC	2	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Chaffinch_CH	3	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Great Tit_GT	1	
Drehid	11	B & S Winter	25/10/2012	AB	None	8/8	Good	F3	12.335	13.35	Grey Wagtail_GL	1	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Coal Tit_CT	2	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Chaffinch_CH	3	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Blackbird_B.	3	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Pheasant_PH	4	Also Pheasant enclosure in small patch of trees in centre of site
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Robin_R.	4	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Rook_RO	6	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Wren_WR	2	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Goldcrest_GC	2	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Woodpigeon_WP	5	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Redwing_RE	13	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Blue Tit_BT	1	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Magpie_MG	1	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Hooded Crow_HC	1	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Jay_J.	2	
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Mallard_MA	22	In small wet area/pond at centre of field near T8
Drehid	8	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	11.00	12.30	Fieldfare_FF	17	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Robin_R.	2	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Wren_WR	2	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Rook_RO	2	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Magpie_MG	1	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Woodpigeon_WP	4	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Chaffinch_CH	3	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Buzzard_Bz	1	Being mobbed by corvids
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Jay_J.	2	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Lesser Redpoll_LR	3	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Blue Tit_BT	1	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Blackbird_B.	2	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Goldcrest_GC	1	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Reed Bunting_RB	3	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Pheasant_PH	10	
Drehid	6	B & S Winter	25/10/2012	AMC	None	8/8	Moderate	F2	14.00	15.00	Long-tailed Tit_LT	2	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Wren_WR	9	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Chaffinch_CH	5	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Rook_RO	3	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Woodpigeon_WP	16	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Pied Wagtail_PW	1	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Magpie_MG	2	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Raven_RN	1	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Blackbird_B.	5	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Robin_R.	12	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Goldcrest_GC	8	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Siskin_SK	20	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Redwing_RE	20	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Hooded Crow_HC	3	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Mistle Thrush_M.	10	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Great Tit_GT	1	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Blue Tit_BT	2	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Coal Tit_CT	2	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Jay_J.	1	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	House Sparrow_HS	2	
Drehid	1, 2, 3	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Bullfinch_BF	1	
Drehid	4	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Kestrel_K.	1	
Drehid	4	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Lesser Redpoll_LR	8	
Drehid	4	B & S Winter	25/10/2012	CC	None	4/8	Good	F1	12.29	13.50	Lapwing_L.	19	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Wren_WR	4	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Dunnock_D.	1	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Robin_R.	5	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		House Sparrow_HS	10	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Blackbird_B.	5	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Great Tit_GT	2	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Goldcrest_GC	1	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Woodpigeon_WP	1	
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Rook_RO	3	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	4	B & S Winter	25/10/2012	ED	Light drizzle	8/8		F1	12.45		Lesser Redpoll_LR	8	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Robin_R.		
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Blackbird_B.	2	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Mistle Thrush_M.	5	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Chaffinch_CH	6	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Woodpigeon_WP	4	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Rook_RO	5	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Fieldfare_FF	15	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Redwing_RE	29	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Hooded Crow_HC	2	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	House Sparrow_HS	14	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Grey Wagtail_GL	1	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Wren_WR	1	
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Golden Plover_GP	2	Flying 10-100m
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Buzzard_Bz	1	Flying 10-50m
Drehid	9	B & S Winter	25/10/2012	ED	None			F3	12.38	13.45	Snipe_SN	2	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Chaffinch_CH	5	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Wren_WR	13	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Woodpigeon_WP	152	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Jay_J.	1	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Magpie_MG	2	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Blackbird_B.	7	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Siskin_SK	23	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Lesser Redpoll_LR	31	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Goldcrest_GC	3	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Great Tit_GT	18	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Blue Tit_BT	3	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Coal Tit_CT	2	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Song Thrush_ST	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Redwing_RE	82	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Meadow Pipit_MP	12	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Pied Wagtail_PW	1	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Goldfinch_GO	53	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Starling_SG	1	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Mistle Thrush_M.	1	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Fieldfare_FF	76	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Rook_RO	3	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Raven_RN	2	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Robin_R.	17	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Hooded Crow_HC	2	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Linnet_LI	18	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Reed Bunting_RB	3	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Snipe_SN	3	Marked on map
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Buzzard_Bz	1	
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Sparrowhawk_SH	1	Female as per map
Drehid	10, 12, 13, 14	B & S Winter	25/10/2012	DML	None	8/8	Excellent	F2	10.00	14.00	Hare		
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Golden Plover_GP	52	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Blackbird_B.	17	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Chaffinch_CH	7	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Rook_RO	22	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Starling_SG	32	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Fieldfare_FF	31	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Wren_WR	1	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Woodpigeon_WP	1	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Dunnock_D.	2	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Magpie_MG	2	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Redwing_RE	27	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Robin_R.	5	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Goldcrest_GC	2	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Raven_RN	1	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Jackdaw_JD	6	
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Golden Plover_GP	20	Flew E at 15-20m
Drehid	11	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Golden Plover_GP	24	Flew S at 10-15m
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Woodpigeon_WP	2	
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Blackbird_B.	7	
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Rook_RO	4	
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Starling_SG	36	
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Raven_RN	1	
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Jay_J.	1	
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Magpie_MG	2	
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Wren_WR	6	
Drehid	10	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Rook_RO	5	
Drehid	13	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Starling_SG	365	
Drehid	13 (N part)	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Rook_RO	2	
Drehid	13 (N part)	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Woodpigeon_WP	1	
Drehid	13 (N part)	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Dunnock_D.	1	
Drehid	13 (N part)	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Hare		
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Dunnock_D.	2	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Blackbird_B.	11	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Wren_WR	3	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Robin_R.	3	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Fieldfare_FF	19	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Starling_SG	38	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Redwing_RE	48	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Blue Tit_BT	4	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Raven_RN	1	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Chaffinch_CH	4	

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Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Rook_RO	12	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Mallard_MA	2	In drainage channel
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Pied Wagtail_PW	1	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Hooded Crow_HC	4	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Snipe_SN	2	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Little Egret_ET	1	Flew in at c.4m
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Great Tit_GT	2	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Goldcrest_GC	1	
Drehid	12	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Bullfinch_BF	1	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Hooded Crow_HC	8	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Magpie_MG	2	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Robin_R.	4	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Wren_WR	2	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Raven_RN	1	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Teal_T.	16	Drainage channel/stream
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Blackbird_B.	6	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Dunnock_D.	2	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Woodpigeon_WP	3	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Jackdaw_JD	4	
Drehid	14	B & S Winter	15/01/2013	CH	None	0/8	Good	F1	10.00	15.45	Badger		
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Jay_J.	1	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Blackbird_B.	13	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Chaffinch_CH	5	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Blue Tit_BT	1	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Hooded Crow_HC	1	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Goldcrest_GC	4	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Coal Tit_CT	22	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Buzzard_Bz	1	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Robin_R.	2	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Dunnock_D.	2	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Wren_WR	5	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Rook_RO	13	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Common Crossbill_CR	1	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Woodpigeon_WP	3	
Drehid	1	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	09.50	11.40	Treecreeper_TC	1	
Drehid	2	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	11.40	13.40	Snipe_SN	4	
Drehid	2	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	11.40	13.40	Wren_WR	1	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Stonechat_SC	1	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Wren_WR	1	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Coal Tit_CT	2	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Goldcrest_GC	1	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Lesser Redpoll_LR	3	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Dunnock_D.	1	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Song Thrush_ST	1	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Magpie_MG	1	
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Deer		
Drehid	3	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	13.40	15.00	Fox		
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.00	15.40	Robin_R.	1	
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.00	15.40	Blackbird_B.	2	
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.00	15.40	Wren_WR	1	
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.00	15.40	Song Thrush_ST	2	
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.00	15.40	Fox		
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.40	16.30	Goldcrest_GC	3	
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.40	16.30	Blackbird_B.	7	
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.40	16.30	Song Thrush_ST	1	
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.40	16.30	Woodpigeon_WP	3	
Drehid	4	B & S Winter	15/01/2013	CCr	None	1/8	Excellent	F0	15.40	16.30	Coal Tit_CT	2	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Blackbird_B.	7	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Wren_WR	4	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Rook_RO	16	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Chaffinch_CH	7	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Robin_R.	4	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Starling_SG	20	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Fieldfare_FF	18	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Snipe_SN	1	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Yellowhammer_Y.	1	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Fox		
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Hare		
Drehid	10	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Golden Plover_GP	18	
Drehid	10	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Hooded Crow_HC	1	
Drehid	10	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Blackbird_B.	3	
Drehid	10	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Hare		
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Redwing_RE	2	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Coal Tit_CT	1	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Hooded Crow_HC	1	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Dunnock_D.	1	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Meadow Pipit_MP	4	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Woodpigeon_WP	6	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Great Tit_GT	1	
Drehid	9	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Long-tailed Tit_LT	7	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Long-tailed Tit_LT	2	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Rook_RO	38	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Robin_R.	2	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Starling_SG	42	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Redwing_RE	59	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Fieldfare_FF	53	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Hooded Crow_HC	3	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Magpie_MG	3	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Blackbird_B.	5	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Jay_J.	1	
Drehid	7, 8	B & S Winter	15/01/2013	AB	None	2/8	Excellent	F0	10.30		Snipe_SN	2	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Blackbird_B.	7	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Goldcrest_GC	5	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Coal Tit_CT	4	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Robin_R.	3	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Jay_J.	1	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Rook_RO	2	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Linnet_LI	11	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Blue Tit_BT	2	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Woodpigeon_WP	1	
Drehid	5, 6	B & S Winter	18/01/2013	CH	Heay at times	8/8	Moderate	F4	09.30	12.30	Goldcrest_GC	3	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Chaffinch_CH	27	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Pheasant_PH	3	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Blackbird_B.	18	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Robin_R.	12	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Hooded Crow_HC	10	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Dunnock_D.	3	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Wren_WR	6	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Rook_RO	22	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Meadow Pipit_MP	11	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Great Tit_GT	4	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Jackdaw_JD	3	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Song Thrush_ST	7	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Blue Tit_BT	2	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Woodpigeon_WP	12	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Coal Tit_CT	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Goldcrest_GC	4	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Redwing_RE	54	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Jay_J.	3	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Bullfinch_BF	1	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Mallard_MA	2	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Starling_SG	106	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Fieldfare_FF	5	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Mistle Thrush_M.	4	
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Whooper Swan_WS	1	Adult at 40m
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Mute Swan_MS	2	Adults at 40m
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	15.23	Kestrel_K.	1	Male at 30m in suitable breeding habitat
Drehid	7, 8, 9, 10	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	09.47	12.10	Buzzard_BZ	1	Soaring and calling to 30m
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Hooded Crow_HC	13	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Chaffinch_CH	25	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Robin_R.	3	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Rook_RO	36	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Woodpigeon_WP	16	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Blue Tit_BT	4	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Meadow Pipit_MP	13	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Pied Wagtail_PW	5	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Goldcrest_GC	7	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Coal Tit_CT	5	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Treecreeper_TC	2	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Yellowhammer_Y.	8	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Magpie_MG	3	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Starling_SG	850	N 73032 34294
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Wren_WR	7	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Tree Sparrow_TS	22	N 73079 34222
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Redwing_RE	39	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Grey Heron_H.	1	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Blackbird_B.	12	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Song Thrush_ST	4	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Dunnock_D.	3	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Sparrowhawk_SH	1	Male at 2m
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Great Tit_GT	3	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Long-tailed Tit_LT	1	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Lesser Redpoll_LR	3	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Jackdaw_JD	3	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Mistle Thrush_M.	6	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Jay_J.	1	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Collared Dove_CD	3	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Feral Pigeon_FP	5	
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Green Sandpiper_GE	2	In flooded field
Drehid	11, 12, 13	B & S Winter	18/03/2013	CCr	Occasional light showers	8/8	Good	F2	12.10	15.23	Buzzard_BZ	2	Pair displaying to 100m
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Blackbird_B.	19	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Chaffinch_CH	25	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Wren_WR	7	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Starling_SG	20	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Woodpigeon_WP	45	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Robin_R.	12	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Rook_RO	3	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Pheasant_PH	2	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	House Sparrow_HS	3	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Blue Tit_BT	1	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Hooded Crow_HC	2	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Reed Bunting_RB	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Redwing_RE	2	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Treecreeper_TC	2	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Goldcrest_GC	3	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Dunnock_D.	2	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Coal Tit_CT	9	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Long-tailed Tit_LT	2	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Lesser Redpoll_LR	22	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Mallard_MA	2	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Teal_T.	21	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Common Crossbill_CR	5	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Raven_RN	1	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Mistle Thrush_M.	1	
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Buzzard_Bz		Heard
Drehid	1, 2, 3, 4, 5, 6, 7	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Otter		
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Starling_SG	430	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Robin_R.	6	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Hooded Crow_HC	6	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Magpie_MG	1	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Wren_WR	2	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Rook/Jackdaw	18	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Blackbird_B.	11	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Song Thrush_ST	2	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Chaffinch_CH	2	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Woodpigeon_WP	81	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Mistle Thrush_M.	1	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Golden Plover_GP	220	120->180m
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Wren_WR	3	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Redwing_RE	34	
Drehid	14, 17	B & S Winter	18/03/2013	BP	Light showers	8/8	Good	F2	08.55	16.00	Great Tit_GT	2	

Table 6: Brown and Shepherd Survey Results Hortland Portion of Drehid-Hortland

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Robin_R.	7	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Great Tit_GT	1	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Rook_RO	6	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	House Sparrow_HS	3	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Wren_WR	2	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Chaffinch_CH	3	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Blue Tit_BT	1	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Blackbird_B.	6	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Starling_SG	140	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Woodpigeon_WP	14	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Hooded Crow_HC	2	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Pied Wagtail_PW	1	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Fieldfare_FF	2	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Redwing_RE	4	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Song Thrush_ST	1	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Bullfinch_BF	1	
Hortland	1	B & S Winter	31/10/2012	BP	None	5/8	Excellent	F1	15.15	16.10	Pheasant_PH	1	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Robin_R.	6	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Chaffinch_CH	3	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Blackbird_B.	4	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Jackdaw_JD	2	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Wren_WR	3	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Common Crossbill_CR	2	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Hooded Crow_HC	1	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Coal Tit_CT	1	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Rook_RO	1	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Bullfinch_BF	1	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Goldcrest_GC	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Long-tailed Tit_LT	3	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Blue Tit_BT	1	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Dunnock_D.	1	
Hortland	9	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Pied Wagtail_PW	1	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Robin_R.	3	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Blackbird_B.	3	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Bullfinch_BF	1	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Hooded Crow_HC	1	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Coal Tit_CT	3	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Common Crossbill_CR	1	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Wren_WR	1	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Great Tit_GT	2	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Treecreeper_TC	2	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Goldcrest_GC	2	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Raven_RN	1	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Blue Tit_BT	1	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Siskin_SK	1	
Hortland	5	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Chaffinch_CH	2	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Reed Bunting_RB	2	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Hooded Crow_HC	2	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Robin_R.	4	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Meadow Pipit_MP	1	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Common Crossbill_CR	5	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Siskin_SK	1	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Kestrel_K.	1	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Wren_WR	6	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Coal Tit_CT	4	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Great Tit_GT	2	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Bullfinch_BF	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Long-tailed Tit_LT	4	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Goldcrest_GC	4	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Chaffinch_CH	2	
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Buzzard_Bz	1	Perched then flies off. Tagged.
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Buzzard_Bz	2	50-100m. Both untagged.
Hortland	3, 4, 6	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Sparrowhawk_SH	1	Female type
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Redwing_RE	3	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Blackbird_B.	6	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Goldfinch_GO	3	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Robin_R.	2	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Dunnock_D.	1	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Hooded Crow_HC	1	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Lesser Redpoll_LR	1	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Woodpigeon_WP	2	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Mistle Thrush_M.	2	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Grey Heron_H.	1	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Chaffinch_CH	2	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Jackdaw_JD	2	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Snipe_SN	1	
Hortland	7	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Coal Tit_CT	1	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Rook_RO	42	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Jackdaw_JD	61	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Raven_RN	1	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Hooded Crow_HC	2	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Magpie_MG	2	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Woodpigeon_WP	6	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Lapwing_L.	58	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Starling_SG	95	
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Chaffinch_CH	12	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hortland	2	B & S Winter	01/11/2012	BP	None	2/8	Good	F3	08.45	13.50	Buzzard_Bz	2	10-100m (prob same as sighting 2)
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Sparrowhawk_SH	105	10-20m for 350 secs. Watch for 10 mins
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Lapwing_L.	110	10-20m for 250s
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Curlew_CU	5	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Rook_RO	25	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Lesser Redpoll_LR	45	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Chaffinch_CH	8	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Hooded Crow_HC	2	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Jackdaw_JD	30	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Blue Tit_BT	19	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Great Tit_GT	2	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Jay_J.	2	Heard only
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Goldfinch_GO	26	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Blackbird_B.	10	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Goldcrest_GC	20	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Coal Tit_CT	1	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Mistle Thrush_M.	2	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Magpie_MG	6	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Meadow Pipit_MP	1	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Dunnock_D.	80	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Redwing_RE	1	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Linnet_LI	35	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Long-tailed Tit_LT	1	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Kestrel_K.	11	Female 30m
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Siskin_SK	3	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Fieldfare_FF	40	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Robin_R.	25	
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Reed Bunting_RB	4	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	24/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Buzzard_Bz	1	15m
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	25/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Lapwing_L.	105	50m for 330 secs and 10-40m for 250 secs. Watched for 10 mins
Hortland	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	B & S Winter	25/01/2013	DML	None	8/8	Excellent	F0	08.30	14.30	Golden Plover_GP	438	10-40m for all of 10 min watch
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Bullfinch_BF	6	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Great Tit_GT	3	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Greenfinch_GR	3	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Rook_RO	2	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Woodpigeon_WP	32	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	House Sparrow_HS	8	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Blue Tit_BT	4	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Coal Tit_CT	3	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Goldcrest_GC	5	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Wren_WR	3	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Blackbird_B.	4	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Treecreeper_TC	1	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Jackdaw_JD	28	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Dunnock_D.	2	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Robin_R.	2	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Chaffinch_CH	5	
Hortland	1	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Goldfinch_GO	2	
Hortland	2	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Pied Wagtail_PW	2	
Hortland	2	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Rook_RO	53	
Hortland	2	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Woodpigeon_WP	17	
Hortland	2	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Pheasant_PH	1	
Hortland	2	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Snipe_SN	1	
Hortland	2	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Chaffinch_CH	7	
Hortland	2	B & S Winter	25/01/2013	CH	Heavy showers	8/8	Moderate	F2	09.30	12.30	Wren_WR	1	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Mistle Thrush_M.	2	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Chaffinch_CH	2	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Wren_WR	4	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Goldcrest_GC	5	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Robin_R.	2	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Rook_RO	2	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Woodpigeon_WP	4	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Lesser Redpoll_LR	1	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Sparrowhawk_SH	1	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Blackbird_B.	5	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Hooded Crow_HC	1	
Hortland	T6-11	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Coal Tit_CT	3	
Hortland	T3 + T4	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Raven_RN	1	
Hortland	T3 + T4	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Hooded Crow_HC	2	
Hortland	T3 + T4	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Wren_WR	1	
Hortland	T3 + T4	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Blue Tit_BT	1	
Hortland	T2, T4, T5	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Blackbird_B.	5	
Hortland	T2, T4, T5	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Redwing_RE	40	
Hortland	T2, T4, T5	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Fieldfare_FF	3	
Hortland	T2, T4, T5	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Rook_RO	2	
Hortland	T2, T4, T5	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Jackdaw_JD	4	
Hortland	T2, T4, T5	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Robin_R.	1	
Hortland	T2, T4, T5	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Woodpigeon_WP	2	
Hortland	T2, T4, T5	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Great Tit_GT	1	
Hortland	T1	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Lesser Black-backed Gull_LB	5	
Hortland	T1	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Blackbird_B.	2	
Hortland	T1	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Rook_RO	11	
Hortland	T1	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Chaffinch_CH	2	
Hortland	T1	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Woodpigeon_WP	1	
Hortland	T1	B & S Winter	22/03/2013	AB	Heavy showers	8/8	Good	F4			Magpie_MG	1	

Table 7: Brown and Shepherd Survey Results Derrybrennan

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	7, 8	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Starling_SG	553	
Derrybrennan	7, 8	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Woodpigeon_WP	210	
Derrybrennan	7, 8	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Rook_RO	63	
Derrybrennan	7, 8	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Redwing_RE	2	
Derrybrennan	7, 8	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Sparrowhawk_SH	1	
Derrybrennan	7, 8	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Whooper Swan_WS	3	Feeding in stubble
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Jay_J.	1	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Rook_RO	4	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Long-tailed Tit_LT	8	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Great Tit_GT	2	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Dunnock_D.	2	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Robin_R.	3	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Raven_RN	1	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Woodpigeon_WP	4	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Bullfinch_BF	4	
Derrybrennan	6	B & S Winter	02/11/2012	CH	None	4/8	Excellent	F2	09.30	11.30	Chaffinch_CH	7	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Sparrowhawk_SH	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Chaffinch_CH	17	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Hooded Crow_HC	2	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Magpie_MG	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Siskin_SK	14	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Robin_R.	13	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Wren_WR	9	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Long-tailed Tit_LT	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Great Tit_GT	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Hooded Crow_HC	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Blue Tit_BT	4	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Woodpigeon_WP	28	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Mistle Thrush_M.	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Lesser Redpoll_LR	2	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Pheasant_PH	2	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Rook_RO	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Starling_SG	16	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Blackbird_B.	5	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Dunnock_D.	2	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Reed Bunting_RB	2	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Coal Tit_CT	4	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Goldcrest_GC	7	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Common Crossbill_CR	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Kestrel_K.	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	CC	None	1/8	Excellent	F1	09.40	11.50	Fox		
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Woodpigeon_WP	31	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Siskin_SK	2	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Goldcrest_GC	3	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Wren_WR	6	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Chaffinch_CH	28	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Great Tit_GT	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Blackbird_B.	1	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Robin_R.	5	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Pheasant_PH	3	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Sparrowhawk_SH	1	In long vegetation next to WD4. Disturbed by pheasants and landed on fence post but flew off as I came closer.
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Starling_SG	54	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Coal Tit_CT	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Pied Wagtail_PW	6	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Magpie_MG	4	
Derrybrennan	T5	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Lapwing_L.	17	
Derrybrennan	1, 2, 3, 9	B & S Winter	02/11/2012	AB	None	2/8	Excellent	F1	09.50	11.15	Hooded Crow_HC	2	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Buzzard_Bz	1	Mostly in field eating invertebrates (worms?)
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Jay_J.	3	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Robin_R.	3	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Pheasant_PH	2	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Chaffinch_CH	46	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Fieldfare_FF	55	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Redwing_RE	32	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Goldcrest_GC	10	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Wren_WR	5	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Blue Tit_BT	2	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Coal Tit_CT	3	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Blackbird_B.	8	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Song Thrush_ST	3	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Magpie_MG	8	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Skylark_S.	11	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Starling_SG	7	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Woodpigeon_WP	14	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Meadow Pipit_MP	3	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Mistle Thrush_M.	7	
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Sparrowhawk_SH	1	Female
Derrybrennan	4, 5	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Hare	1	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Goldcrest_GC	3	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Song Thrush_ST	2	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Blackbird_B.	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Robin_R.	1	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Coal Tit_CT	3	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Reed Bunting_RB	3	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Sparrowhawk_SH	1	Male
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Jay_J.	2	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Wren_WR	2	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Blue Tit_BT	2	On grassy forestry track
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Sparrowhawk_SH	2	Immature male max height 40m
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Kestrel_K.	1	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Chaffinch_CH	6	
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Fox		
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Pygmy Shrew		
Derrybrennan	9	B & S Winter	28/01/2013	CCr	Occasional light rain	8/8	Good	F4	08.55	16.10	Otter		
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Woodpigeon_WP	22	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Chaffinch_CH	35	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Pied Wagtail_PW	3	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Rook_RO	130	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Hooded Crow_HC	1	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Fieldfare_FF	5	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Skylark_S.	7	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Meadow Pipit_MP	23	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Goldcrest_GC	2	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Blue Tit_BT	2	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Robin_R.	2	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Woodcock_WK	1	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Lesser Redpoll_LR	1	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Blackbird_B.	2	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Coal Tit_CT	3	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Pheasant_PH	1	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Wren_WR	1	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Mistle Thrush_M.	7	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Bullfinch_BF	2	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Jay_J.	1	
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Badger		
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Deer		
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Fox		
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Hare		
Derrybrennan	6, 7, 8	B & S Winter	28/01/2013	CC	Occasional showers	8/8	Good	F2	11.30	14.00	Otter		
Derrybrennan	4, 5, 9, 3	B & S Winter	30/01/2013	CH	Heavy showers	8/8	Moderate	F5	09.30	12.30	Hooded Crow_HC	2	
Derrybrennan	4, 5, 9, 3	B & S Winter	30/01/2013	CH	Heavy showers	8/8	Moderate	F5	09.30	12.30	Magpie_MG	1	
Derrybrennan	4, 5, 9, 3	B & S Winter	30/01/2013	CH	Heavy showers	8/8	Moderate	F5	09.30	12.30	Linnet_LI	12	
Derrybrennan	4, 5, 9, 3	B & S Winter	30/01/2013	CH	Heavy showers	8/8	Moderate	F5	09.30	12.30	Woodpigeon_WP	6	
Derrybrennan	4, 5, 9, 3	B & S Winter	30/01/2013	CH	Heavy showers	8/8	Moderate	F5	09.30	12.30	Fieldfare_FF	96	
Derrybrennan	4, 5, 9, 3	B & S Winter	30/01/2013	CH	Heavy showers	8/8	Moderate	F5	09.30	12.30	Mistle Thrush_M.	1	
Derrybrennan	4, 5, 9, 3	B & S Winter	30/01/2013	CH	Heavy showers	8/8	Moderate	F5	09.30	12.30	Kestrel_K.	1	Flying 1-3m above road then moved over forestry flying 10-12m. Hovered over bog for 24 secs
Derrybrennan	9	B & S Winter	30/01/2013	CCr	Heavy showers after 11.00	7/8	Good	F5	08.00	09.50	Buzzard_Bz	1	out of forestry, circling & calling. Potential breeding area?
Derrybrennan	9	B & S Winter	30/01/2013	CCr	Heavy showers after 11.00	7/8	Good	F5			Otter		
Derrybrennan	9	B & S Winter	30/01/2013	CCr	Heavy showers after 11.00	7/8	Good	F5	10.10	12.10			No sightings of note
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Rook_RO	3	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Goldcrest_GC	4	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Woodpigeon_WP	2	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Blackbird_B.	3	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Long-tailed Tit_LT	1	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Robin_R.	2	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Coal Tit_CT	1	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Wren_WR	3	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Mistle Thrush_M.	1	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Deer		
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Goldcrest_GC	4	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Blue Tit_BT	1	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Chaffinch_CH	32	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Long-tailed Tit_LT	7	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Blackbird_B.	2	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Rook_RO	1	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Mistle Thrush_M.	6	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Redwing_RE	17	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Reed Bunting_RB	2	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Skylark_S.	9	Near T7 & 4
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Fieldfare_FF	25	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Meadow Pipit_MP	1	
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Lapwing_L.	40	Displaying to 20m then 38 flushed all alarming & remaining nearby & circling overhead. Likely breeding area. All in vicinity T7.
Derrybrennan	9, 3, 21	B & S Winter	26/03/2013	CCr	Constant light snow	8/8	Good	F3	10.00	15.00	Kestrel_K.	1	male max 10m. Landed & present till end.
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Buzzard_Bz	2	Pair of BZ flew N to S into WD4

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Robin_R.	2	
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Blackbird_B.	4	
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Fieldfare_FF	24	
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Redwing_RE	30	
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Rook_RO	1	
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Mistle Thrush_M.	2	
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Coal Tit_CT	2	
Derrybrennan	4	B & S Winter	26/03/2013	CH	Heavy snow	8/8	Moderate	F5	09.30	12.30	Jay_J.	2	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Pied Wagtail_PW	1	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Chaffinch_CH	5	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Blackbird_B.	4	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Robin_R.	8	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Hooded Crow_HC	2	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Starling_SG	1	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Bullfinch_BF	1	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Woodpigeon_WP	6	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Lesser Redpoll_LR	2	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Wren_WR	2	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Dunnock_D.	2	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Skylark_S.	1	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Linnet_LI	8	
Derrybrennan		B & S Winter	21/02/2014	CC	Dry	6/8	Good	F2 W	09.30	11.00	Raven_RN	2	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Pied Wagtail_PW	1	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Chaffinch_CH	5	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Blackbird_B.	4	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Robin_R	8	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Hooded Crow_HC	2	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Song Thrush_ST	1	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Bullfinch_BF	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Woodpigeon_WP	6	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Lesser Redpoll_LR	2	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Wren_WR	2	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Dunnock_D.	2	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Skylark_S.	1	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Linnet	8	
Derrybrennan	T9	B & S Winter	21/02/2014	CC	DRY	6/8	Good	WF2	09.30	10.30	Raven_RN	2	

Table 8: Brown and Shepherd Survey Results Cloncumber

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Coal Tit_CT	15	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Goldcrest_GC	11	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Buzzard_BZ	2	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Hooded Crow_HC	4	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Robin_R.	12	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Wren_WR	26	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Blackbird_B.	13	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Rook_RO	20	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Chaffinch_CH	22	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Great Tit_GT	10	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Blue Tit_BT	28	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Jay_J.	1	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Meadow Pipit_MP	13	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Sparrowhawk_SH	1	Male. Marked on map
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Song Thrush_ST	1	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Goldfinch_GO	1	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Lesser Redpoll_LR	3	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Siskin_SK	2	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Skylark_S.	28	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Yellowhammer_Y.	6	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Starling_SG	16	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Redwing_RE	42	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Fieldfare_FF	10	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Mistle Thrush_M.	2	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Tree Sparrow_TS	3	
Cloncumber	5, 6, 7, 8, 9	B & S Winter	02/11/2012	DML	Occasional heavy sleet	2/8	Excellent	F4	09.30	13.00	Otter		
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Chaffinch_CH	1	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Skylark_S.	2	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Blackbird_B.	6	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Woodpigeon_WP	7	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Redwing_RE	4	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Reed Bunting_RB	2	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Meadow Pipit_MP	5	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Treecreeper_TC	1	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Blue Tit_BT	2	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Mistle Thrush_M.	2	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Wren_WR	1	
Cloncumber	1	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Snipe_SN	11	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Raven_RN	1	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Stonechat_SC	1	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Redwing_RE	176	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Woodpigeon_WP	30	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Mistle Thrush_M.	5	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Blackbird_B.	14	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Robin_R.	2	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Lapwing_L.	1	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Long-tailed Tit_LT	8	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Goldcrest_GC	2	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Blue Tit_BT	3	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Coal Tit_CT	3	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Starling_SG	260	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Hooded Crow_HC	2	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Rook_RO	10	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Fieldfare_FF	80	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Great Tit_GT	1	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Chaffinch_CH	10	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Goldfinch_GO	3	

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Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Song Thrush_ST	1	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Reed Bunting_RB	1	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Meadow Pipit_MP	2	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Bullfinch_BF	2	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Dunnock_D.	2	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	House Sparrow_HS	5	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Wren_WR	1	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Snipe_SN	1	
Cloncumber	2, 3, 4, 5	B & S Winter	02/11/2012	BP	One heavy shower	5/8	Excellent	F4	09.55	13.20	Sparrowhawk_SH	1	Female type 50 - 100 m
Cloncumber		B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Whooper Swan_WS	2	2 adults flying low c. 30m over canal
Cloncumber	6, 9	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Golden Plover_GP	1	Over
Cloncumber	6, 9	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Yellowhammer_Y.	2	
Cloncumber	6, 9	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Jay_J.	1	
Cloncumber	6, 9	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Kestrel_K.	1	
Cloncumber	6, 9	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Skylark_S.	5	
Cloncumber	1, 6	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Teal_T.	1	Female on canal
Cloncumber	1, 6	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Fox		
Cloncumber	1, 6	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Otter		
Cloncumber	1, 6	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Skylark_S.	18	Near T3
Cloncumber	1, 6	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Yellowhammer_Y.	5	In site at farm
Cloncumber	1, 6	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	House Sparrow_HS	15	In site at farm
Cloncumber	1, 6	B & S Winter	02/11/2012	CCr	One heavy shower	2/8	Excellent	F3	09.10	13.30	Tree Sparrow_TS	4	In site at farm
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Sparrowhawk_SH	1	Female
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Woodpigeon_WP	25	
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Hooded Crow_HC	5	
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Rook_RO	7	
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Buzzard_BZ	2	

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Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Kestrel_K.	1	
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Sparrowhawk_SH	3	3 females observed at same time
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Peregrine_PE	1	20m
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Fieldfare_FF	105	
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Redwing_RE	25	
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Mistle Thrush_M.	2	
Cloncumber	6, 7, 8, 9	B & S Winter	30/01/2013	DML	Occasional showers	8/8	Excellent	F7	10.00	16.00	Starling_SG	150	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Robin_R.	17	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Goldcrest_GC	33	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Coal Tit_CT	13	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Wren_WR	3	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Song Thrush_ST	12	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Dunnock_D.	2	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Hooded Crow_HC	6	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Blue Tit_BT	3	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Chaffinch_CH	3	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Common Crossbill_CR	2	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Woodcock_WK	1	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Blackbird_B.	3	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Treecreeper_TC	1	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Jay_J.	2	
Cloncumber	9, 8, 7	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Long-tailed Tit_LT	23	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Hooded Crow_HC	2	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Meadow Pipit_MP	20	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Great Tit_GT	2	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Pheasant_PH	1	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Magpie_MG	4	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Song Thrush_ST	7	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Wren_WR	1	

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Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Dunnock_D.	4	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Jackdaw_JD	2	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Rook_RO	48	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Skylark_S.	13	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Blue Tit_BT	1	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Reed Bunting_RB	2	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Pied Wagtail_PW	2	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Starling_SG	1	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Moorhen_MH	1	In drain
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Blackbird_B.	2	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Redwing_RE	1	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Fieldfare_FF	11	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Yellowhammer_Y.	1	In stubble
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Snipe_SN	5	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Grey Wagtail_GL	1	
Cloncumber	6	B & S Winter	01/02/2013	CCr	Occasional brief showers	6/8	Excellent	F3	08.30	11.20	Otter		
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Great Tit_GT	3	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Blackbird_B.	8	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Coal Tit_CT	1	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Robin_R.	7	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Wren_WR	5	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Blue Tit_BT	6	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Jackdaw_JD	3	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Goldcrest_GC	1	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Woodpigeon_WP	4	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Song Thrush_ST	2	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Rook_RO	2	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	House Sparrow_HS	7	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Chaffinch_CH	2	

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Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Hooded Crow_HC	2	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Dunnock_D.	1	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Reed Bunting_RB	3	
Cloncumber	1	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Mistle Thrush_M.	1	
Cloncumber	2	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Rook_RO	6	
Cloncumber	2	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Robin_R.	4	
Cloncumber	2	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Redwing_RE	26	
Cloncumber	2	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Blackbird_B.	2	
Cloncumber	2	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Fieldfare_FF	36	
Cloncumber	2	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Starling_SG	288	
Cloncumber	3	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Wren_WR	2	
Cloncumber	3	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Chaffinch_CH	1	
Cloncumber	3	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Robin_R.	1	
Cloncumber	3	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Buzzard_Bz	1	
Cloncumber	3	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Long-tailed Tit_LT	9	
Cloncumber	3	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Mute Swan_MS	2	On river between T4 & T6
Cloncumber	3	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Reed Bunting_RB	1	
Cloncumber	5	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Redwing_RE	29	
Cloncumber	5	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Mistle Thrush_M.	2	
Cloncumber	5	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Fieldfare_FF	3	
Cloncumber	5	B & S Winter	01/02/2013	CH	None	6/8	Good	F2	09.30	15.30	Rook_RO	2	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Mistle Thrush_M.	1	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Blackbird_B.	3	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Song Thrush_ST	1	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Robin_R.	1	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Blue Tit_BT	1	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Goldcrest_GC	2	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Dunnock_D.	1	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Long-tailed Tit_LT	3	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Wren_WR	1	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Meadow Pipit_MP	12	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Skylark_S.	1	N of T.1
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Yellowhammer_Y.	1	Near T.1
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Woodpigeon_WP	4	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Rook_RO	3	
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Otter		
Cloncumber	1	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	10.00	11.05	Mink		
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Meadow Pipit_MP	20	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Woodpigeon_WP	9	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Rook_RO	13	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Hooded Crow_HC	8	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Goldcrest_GC	6	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Redwing_RE	74	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Mistle Thrush_M.	2	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Great Tit_GT	1	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Snipe_SN	3	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Blackbird_B.	3	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Blue Tit_BT	1	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Kingfisher_KF	1	West along stream just off site in N
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Mallard_MA	2	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Skylark_S.	4	Singing
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Fieldfare_FF	84	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Teal_T.	4	On river just off site
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Teal_T.	1	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Starling_SG	180	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Magpie_MG	3	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Song Thrush_ST	2	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Jackdaw_JD	9	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Pied Wagtail_PW	2	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Chaffinch_CH	4	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Yellowhammer_Y.	3	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Grey Heron_H.	1	
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Buzzard_BZ	1	30m
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Buzzard_BZ	2	Soaring and calling together at 25m then 1 off hunting at 12.08. Both together soaring 12.09 - 12.43 at 30m
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Golden Plover_GP	4	20m
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Lapwing_L.	12	Including 2 displaying. All subsequently flushed but none left area, circled calling= breeding. Likely to be 4-6 pairs in vicinity T3
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Otter		
Cloncumber	2, 3, 4, 5	B & S Winter	21/03/2013	CCr	None	8/8	Excellent	F3	11.05	13.05	Mink		
Cloncumber	7, 8, 9	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Blue Tit_BT	1	
Cloncumber	7, 8, 9	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Goldcrest_GC	9	
Cloncumber	7, 8, 9	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Blackbird_B.	2	
Cloncumber	7, 8, 9	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Robin_R.	4	
Cloncumber	7, 8, 9	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Wren_WR	3	
Cloncumber	7, 8, 9	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Bullfinch_BF	2	
Cloncumber	7, 8, 9	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Coal Tit_CT	4	
Cloncumber	7, 8, 9	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Long-tailed Tit_LT	4	
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Snipe_SN	2	
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Hooded Crow_HC	2	
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Meadow Pipit_MP	8	
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Fieldfare_FF	9	
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Pheasant_PH	1	
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Blackbird_B.	1	

Site Name	Subsection	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Mute Swan_MS	1	
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Redwing_RE	45	
Cloncumber	6	B & S Winter	21/03/2013	AB	None	8/8	Good	F4			Starling_SG	20	

Table 9: Hen Harrier Watch Results Roost A and B (locations confidential)

Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hen Harrier VP	30/01/2013	CC	None	4/8	Good	F2	07.30	09.30	Hen Harrier_HH	1	
Hen Harrier VP	30/01/2013	CC	None	4/8	Good	F2	07.30	09.30	Mute Swan_MS	2	
Hen Harrier VP	30/01/2013	CC	None	4/8	Good	F2	07.30	09.30	Buzzard_Bz	1	Over WD4 to N
Hen Harrier VP	30/01/2013	CC	None	4/8	Good	F2	07.30	09.30	Mute Swan_MS	2	Into standing water
Hen Harrier VP	30/01/2013	CC	None	4/8	Good	F2	07.30	09.30	Buzzard_Bz	1	
Hen Harrier VP	30/01/2013	CC	None	4/8	Good	F2	07.30	09.30	Golden Plover_GP	21	
Hen Harrier VP	21/02/2013	CC	None	6/8	Good	F2	07.10	09.10	Raven_RN	2	
Hen Harrier VP	21/02/2013	CC	None	6/8	Good	F2	07.10	09.10	Water Rail_WA	2	
Hen Harrier VP	21/02/2013	CC	None	6/8	Good	F2	07.10	09.10	Mute Swan_MS	1	Brief movement
Hen Harrier VP	21/02/2013	CC	None	6/8	Good	F2	16.30	18.30			No observations
Hen Harrier VP	07/03/2013	CC	None	8/8	Moderate	F2	06.30	8.30	Mute Swan_MS	1	
Hen Harrier VP	07/03/2013	CC	None	8/8	Moderate	F2	06.30	8.30	Buzzard_Bz	2	
Hen Harrier VP	07/03/2013	CC	None	8/8	Moderate	F2	06.30	8.30	Meadow Pipit_MP		in song
Hen Harrier VP	07/03/2013	CC	None	8/8	Moderate	F2	06.30	8.30	Stonechat_SC		in song
Hen Harrier VP	07/03/2013	cc	None	8/8	Moderate	F2	17.00	19.00	Buzzard_Bz	2	2 on approach, Water Rail calling.
Hen Harrier VP	20/03/2013	BP	None	8/8	poor	F0	05.55	08.00	Snipe_SN	1	heard chipping only
Hen Harrier VP	19/03/2013	BP	Showers	8/8	Good	N F1	17.00	19.20	Kestrel_K.	1	hunting
Hen Harrier VP	19/03/2013	BP	Showers	8/8	Good	N F1	17.00	19.20	Mute Swan_MS	1	flying extensively
Hen Harrier VP	19/03/2013	BP	Showers	8/8	Good	N F1	17.00	19.20	Buzzard_Bz	2	tracked bird flies to perch, disturbed by second
Hen Harrier VP	19/03/2013	BP	Showers	8/8	Good	N F1	17.00	19.20	Sparrowhawk_SH	1	flying to conifer plantation to north. Woodcock heard roding
Hen Harrier VP	19/03/2013	BP	Showers	8/8	Good	N F1	17.00	19.20	Curlew_CU	1	heard calling
Hen Harrier VP	19/03/2013	BP	Showers	8/8	Good	N F1	17.00	19.20	Snipe_SN	1	heard in display chipping and drumming
Hen Harrier VP	26/03/2013	CCr	Constant snow	8/8	Moderate	F2	17.30	19.30	Curlew_CU	10	Up, circled at landed. To 20m. Remained till dark.
Hen Harrier VP	26/03/2013	CCr	Constant snow	8/8	Moderate	F2	17.30	19.30	Woodcock_WK	1	Roding at 15m
Hen Harrier VP	26/03/2013	CCr	Constant snow	8/8	Moderate	F2	17.30	19.30	Woodcock_WK	1	Roding with Woodcock seen earlier (see flightline 2)
Hen Harrier VP	26/03/2013	CCr	Constant snow	8/8	Moderate	F2	17.30	19.30	Sparrowhawk_SH	1	Male 10m
Hen Harrier VP	30/11/2012	BP	none	7/8	V good	F0	15.20	17.00	Peregrine_PE	1	male with prey (starling) close to VP, <10m

Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hen Harrier VP	30/01/2013	CC	None	4/8	Good	F2	16.00	18.00	Mute Swan_MS	1	
Hen Harrier VP	30/01/2013	CC	None	4/8	Good	F2	16.00	18.00	Hen Harrier_HH	1	Flying NW
Hen Harrier VP	21/02/2013	CC	None	6/8	Good	F2	16.30	18.30			No sightings of note
Hen Harrier VP	07/03/2013	CC	Showers	8/8	Moderate	F2	17.00	19.00	Water Rail_WA	1	
Hen Harrier VP	07/03/2013	CC	Showers	8/8	Moderate	F2	17.00	19.00	Buzzard_Bz		two BZ on approach road (Coolree)
Hen Harrier VP	26/03/2013	CH	Snow	8/8	Poor	F3	17.30	19.30			No sightings of HH
Hen Harrier VP	26/11/2013	BP	dry			F0-F3	15.10	17.10	Kestrel_K.	1	Hunting/perched, in from SW
Hen Harrier VP	26/11/2013	BP	dry			F0-F3	15.10	17.10	Kestrel_K.	1	Hunting/perched, in from W
Hen Harrier VP	26/11/2013	BP	dry			F0-F3	15.10	17.10	Kestrel_K.	1	Hunting/perched
Hen Harrier VP	27/11/2013	BP	dry			F0-F3	15.00	17.10	Buzzard_Bz	1	in from SE, flying
Hen Harrier VP	27/11/2013	BP	dry			F0-F3	15.00	17.10	Hen Harrier_HH	1	perched and flys N hrough trees, wing tagged-white tag on left wing, yellow tag on right wing
Hen Harrier VP	27/11/2013	BP	dry			F0-F3	15.00	17.10	Hen Harrier_HH	1	as 2. in from N East settled at 16.35, dropping to roost. Settling location N 808/287. Wing tagged-white tag on left wing, yellow tag on right wing
Hen Harrier VP	27/11/2013	BP	dry			F0-F3	15.00	17.10	Buzzard_Bz	1	In from NW, going to roost
Hen Harrier VP	11/12/2013	CCr	None			F0-3 SW	14.09	17.09			No HH seen. SN,J. H. Redpoll recorded
Hen Harrier VP	13/12/2013	CCr	Showers			S F2	07.38	10.38	Hen Harrier_HH	1	In from SE, flew through. Wing tags- white on left wing, prob blue on right wing
Hen Harrier VP	09/01/2014	CCr	Dry			W F1	14.50	17.50			No birds of note seen
Hen Harrier VP	17/01/2014	CCr	Dry			W F2	07.33	10.33	Hen Harrier_HH	1	Circling up and away. Pale adult male bird
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Merlin_ML	1	low over bog/scrub
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Golden Plover_GP	7	
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Mute Swan_MS	2	
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Starling_SG	43	
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Mallard_MA	2	
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Starling_SG	17	nearly dark
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Snipe_SN	2	
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Snipe_SN	1	dark
Hen Harrier VP	18/10/2013	CB	showers	6/8	Moderate	F0-F3	17.15	19.30	Redwing_RE	50	dropping into scrub around VP in small parties of <10

Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Hen Harrier VP	17/10/2013	CB	drizzle			F0-F3	06.40	09.10	Hen Harrier_HH	1	Flew SW, perched in tree-NB not a roost. Ringtail.
Hen Harrier VP	09/01/2014	CCr	Dry			W F1	14.50	17.50			No birds of note seen
Hen Harrier VP	19/02/2014	CC	Light Mist @first clearing	8/8	Moderate-Good	SW F1	06.50	08.50	Sparrowhawk_SH	1	No HH observations
Hen Harrier VP	19/02/2014	CC	Light Mist @first clearing	8/8	Moderate-Good	SW F1	06.50	08.50	Buzzard	1	
Hen Harrier VP	19/02/2014	CC	Dry	8/8	Good	SW F1	16.40	18.40	Buzzard_BZ	1	Flew west to east across VP. No HH
Hen Harrier VP	15/03/2014	CCR	Occ. Light showers	3/8	Excellent	SE F4	16.33	19.33	Peregrine	1	
Hen Harrier VP	15/03/2014	CCR	Occ. Light showers	3/8	Excellent	SE F4	16.33	19.33	Hen Harrier_HH	1	Flew into roost
Hen Harrier VP	19/03/2014	CCR	DRY	7/8	Excellent	s f4	16.41	19.41	Woodcock_WK	2	
Hen Harrier VP	08/04/2014	CCR	Dry	3/8	Excellent	SW F2-3	18.17	21.17			No observations of note
Hen Harrier VP	11/04/2014	CCR	Dry	4/8	Excellent	W F3	18.23	21.23			No observations of note

Table 10: Winter VP Watches Derrybrennan

Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Kestrel_K.	1	
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Sparrowhawk_SH	1	4s@<10m, 41s@10-20m
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Golden Plover_GP	8	11s@30-40m, 16s@20-30m
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Grey Heron_H.		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Buzzard_Bz		on ground, never seen in flight
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Fieldfare_FF		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Redwing_RE		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Blackbird_B.		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Starling_SG		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Chaffinch_CH		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Robin_R.		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Meadow Pipit_MP		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Reed Bunting_RB		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Woodpigeon_WP		
Derrybrennan	Winter Dusk VP	22/11/2013	BP	dry	0/8	very good	NNE F1-F0	14.00	17.25	Hooded Crow_HC		
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Kestrel_K.	1	
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Kestrel_K.	1	
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Hen Harrier_HH	1	female
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Jay_J.		
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Pied Wagtail_PW		
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Pheasant_PH		
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Wren_WR		
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Great Tit_GT		
Derrybrennan	Winter Dawn VP	27/11/2013	BP	dry	8/8	good	W F0	07.15	10.15	Lesser Redpoll_LR		
Derrybrennan	Winter Dawn VP	22/12/2013	BP	rain to showers	8/8	mod-good	SSE F5-F4	07.40	10.40	Hen Harrier_HH	1	juv
Derrybrennan	Winter Dawn VP	23/12/2013	BP	rain to showers	8/8	mod-good	SSE F5-F4	07.40	10.40	Hen Harrier_HH	1	juv
Derrybrennan	Winter Dawn VP	23/12/2013	BP	rain to showers	8/8	mod-good	SSE F5-F4	07.40	10.40	Buzzard_Bz	2	105s@10-20m, 17s@20-30m
Derrybrennan	Winter Dusk VP	23/12/2013	BP	Dry	7/8-3/8-8/8	good	SW F3-F5	13.00	17.10	Kestrel_K.	1	

Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	Winter Dusk VP	23/12/2013	BP	Dry	7/8-3/8-8/8	good	SW F3-F5	13.00	17.10	Lapwing_L.	33	varying height constantly
Derrybrennan	Winter Dusk VP	23/12/2013	BP	Dry	7/8-3/8-8/8	good	SW F3-F5	13.00	17.10	Lapwing_L.	24	
Derrybrennan	Winter Dusk VP	23/12/2013	BP	Dry	7/8-3/8-8/8	good	SW F3-F5	13.00	17.10	Kestrel_K.	1	
Derrybrennan	Winter Dusk VP	23/12/2013	BP	Dry	7/8-3/8-8/8	good	SW F3-F5	13.00	17.10	Kestrel_K.	1	
Derrybrennan	Winter Dawn VP	02/01/2014	CCr	None	1/8	Excellent	S F2	07.42	10.42	Peregrine_PE	1	I immature bird, hunting woodpigeon
Derrybrennan	Winter Dusk VP	03/01/2014	CCr	Showers	8/8	Excellent	S F5	14.24	17.24			Nothing of note seen
Derrybrennan	Winter Dusk VP	18/02/2014	CC	DRY	6/8	EXCELLENT	SWF1	15.40	18.40	Buzzard_BZ	1	
Derrybrennan	Winter Dusk VP	18/02/2014	CC	DRY	6/8	EXCELLENT	SWF1	15.40	18.40	Buzzard_BZ	1	Interacting with HC
Derrybrennan	Winter Dusk VP	18/02/2014	CC	DRY	6/8	EXCELLENT	SWF1	15.40	18.40	Kestrel_K.	1	
Derrybrennan	Winter Dusk VP	18/02/2014	CC	DRY	6/8	EXCELLENT	SWF1	15.40	18.40	Kestrel_K.	1	SN x2 drumming after sunset at VP.
Derrybrennan	Winter Dawn VP	18/02/2014	CC	DRY	2/8	Excellent	WF2	06.50	09.50	Hen Harrier_HH	1	Female type from north; No WS in lakes on arrival in darkness.
Derrybrennan	Winter Dawn VP	04/03/2014	CCR	Dry	3/8	Excellent	S2	06.08	09.08			No sightings of note
Derrybrennan	Winter Dusk VP	04/03/2014	CCR	Dry	3/8	excellent	SW F1	16.13	19.13	Fieldfare_FF	130	
Derrybrennan	Winter Dusk VP	04/03/2014	CCR	Dry	3/8	excellent	SW F1	16.13	19.13	Woodcock	1	
Derrybrennan	Winter Dusk VP	04/03/2014	CCR	Dry	3/8	excellent	SW F1	16.13	19.13	Woodcock	3	
Derrybrennan	Winter Dawn VP	20/03/2014	CCR	Intermittent	8/8	very good	SW F4	05.30	08.30			No sightings of note
Derrybrennan	Winter Dusk VP	20/03/2014	CCR	Occ. Showers	4/8	excellent	NW F4	16.43	19.43	Buzzard	2	Pair soaring or displaying
Derrybrennan	Winter Dawn VP	20/03/2014	CCR	Occ. Showers	4/8	excellent	NW F4	16.43	19.43	Woodcock	1	<10m

Table 11: Winter VP watches Cloncumber

Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Whooper Swan_WS	4	feeding, almost full moon- no cloud, still feeding till 17.40
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Peregrine_PE	1	
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Lapwing_L.	105	
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Lapwing_L.	30	
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Golden Plover_GP	6	122s@ 60-120m, 6s@60-10m, 20s@10-0m
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Swan sp.		160s@20-30m, 20s@30-40m
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Whooper Swan_WS	6	105s@120-180m, 9s@100-80m, 17s@80-60m, 6s@60-40m, 16s@40-30m, 5s@30-10m. Considered landed at new ponds at Lullymore heritage centre
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Fieldfare_FF		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Redwing_RE		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Skylark_S.		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Jackdaw_JD		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Rook_RO		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Hooded Crow_HC		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Magpie_MG		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Blackbird_B.		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Mistle Thrush_M.		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Woodpigeon_WP		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Starling_SG		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Chaffinch_CH		
Cloncumber	Winter Dusk VP	18/11/2013	BP	occ short shws	6/8-0/8	v good	WNW F2-F0	13.20	17.40	Kingfisher_KF	1	at bridge
Cloncumber	Winter Dawn VP	22/11/2013	BP	dry	6/8-8/8	Good	F0	07.00	10.00	Whooper Swan_WS	3	22s@10-20m, 42s@20-30m, 31s@30-40m, 138S@40-60m, 88s@60-80m 129s@80-100m
Cloncumber	Winter Dawn VP	22/11/2013	BP	dry	6/8-8/8	Good	F0	07.00	10.00	Lapwing_L.	7	23s@30-40m, 42s@20-30m
Cloncumber	Winter Dawn VP	22/11/2013	BP	dry	6/8-8/8	Good	F0	07.00	10.00	Lapwing_L.	29	
Cloncumber	Winter Dawn VP	22/11/2013	BP	dry	6/8-8/8	Good	F0	07.00	10.00	Lapwing_L.	29	116s@0-20m, 62s@20-40m

Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Cloncumber	Winter Dawn VP	10/12/2013	BP	dry	8/8-3/8	good-v. good	S F4	07.30	10.30	Golden Plover_GP	90	
Cloncumber	Winter Dusk VP	10/12/2013	BP	v occ spitting	8/8	good-mod	S F5-F4	14.10	17.10	Golden Plover_GP	7	
Cloncumber	Winter Dawn VP	24/01/2014	BP	Occasional light mist	8/8	Good to moderate in mist	SW F2	07.25	10.25	Golden Plover_GP	180	
Cloncumber	Winter Dusk VP	24/01/2014	BP	Mist, drizzle and dry spells	8/8-7/8	Good-Moderate	SW F3-5	14.30	17.55	Buzzard_BZ	1	
Cloncumber	Winter Dusk VP	24/01/2014	BP	Mist, drizzle and dry spells	8/8-7/8	Good-Moderate	SW F3-5	14.30	17.55	Yellowhammer_Y.	30	Onsite
Cloncumber	Winter Dawn VP	07/02/2014	BP	Dry	0/8	Very good	F1-2 SW-S	07.05	10.05	Whooper Swan/Mute Swan	5	Very distant to observer, circa 6 km.
Cloncumber	Winter Dawn VP	07/02/2014	BP	Dry	0/8	Very good	F1-2 SW-S	07.05	10.05	Buzzard_BZ	1	
Cloncumber	Winter Dawn VP	07/02/2014	BP	Dry	0/8	Very good	F1-2 SW-S	07.05	10.05	Golden Plover_GP	125	Constantly changing height over fields. Climbs higher as they fly westerly
Cloncumber	Winter Dusk VP	07/02/2014	BP	Occasional drizzle and rain	8/8	Very good	F3-4 SSE	15.20	18.20	Buzzard_BZ	3	Scavenging on dead sheep
Cloncumber	Winter Dusk VP	07/02/2014	BP	Occasional drizzle and rain	8/8	Very good	F3-4 SSE	15.20	18.20	Buzzard_BZ	1	
Cloncumber	Winter Dusk VP	07/02/2014	BP	Occasional drizzle and rain	8/8	Very good	F3-4 SSE	15.20	18.20	Kestrel_K.	1	
Cloncumber	Winter Dusk VP	07/02/2014	BP	Occasional drizzle and rain	8/8	Very good	F3-4 SSE	15.20	18.20	Buzzard_BZ	1	
Cloncumber	Winter Dusk VP	07/02/2014	BP	Occasional drizzle and rain	8/8	Very good	F3-4 SSE	15.20	18.20	Buzzard_BZ	2	
Cloncumber	Winter Dawn VP	31/03/2014	BP	dRY	7/8	Good-Moderate	SE F0-1	06.05	09.05	Buzzard_BZ	1	
Cloncumber	Winter Dusk VP	31/03/2014	BP	Dry; light rain from 20.23	8/8	Very Good	0	18.00	21.00	Buzzard_BZ	1	
Cloncumber	Winter Dawn VP	05/03/2014	BP	Dry	8/8	Very Good	S F2	06.05	09.05	Buzzard_BZ	1	
Cloncumber	Winter Dawn VP	05/03/2014	BP	Dry	8/8	Very Good	S F2	06.05	09.05	Buzzard_BZ	1	
Cloncumber	Winter Dawn VP	05/03/2014	BP	Dry	8/8	Very Good	S F2	06.05	09.05	Buzzard_BZ	1	
Cloncumber	Winter Dawn VP	05/03/2014	BP	Dry	8/8	Very Good	S F2	06.05	09.05	Buzzard_BZ	1	
Cloncumber	Winter Dawn VP	05/03/2014	BP	Dry	8/8	Very Good	S F2	06.05	09.05	Buzzard_BZ	2	Considered a pair; in close association
Cloncumber	Winter Dusk VP	05/03/2014	BP	Dry	8/8	Very Good	S F3-4	16.10	19.10	Buzzard_BZ	1	
Cloncumber	Winter Dusk VP	05/03/2014	BP	Dry	8/8	Very Good	S F3-4	16.10	19.10	Buzzard_BZ	1	
Cloncumber	Winter Dusk VP	05/03/2014	BP	Dry	8/8	Very Good	S F3-4	16.10	19.10	Buzzard_BZ	3	

Table 12: Spring Migration VP Watches Derrybrennan

Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Derrybrennan	Spring VP	04/04/2014	CCR	Dry	6/8	Excellent	0	05.53	08.53	Golden Plover_GP	43	
Derrybrennan	Spring VP	12/04/2014	CCR	dry	5/8	Excellent	W F4	18.25	21.25	Lapwing_L	3	Territorial display
Derrybrennan	Spring VP	12/04/2014	CCR	dry	5/8	Excellent	W F4	18.25	21.25	Buzzard	1	
Derrybrennan	Spring VP	12/04/2014	CCR	dry	5/8	Excellent	W F4	18.25	21.25	Peregrine	1	
Derrybrennan	Spring VP	12/04/2014	CCR	dry	5/8	Excellent	W F4	18.25	21.25	Grey Heron_H	2	
Derrybrennan	Spring VP	12/04/2014	CCR	dry	5/8	Excellent	W F4	18.25	21.25	Snipe	1	Drumming (territorial display)

Table 13: Spring Migration VP Watches Cloncumber

County	Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Species	Number	Bird Notes
Kildare	Cloncumber	Spring VP	16/04/2014	BP	Dry	1/8	Very Good	SSE F3-2	18.28	21.28	Buzzard_BZ	1	
Kildare	Cloncumber	Spring VP	16/04/2014	BP	Dry	1/8	Very Good	SSE F3-2	18.28	21.28	Golden Plover_GP	50	
Kildare	Cloncumber	Spring VP	16/04/2014	BP	Dry	1/8	Very Good	SSE F3-2	18.28	21.28	Golden Plover_GP	1	
Kildare	Cloncumber	Spring VP	17/04/2014	BP	Dry	8/8	Very Good	SW-W F3	05.25	08.25	Heron_H	1	
Kildare	Cloncumber	Spring VP	17/04/2014	BP	Dry	8/8	Very Good	SW-W F3	05.25	08.25	Golden Plover_GP	10	

Appendix F2 – Bird Survey Data 2

Table 1: Breeding Wader Results (note this includes results from turbine locations subsequently dropped during the iterative design review process)

Site Name	Survey Type	Observer	Species	Number	Bird Notes
Ballynakill	Breeding Wader	CH	Snipe_SN	6	birds only three heard/seen drumming
Cloncumber	Breeding wader	CH	Lapwing_L.	2	Not possible to confirm nesting. Birds there in May and June exhibiting very agitated behaviour and circling while observer in area
Cloncumber	Breeding wader	CH	Woodcock_WK	1	
Cloncumber	Breeding wader	CH	Snipe_SN	1	
Derrybrennan	Breeding Wader	CH	Lapwing_L.	10	not possible to count number of chicks
Derrybrennan	Breeding wader	CH	Woodcock_WK	1	
Derrybrennan	Breeding wader	CH	Snipe_SN	1	
Derrybrennan	Breeding wader	CCR	Snipe_SN	4	4 BIRD DRUMMING; UP TO FOUR ot'S
Derrybrennan	Breeding wader	CCR	Woodcock_WK	1	2 roding; up to 2 occupied territories
Derrybrennan	Breeding wader	CCR	Woodcock_WK	1	1 roding
Derrybrennan	Breeding wader	CCR	Woodcock_WK	3	3 RODING; UP TO 3 TERRITORIES
Derrybrennan	Breeding wader	CCR	Woodcock_WK	2	2 RODING; UP TO 2 OCCUPIED TERRITORIES
Derrybrennan	Breeding wader	CCR	Snipe	3	3 birds drumming
Derrybrennan	Breeding wader	CCR	Snipe	3	3 drumming same location as April near VP
Derrybrennan	Breeding wader	CCR	Woodcock	4	4 roding over trackway at Grid reference
Derrybrennan	Breeding wader	CCR	Lapwing_L	2	MALE AND FEMALE; BREEDING CONFIRMED
Derrybrennan	Breeding wader	CCR	Lapwing_L	1	1 displaying over field; occupied territory
Derrybrennan	Breeding wader	CCR	Snipe_SN	1	1 Flushed and chipping
Derrybrennan	Breeding wader	CCR	Lapwing_L	2	Male alarming and female in air same location as May; no birds visible at T8 vicinity
Derrybrennan	Breeding wader	CCR	Snipe_SN	1	drumming or chipping bird
Derrybrennan	Breeding wader	CCR	Snipe_SN	1	drumming or chipping bird
Derrybrennan	Breeding wader	CCR	Snipe_SN	6	UP TO 6 BIRDS IN AIR
Derrybrennan	Breeding wader	CCR	Snipe_SN	1	drumming or chipping bird
Derrybrennan	Breeding wader	CCR	Woodcock_WK	1	RODING BIRDS
Derrybrennan	Breeding wader	CCR	Woodcock_WK	2	RODING BIRDS
Derrybrennan	Breeding wader	CCR	Woodcock_WK	1	RODING BIRDS
Drehid	Breeding wader	CH	Snipe_SN	1	
Drehid	Breeding wader	CH	Woodcock_WK	1	
Drehid	Breeding wader	CH	Snipe_SN	1	Possible breeder, flying no drumming
Drehid	Breeding wader	CH	Snipe_SN	2	
Drehid	Breeding wader	CH	Woodcock_WK	1	
Drehid	Breeding wader	CB	Snipe_SN	1	One drumming; 2014 visits to cover envelope changes
Hortland	Breeding wader	BP	Snipe_SN	1	Chipping
Hortland	Breeding wader	BP	Woodcock_WK	1	Roding and flushed 27/04/2013
Hortland	Breeding wader	BP	Snipe_SN	1	Chipping
Hortland	Breeding wader	BP	Woodcock_WK	1	Roding
Hortland	Breeding wader	BP	Woodcock_WK	2	Roding
Hortland	Breeding wader	BP	Snipe_SN	2	Drumming both visits
Hortland	Breeding wader	BP	Snipe_SN	1	Chipping
Hortland	Breeding wader	BP	Woodcock_WK	1	Roding
Windmill	Breeding wader	CH	Woodcock_WK	1	
Windmill	Breeding wader	CH	Woodcock_WK	1	

Table 2: Merlin Survey Results

Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Additional Species	Number	Sighting / Structure / Sighting Grid Reference	sign / evidence type	No. Of prey items	Age of prey / evidence	Bird Notes
Windmill	Merlin_1	06/05/2013	CH	1	2	1	1	09.00	12.30			67840/36820	P	1	<3weeks	barn owl pellet
Windmill	Merlin_1	06/05/2013	CH	1	2	1	1	09.00	12.30			67840/36820	P	2	<3weeks	2 kestrel pellets and Kestrel observed
Windmill	Merlin_1	06/05/2013	CH	1	2	1	1	09.00	12.30			67840/36820		2	<3weeks	2 kestrel feathers
Windmill	Merlin_1	06/05/2013	CH	1	2	1	1	09.00	12.30			67763/36655	PL	8	<3weeks	fluffy white feathers in Birch tree
Windmill	Merlin_1	06/05/2013	CH	1	2	1	1	09.00	12.30			68052/37043	PL	1	<3weeks	pellet on bog along margin with cutaway bog, Buzzard observed.
Windmill	Merlin_1	06/05/2013	CH	1	2	1	1	09.00	12.30			67980/36980	W	1	<3weeks	barn owl white wash under marking post
Windmill	Merlin_1	06/05/2013	CH	1	2	1	1	09.00	12.30			68635/36882	P	1	<3weeks	barn owl pellet under fence post
Windmill	Merlin_2	04/06/2013	CH	1	1	1	1	08.50	12.00							no pellets or plucked items at any of previous locations or elsewhere in square,
Windmill	Merlin_2	04/06/2013	CH	1	1	1	1	08.50	12.00	Cuckoo_CK	2					flying W to E across ML sq
Windmill	Merlin_3	15/08/2013	CH	1	1	1	1	08.30	11.00							no signs recorded
Drehid	Merlin_1	07/05/2013	CH	1	3	1	1	10.00	13.30			74981/36105	P	1	>3weeks	possibly K. Pellet. Parts of square impenetrable bog woodland.
Drehid	Merlin_1	07/05/2013	CH	1	3	1	1	10.00	13.30	Snipe_SN	1	75452/36105				
Drehid	Merlin_1	07/05/2013	CH	1	3	1	1	10.00	13.30	Mallard_MA	1	75619/35533				
Drehid	Merlin_2	07/06/2013	CH	1	1	1	1	09.40	12.40							no signs recorded
Drehid	Merlin_3	09/08/2013	CH	1	1	1	1	09.45	13.30			675323/736879	Pl	15	<3weeks	Passerine feathers found under a birch tree along ditch
Drehid	Merlin_3	09/08/2013	CH	1	1	1	1	09.45	13.30	Jay_J.	2					pair in forestry between T3 and T2
Hortland	Merlin_1	11/04/2013	BP	Light	F2	Moderate	8	15.00	19.15	Merlin_ML		N79372 35481	Pellets, Plucked item	2	>/<3weeks	frog, bird
Hortland	Merlin_1	11/04/2013	BP	Light	F2	Moderate	8	15.00	19.15	Merlin_ML		N79356 35500	Pellets, Plucked item	1	<3weeks	frog
Hortland	Merlin_1	11/04/2013	BP	Light	F2	Moderate	8	15.00	19.15	Merlin_ML		N79347 35507	Plucked item	2	>/<3weeks	frog, bird
Hortland	Merlin_1	11/04/2013	BP	Light	F2	Moderate	8	15.00	19.15	Merlin_ML		N79200 35164	Plucked item	1	<3weeks	frog
Hortland	Merlin_1	11/04/2013	BP	Light	F2	Moderate	8	15.00	19.15	Hen Harrier_HH	1					male, hunting/flying. Mobbed by hooded crows
Hortland	Merlin_1	11/04/2013	BP	Light	F2	Moderate	8	15.00	19.15	Buzzard_Bz	1					
Hortland	Merlin_1	11/04/2013	BP	Light	F2	Moderate	8	15.00	19.15	Kestrel_K.	2					male and female
Hortland	Merlin_2	04/06/2013	BP	Dry	1	Good	F1	09.45	12.50	Merlin_ML		N79369 35482	Plucked item	1	<3weeks	bird
Hortland	Merlin_2	04/06/2013	BP	Dry	1	Good	F1	09.45	12.50	Merlin_ML		N79364 35493	Pellets		>3weeks	
Hortland	Merlin_2	04/06/2013	BP	Dry	1	Good	F1	09.45	12.50	Merlin_ML		N79356 35501	Plucked item		>3weeks	
Hortland	Merlin_2	04/06/2013	BP	Dry	1	Good	F1	09.45	12.50	Merlin_ML		N79352 35508	Plucked item	2	<3weeks	bird and mammal
Hortland	Merlin_2	04/06/2013	BP	Dry	1	Good	F1	09.45	12.50	Merlin_ML		N78882 35407	Plucked item, pellets	1	>3weeks	feather
Hortland	Merlin_2	04/06/2013	BP	Dry	1	Good	F1	09.45	12.50	Merlin_ML		N79202 35168	Moth Wings	1	previous season	dragon fly wings

Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time	Additional Species	Number	Sighting / Structure / Sighting Grid Reference	sign / evidence type	No. Of prey items	Age of prey / evidence	Bird Notes
Hortland	Merlin_3	10/07/2013	BP	Dry	0	Good	F1	08.45	11.00	Invertebrate	2	N7928 3567				
Hortland	Merlin_2	24/05/2013	BP							Buzzard_Bz	2	N801 362				Possible nest at N801 362 birds observed perched and flying; same location in April.

Table 3: Barn Owl Survey Results

Site Name	Survey Type	Date	Observer	Sighting / Structure / Sighting Grid Reference	Suitability	Nesting Opp	Active	Other Species	Bird Notes
Ballynakill	Barn Owl	03/09/2013	CH	675944 742445	1	8	1		Abandoned cottage tin roof, no glass in windows
Ballynakill	Barn Owl	03/09/2013	CH	675959 743151	2	2	1		abandoned farm building. Access but limited nesting opportunity. No signs
Ballynakill	Barn Owl	03/09/2013	CH	673406 744006	2	1	1	JD	Abandoned cottage chimney inhabited by JD
Ballynakill	Barn Owl	03/09/2013	CH	673663 745371	2	0	2		2 storey old brick building with slate roof. Door locked. Holes in slate roof
Ballynakill	Barn Owl	03/09/2013	CH	674094 746139	2	2	2		old stables with slate roof well sealed. Limited access.
Ballynakill	Barn Owl	03/09/2013	CH	676088 745525	1	8	1		Old farm building, tin roof, limited nesting opportunity
Ballynakill	Barn Owl	03/09/2013	CH	675723 741934	2	0	1		abandoned bungalow at entrance to estate. Slate roof partially collapsed. Chimney completely covered in ivy
Ballynakill	Barn Owl	03/09/2013	CH	675596 741622	2		2		castle ruin. In good condition. Access not possible. Difficult to say what nesting potential. At least two floors. Owner said she had owls in another farm shed but no signs.
Ballynakill	Barn Owl	03/09/2013	CH	675495 741993	2	1	1		abandoned cottage with chimney
Ballynakill	Barn Owl	03/09/2013	CH	674876 742133	2	1	1		abandoned cottage with chimney. No signs of BO, JD using chimney
Cloncumber	Barn Owl	12/09/2013	CH	675250 724254	2	0	1		Castle with two floors, 1 missing. Ledges at windows cracked and used by nesting JDs. Type of chimney flue but is unblocked. No signs inside or outside. Top floor unsafe to enter.
Cloncumber	Barn Owl	12/09/2013	CH	675228 724254	2	2	1		2 storey farm building with slate roof. Top floor clean and roof has rafters. No signs on floor up or down stairs.
Cloncumber	Barn Owl	12/09/2013	CH	675212 742293	1	8	1		stables: could be used for roosting but not nesting. No signs found
Cloncumber	Barn Owl	12/09/2013	CH	674562 723884	2	1	2		old buildings alongside the lock on the canal. Appears to have chimney covered in ivy. Doors and windows locked. No signs outside.
Cloncumber	Barn Owl	12/09/2013	CH	674490 723770	2	1	2		Abandoned cottage in good condition and lived in up until recently. Outbuilding unsuitable.
Cloncumber	Barn Owl	12/09/2013	CH	673941 723478	2	1	2		abandoned cottage, small building with chimney. Building completely surrounded by brambles and nettles. Not possible to get in to building, close to canal.
Cloncumber	Barn Owl	12/09/2013	CH	673435 721891	2	2	1		High shed with slate roof, front door missing, no signs.
Cloncumber	Barn Owl	12/09/2013	CH	673428 721865	2	1	1		Abandoned cottage with 2 chimneys which did not appear to be blocked. No signs inside or outside, surrounded by woodland.
Cloncumber	Barn Owl	12/09/2013	CH	670711 721507	0	2	1		Farm building. Appears suitable but doors and window well sealed and here doesn't seem to be any other access points
Cloncumber	Barn Owl	12/09/2013	CH	670756 721500	2	3	1		Hayshed-said they used to have BO years ago but it died. Hay bales present but no signs
Cloncumber	Barn Owl	12/09/2013	CH	670595 721535	2	1	2		abandoned house by lock on canal, access via chimneys. Not possible to get inside. No signs outside.
Cloncumber	Barn Owl	12/09/2013	CH	670818 724174	2	1	1		Abandoned ruin of cottage, no signs.
Cloncumber	Barn Owl	12/09/2013	CH	674067 726407	2	1	1		Abandoned cottage, no signs outside
Drehid	Barn Owl	05/09/2013	CH	671012 735343	0	8	1		ardkill castle ruin: only wall remaining
Drehid	Barn Owl	05/09/2013	CH	672026 734022	3	0	2		abandoned cottage, 3 chimneys with fire places. Not possible to say if blocked multiple swallow nests. Adjoining farm buildings, 1 with potential also. No pellets or whitewash found.
Drehid	Barn Owl	05/09/2013	CH	672642 736620	1	8	1		old stone bungalow, roof collapsed. No chimney, spoke to owner, no sightings.

Site Name	Survey Type	Date	Observer	Sighting / Structure / Sighting Grid Reference	Suitability	Nesting Opp	Active	Other Species	Bird Notes
Drehid	Barn Owl	05/09/2013	CH	672806 736713	2	0	2		old bungalow used as stables, 1 chimney, 2 fireplaces, blocked with sticks, wire mesh covering windows. Roof partially collapsed at one side. Roof space. No pellets or whitewash in or outside.
Drehid	Barn Owl	05/09/2013	CH	673266 736951	2	1	2		bungalow on main road, 1 chimney. Door and windows locked, chimney is only access, no signs outside house
Drehid	Barn Owl	05/09/2013	CH	675156 737427	2	2	1		thatched stables, new roof with wooden rafters, suitable roof spaces but access may be limited if all doors shut. No signs.
Drehid	Barn Owl	05/09/2013	CH	675707 738394	2	1	1		Ruined cottage with chimney and corrugated roof, chimney intact with fireplace. Checked fence posts surrounding house, no signs.
Drehid	Barn Owl	05/09/2013	CH	677562 738375	1	8	1		Dunfierth church. 16 century church. No roof, small crypt beside with access. Roof brick, no nest locations, no signs in graveyard.
Drehid	Barn Owl	05/09/2013	CH	677109 736700	3	0	2		abandoned cottage-gate lodge on estate. Partly collapsed, chimney intact. Bloacked with sticks and dead JD, no pellets or white wash.
Drehid	Barn Owl	05/09/2013	CH	677077 736552	0	2	1		farm with old stone buildings. Most with new roof and windows. Limited access, no chimneys.
Hortland	Barn Owl	12/08/2013	BP	N82058/33974	1		1		stone and iron barns, unused, no chimneys
Hortland	Barn Owl	12/08/2013	BP	N80901/34588	2	1		JD	tiny cottage used as shed
Hortland	Barn Owl	12/08/2013	BP	N78992/34564	2	1,5	1	JD	abandoned cottage as cow shed, checked trees adjacent
Hortland	Barn Owl	12/08/2013	BP	N79512/34435					derelict cottages and barn
Hortland	Barn Owl	12/08/2013	BP	N79444/34447	2	5,2	1	JD	derelict cottage, chimneys blocked, no white wash
Hortland	Barn Owl	12/08/2013	BP	N77118/36536	3	1,5	1	JD	period farm, courtyard buildings, several stone sheds
Hortland	Barn Owl	12/08/2013	BP	N78713/36753	2	1	1	JD	abandoned cottage, sheds and barns
Hortland	Barn Owl	12/08/2013	BP	N78521/36898	1		1		barns, refurbished
Hortland	Barn Owl	12/08/2013	BP	N784/368	1		1		stone barn, no access
Hortland	Barn Owl	12/08/2013	BP	N79240/38185	3	0	1	JD	ruined period house mainly chimneys and some wall cavities
Hortland	Barn Owl	12/08/2013	BP	N80777/37927	0				manor house/golf club, all in use
Hortland	Barn Owl	12/08/2013	BP	N80994/37677	2	6	1		avenue trees, mainly lime
Hortland	Barn Owl	12/08/2013	BP	N81031/36653	1		1		barns and sheds, old and newer fairly unused
Hortland	Barn Owl	12/08/2013	BP	N81580/36837	3	1,3,5	1	JD	period house courtyard with abandoned sheds and stables of stone
Hortland	Barn Owl	12/08/2013	BP	N81202/36731	2	6	1		period house grounds with lime and horse chestnut trees
Hortland	Barn Owl	12/08/2013	BP	N81140/36600	2	1	1		abandoned gate lodge, no access
Hortland	Barn Owl	12/08/2013	BP	N81550/36476	2	1,2	1	JD	abandoned cottage, adjacent to cereal fields
Hortland	Barn Owl	12/08/2013	BP	N81245/36250	2	2	1		farm house and out houses
Hortland	Barn Owl	12/08/2013	BP	N82113/35505	1		1		stone sheds
Hortland	Barn Owl	12/08/2013	BP	N82421/34817	2	2,5	1		period house, out buildings, several stables and sheds
Hortland	Barn Owl	12/08/2013	BP	N82480/34644	2	1,2,5	1	JD	abandoned farm with unused buildings, no chimneys.
Windmill	Barn Owl	21/08/2013	CH	668623 735107	3	0	1	JD	Carbury castle: All four walls reasonably intact, 3-4 large chimneys. One loosely blocked with sticks, others undetermined. Numerous suitable ledges and cavities. No significant whitewash on walls, no pellets. Search around castle found nothing
Windmill	Barn Owl	21/08/2013	CH	668627 735008	1	8	1	K	old church beside carbury castle. In grave yard, stone roof no beams or cavities. No whitewash on gravestones or chruch. K. pellets found on wall of graveyard.

Site Name	Survey Type	Date	Observer	Sighting / Structure / Sighting Grid Reference	Suitability	Nesting Opp	Active	Other Species	Bird Notes
Windmill	Barn Owl	21/08/2013	CH						Potential BO pellets by 3 found on Carbury bog during ML survey. Also white feather.
Windmill	Barn Owl	21/08/2013	CH	666339 737106					Stately house with many outbuildings, security gates. No access.
Windmill	Barn Owl	21/08/2013	CH	667562 738667	2	1	2		old stable and cottage with chimney. Spoke to landowner, no sightings of BO. Yard very clean outside, owner didn't want us entering buildings
Windmill	Barn Owl	21/08/2013	CH	667176 738018	0	0	1		old barn but unlikely to be used as owner said it's closed at night. No obvious access points. Other old barn converted to flat, owner said no sightings of BO in a long time.
Windmill	Barn Owl	21/08/2013	CH	667200 738269	3	2	1		old barn, old slate roof, some slates missing. Gable end has large opening and window has no glass. Large JD nest. Perfect roosting perch along roof, no signs of BO. No whitewash or pellets
Windmill	Barn Owl	21/08/2013	CH	670471 737208	0	8	1		Mylerstown castle, only 1m high wall remains.
Windmill	Barn Owl	21/08/2013	CH	664023 736895	0	8	1		Carrick castle
Windmill	Barn Owl	21/08/2013	CH		0	8	1		ruin castle, only wall remaining

Table 4: CBS Surveys Dates and Times

Site Name	Survey Type	Date	Observer	Rain	Cloud	Visibility	Wind	Start Time	End Time
Ballinakill	CBS_E	01/05/2013	CH	1	2	1	1	06.30	09.00
Ballinakill	CBS_L	05/06/2013	CH	1	1	1	1	06.30	09.15
Cloncumber	CBS_E	10/05/2013	CH	3	3	1	1	06.40	08.20
Cloncumber	CBS_L	12/06/2013	CH	1	1	1	1	06.00	08.40
Derrybrennan	CBS_E	09/05/2013	CH	1	1	1	2	06.00	08.00
Derrybrennan	CBS_L	29/06/2013	CH	1	1	1	2	06.30	08.45
Drehid	CBS_E	07/05/2013	CH	1	3	1	1	05.30	07.30
Drehid	CBS_L	07/06/2013	CH	1	1	1	1	05.30	07.30
Drehid	CBS_E	07/05/2013	CH	1	3	1	1	08.00	09.30
Drehid	CBS_L	07/06/2013	CH	1	1	1	1	07.50	09.20
Hortland	CBS_E	12/04/2013	BP	1	3	2	1	07.12	09.03
Hortland	CBS_L	04/06/2013	BP	1	1	1	1	07.15	08.56
Windmill	CBS_E	06/05/2013	CH	1	2	1	1	05.30	08.45
Windmill	CBS_L	04/06/2013	CH	1	1	1	1	05.45	08.45

Appendix F3 – Marsh Fritillary Habitat Appraisal Form

MARSH FRITILLARY HABITAT APPRAISAL

Site Name	
Date	
Observer	
OS Grid Ref	

Weather	Rain	Windspeed	Visibility	Cloud Cover (0/8-8/8)	Temp

Size	<1ha		1-5ha		>5ha	
Nature	Linear		Non Linear			
% Scrub	<25%		25-75%		>75%	
Habitat Condition	Good		Suitable		Unsuitable	

Habitat Type	Bog Margin	
	Limestone Pavement	
	Esker Ridge	
	Linear colony Bog Road	
	Dry or Wet Heath	

METHODS

1. Establish a W shape (zigzig) route that will cross thoroughly and evenly the whole site/compartment. For linear strips of potential habitat a linear transect will suffice.
2. Decide stopping distances along this route, where recordings of habitat condition will be made e.g. every 10 or 20 metres.
Aim to have at least 20 stopping points for a small site (<1Ha); more than 40 stopping points for a medium sized site (1-5ha) and more than 50 stopping points for a large site (>5ha).
3. Follow your route and at each stopping point record key influencing factors based on provided keys.
4. At the end of each structured walk return to the beginning (if possible via a different route) and assess both overall scrub cover and condition of site, as per provided guidance.

KEY TO APPRAISAL

Aspect:	1 North Facing 2 South Facing 3 East Facing 4 West Facing	**Succsia % Cover**	1 <25% 2 25-75% 3 >75%	**Senescent Material**	1 Molinia 2 Other	**Succisa Connectivity**	1 >1 direction 2 1 direction 3 not connected	**Shelter**	(shelter provided in form of windbreak, bank,scrubline, conifer block etc)	1 North 2 South 3 East 4 West	
Slope (ground slopes towards..)	1 North 2 South 3 East 4 West	**Companion Species** (present or observed)	1 Small Heath 2 Black Bog Rush 3 Tormentil	**Sward Height**	1 <12cm 2 12-25cm 3 >25cm	**Negative Indicators** (when high % cover)	1 Juncus 2 Cocksfoot 3 Knapweed 4 Yorkshire Fog	**Grazing Regime**		1 Cattle/Horses 2 Sheep 3 None	

HABITAT CONDITION ASSESSMENT

Assessment	**Code**	**Description**
Good	GC	Minimum of 25% Succisa, with high interconnectivity between plants. Aspect S,E, or W facing. Sheltered from North or containing sheltered sections via Scrublines,raised banks etc. High cover of senescent material (yellow sward). Companion species present. Sward height within optimum range for Ireland (2 or 3 in key). Scrub <25%. Low percentage cover of negative indicator species. Large area.
Suitable (but requiring management)	SU	>25% SCRUB (possibly encroaching), Succisa present. Shelter level not optimum , possibly exposed or sloping to north. Exposure to south limited perhaps by landscape features. Companion species present to different degrees. Under or over grazed.
Unsuitable Habitat	US	<25% Succisa present or 100% Succisa present. Low percentage cover of senescent material. Exposed or sloping to north. Possibly waterlogged. Possible high percentage cover of negative indicator species. Size <0.5 acre. Sheep present. Possibly shaded to south. Low number of companion species.

STOP Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Aspect																		
Senescent Material																		
Succisa % Cover																		
Succisa Connectivity																		
Shelter																		
Slope																		
Companion Species																		
Negative Indicators																		
Sward Height																		
Grazed																		

STOP Number	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Aspect																		
Senescent Material																		
Succisa % Cover																		
Succisa Connectivity																		
Shelter																		
Slope																		
Companion Species																		
Negative Indicators																		
Sward Height																		
Grazed																		

Target Notes:

Appendix F4 – Plant Species Lists

Table 1: Ballinakill Plant Species List

Woody		Herbs		Herbs		Herbs		Sedges			Mosses		Liverworts		Trees	
Calluna vulgaris (Ling heather)		Epilobium hirsutum (Great Willowherb)		Pimpinella saxifraga (Burnet Saxifrage)		Valeriana officinalis (Common Valerian)		Carex rostrata (Bottle Sedge)	✓	Poa trivialis (Rough Meadowgrass)	Eurhynchium striatum		Calypogeia fissa		Picea sitchensis (Sitka Spruce)	
Crataegus monogyna (Hawthorn)	✓	Epilobium parviflorum (Hoary Willowherb)		Pinguicula vulgaris (Common Butterwort)		Veronica beccabunga (Brookelime)		Carex strigosa (Starved Wood Sedge)		Sesleria caerulea (Blue Moor-grass)	Fissidens adianthoides		Calypogeia muellleriana		Pinus contorta (Lodgepole Pine)	
Empetrum nigrum (Crowberry)		Euphrasaia officinalis (Eyebright)		Plantago lanceolata (Ribwort Plantain)	✓	Veronica chamedrys (Germander Speedwell)		Carex sylvatica (Wood Sedge)		Trisetum flavescens (Yellow Oat Grass)	Fissidens bryoides		Chiloscyphus polyanthos		Pinus Sylvestris (Scots Pine)	
Erica cinerea (Bell-heather)		Filipendula ulmaria (Meadow-sweet)		Plantago major (Greater Plantain)	✓	Veronica montana (Wood Speedwell)		Carex vesicaria (Bladder Sedge)			Fissidens taxifolius		Conocephalum conicum		Populus spp (Poplars)	
Erica tetralix (Cross-leaved heath)		Galium aparine (Goose-grass,Clevers)		Polygala serpyllifolia (Heath Milkwort)		Veronica officinales (Heath Speedwell)		Carex viridula (Yellow Sedge)		**Horsetails**	Fontinalis antipyretica		Diplophyllum albicans		Prunus laurocerasus (Cherry Laurel)	
Hedera helix (Ivy)		Galium odoratum (Sweet Woodruff)		Polygala vulgaris (Milkwort)		Veronica persica (Common Field-speedwell)				Equisetum arvense (Field Horsetail)	Homalothecium sericeum		Lejeunea (micolejeunea) ulicina		Prunus spinosa (Blackthorn)	
Myrica gale (Bog-myrtle)		Galium palustre (Marsh Bedstraw)		Potentilla anserina (Silverweed)	✓	Veronica serpyllifolia (Thyme-leaved Speedwell)		**Grasses**		Equisetum fluviatile (Water Horsetail)	Hookeria lucens		Lepidozia reptans		Quercus pettraea (Sessile Oak)	
Prunus spinosa (Blackthorn)		Galium saxatile (Heath Bedstraw)		Potentilla erecta (Tormentil)		Vicia cracca (Tufted Vetch)	✓	Agrostis canina (Velvet Bent)		Equisetum palustre (Marsh Horsetail)	Hylocomium brevirostre		Lophocolea bidentata		Quercus Robur (Pedunculate Oak)	
Rubus fruticosus agg (Bramble)		Galium verum (Lady's Bedstraw)		Potentilla palustris (Marsh Cinquefoil)		Viola canina (Heath Dog-violet)		Agrostis capillaris (Common Bent)		Equisetum sylvaticum (Wood Horsetail)	Hylocomium splendens		Lunularia cruciata		Rhododendron ponticum (Rhododendron)	
Solanum dulcamara (Bittersweet)		Gentianella amarella (Autumn Gentian)		Potentilla reptans (Creeping Cinqefoil)		Vicia sepium (Bush Vetch)		Agrostis stolonifera (Creeping Bent)	✓	Equisetum telmateia (Great Horsetail)	Hyocomium armoricum		Marchesini mach mackaii		Rosa canina (Dog-rose)	
Ulex europaeus (Gorse)		Geranium robertianum (Herb Robert)		Potentilla sterilis (Barren Strawberry)		Viola palustris (Marsh Violet)		Alopecurus geniculatus (Water/ Marsh foxtail)			Hypnum cupressiforme		Metzgeria fruticulosa		Rosa spp (Erect or Scrambling roses)	
Ulex gallii (Autumn Gorse)		Gymnadenia conopsea (Fragrant Orchid)		Primula veris (Cowslip)		Viola reichenbachiana (Early Dog-violet)		Alopecurus pratensis (Meadow Foxtail)	✓	**Ferns**	Hypnum jutlandicum		Metzgeria furcata		Salix cinerea ssp. oleifolia (Rusty Willow)	
Vaccinium myrtillus (Bilberry)		Hydrocotyle vulgaris (Marsh Pennywort)		Primula vulgaris (Primrose)		Viola riviniana (Common Dog-violet)	✓	Anisantha sterilis (Barren Brome)		Asplenium trichomanes (maindenhair spleenwort)	Isopterygium elegans		Pellia endiviifolia		Salix spp (Willows)	
		Heracleum sphondylium (Hogweed)		Prunella vulgaris (Selfheal)		Viola sp.		Anthoxanthum odoratum (Sweet Vernal-grass)	✓	Asplenium scolopendrium (harts tongue)	Isothecium alopecuroides		Pellia epiphylla		Sambucus nigra (Elder)	✓
Herbs		Hypericum maculatum (Imperforate St John's-wort)		Ranunculus acris (Meadow Buttercup)				Arrhenatherum elatius (False Oat-grass)		Athyrium filix-femina (Lady Fern)	Kindbergia praelonga		Plagiochila asplenioides		Sorbus aucuparia (Rowan)	
Achillea millefolium (Yarrow)		Hypericum perforatum (Perforate St John's-wort)		Ranunculus bulbosus (Bulbous Buttercup)		**Rushes**		Brachypodium pinnatum (Heath False Brome)		Blechnum spicant (Hard Fern)	Leucobryum glaucum		Plagiochila porelloides		Symphoricarpos albus (Snowberry)	
Achillea ptarmica (Sneezewort)		Hypericum pulchrum (Slender St John's-wort)		Ranunculus flammula (Lesser Spearwort)		Juncus acutifloras (Sharp-flowered Rush)		Brachypodium sylvaticum (False Brome)		Dryopteris aemula (Hay-scented Buckler Fern)	Mnium hornum		Saccogyna viticulosa		Taxis Baccata (Yew)	
Ajuga reptans (Bugle)		Hypericum tetrapterum (Square stalked St John's-wort)		Ranunculus repens (Creeping Buttercup)		Juncus articulatus (Jointed Rush)	✓	Briza media (Quaking Grass)		Dryopteris affinis (Western Scaly Male Fern)	Neckera crispa		Scapania gracilis		Tilia spp (Limes)	
Anacamptis pyramidalis (Pyramidal Orchid)		Hypochaeris radicata (Cat's Ear)		Rhinanthus minor (Yellow Rattle)		Juncus bufonius (Toad Rush)		Bromus erectus (Meadow Brome)		Dryopteris carthusiana (Narrow Buckler Fern)	Orthotrichum affine		Scapania nemorera		Ulmus spp (Elms)	
Anagallis arvensis (Scarlet Pimpernel)		Iris pseudacorus (Yellow iris/flag)		Rumex acetosa (Common Sorrel)		Juncus bulbosus (Bulbous Rush)		Bromus hordeaceus (Soft Brome)		Dryopteris dilatata (Broad Buckler Fern)	Oxyrrhynchium hians		Scapania undulata			
Angelica sylvestris (Wild Angelica)		Knautia arvensis (Field Scabious)		Rumex acetosella (Sheep Sorrel)		Juncus congclomeratus (Compact Rush)		Bromus ramosus (Hairy Brome)		Dryopteris filix-mas (Male Fern)	Pleurozium schreberi		Tricolea tomentella			
Anthriscus sylvestris (Cow-parsley)		Lapsana communis (Nipplewort)		Rumex conglomeratus (Clustered Dock)		Juncus effusus (Soft Rush)	✓	Cynosurus cristatus (Crested Dog's-tail)	✓	Ophioglossom vulgatum (Common Adderstongue)	Pliothecium denticulatum					
Anthyllis vulneraria (Kidney Vetch)		Lathyrus linifolius (Bitter Vetch)		Rumex crispus (Curled Dock)		Juncus inflexus (Hard Rush)	✓	Dactylis glomerata (Cock's Foot)	✓	Osmunda regalis (Royal Fern)	Pliothecium undulatum		**Trees**		**Other species**	
Bellis perennis (Daisy)	✓	Lathyrus pratensis (Meadow Vetchling)		Rumex obtusifolius (Broad Dock)	✓	Juncus squarrosus (Heath Rush)		Danthonia decumbens (Common Heath Grass)		Phyllitis scolopendrium (Harts Tongue)	Plagiomnium undulatum		Acer Pseudoplatanus (Sycamore)	✓		
Blackstonia perfoliata (Yellow-wort)		Leontodon autumnalis (Autumn Hawkbit)		Sagina procumbens (Procumbent Pearlwort)		Luzula campestris (Field Wood-rush)		Deschampsia cespitosa (Tufted Hair Grass)		Polystichum setiferum (Soft Shield Fern)	Polytrichum commune		Aesculus Hippocastanum (Horse Chestnut)			
Caltha palustris (Marsh-marigold)		Leucanthemum vulgare (Ox-eye Daisy)	✓	Sanguisorba minor (Burnet Salad)		Luzula pilosa (Hairy Wood-rush)		Deschampsia flexuosa (Wavy Hair Grass)		Pteridium aquilinum (Bracken)	Polytrichum formosum		Alnus Glutinosa (Alder)	✓		
Campanula rotundifolia (Harebell)		Linum catharticum (Fairy Flax)		Scutellaria galericulata (Skullcap)		Luzula multiflora (Heath Wood-rush)		Festuca altissima (Wood Fescue)			Pseudoscleropodium purum		Betula pubescenes (Downy Birch)			
Cardamine flexuosa (Wavy Bittercrss)		Listeria ovata (Common Twayblade)		Senecio aquaticus (Marsh Ragwort)		Luzula sylvatica (Great Wood-rush)		Festuca arundinacea (Tall Fescue)			Rhizomnium punctatum		Betula spp (Birch)	✓		
Cardamine hirsuta (Hairy Bittercress)		Lotus corniculatus (Common Bird's-foot-trefoil)		Senecio jacobaea (Common Ragwort)	✓			Festuca ovina (Sheep's Fescue)			Rhynchostegium riparioides		Buddleja davidii (Butterfly-bush)			
Cardamine pratensis (Cukoo Flower / Lady's Smock)		Lotus pedunculatus (Greater Birds-foot-trefoil)		Silene dioica (Red Campion)		**Sedges**		Festuca pratensis (Meadow Fescue)		**Mosses**	Rhytidiadelphus loreus		Buxus sempervirens (Box)			
Carlina vulgaris (Carline Thistle)		Lychnis flos-cuculi (Ragged Robin)		Solidago virgaurea (Goldenrod)		Carex acutiformus (Lesser Pond Sedge)		Festuca rubra (Red Fescue)		Amblystegium serpens	Rhytidiadelphus squarrosus		Carpinus Betulus (Hornbeam)			
Centaurea nigra (Knapweed)		Lysimachia nemorum (Yellow pimpernel)		Sonchus asper (Prickly Sow Thistle)		Carex binervis (Green Ribbed Sedge)		Festuca gigantea (Giant Fescue)		Atrichum undulatum	Rhytidiadelphus triquetrus		Castanea Sativa (Spanish Chestnut)			
Cerastium fontanum (Common Mouse-ear)		Lysimachia nummularia (Creeping-jenny)		Soncus oleraceus (Smooth Sow Thistle)		Carex caryophyllea (Spring Sedge)		Glyceria fluitans (Sweet Floating Grass)		Brachythecium rivulare	Sphagnum capillifolium		Corylus Avellana (Hazel)			
Cirsium arvense (Creeping Thistle)	✓	Lysimachia vulgaris (Yellow-loosestrife)		Stachys palustris (Marsh Woundwort)		Carex demissa (Common Yellow Sedge)		Helictotrichon pubescens (Downy Oat Grass)		Brachythecium rutabulum	Sphagnum cuspidatum		Cotoneaster spp (Cotoneaster spp)			
Cirsium palustre (Marsh Thistle)	✓	Lythrum salicaria (Purple-loosestrife)		Stachys sylvatica (Hedge Woundwort)		Carex disticha (Brown Sedge)		Holcus lanatus (Yorkshire Fog)	✓	Calliergonella cordifolium	Sphagnum palustre		Cytisus scoparius (Broom)			
Cirsium vulgare (Spear Thistle)		Medicago lupulina (Black Medick)		Stellaria graminea (Lesser Stitchwort)		Carex echinata (Star Sedge)		Holcus mollis (Creeping Velvet Grass)		Calliergonella cuspidata	Thamnobryum alopecurum		Fagus Sylvatica (Beech)			
Conopodium majus (Pignut)		Mentha aquatica (Water Mint)		Stellaria holostea (Greater Stitchwort)		Carex elata (Bowles Golden Sedge)		Koeleria macrantha (Crested Hair Grass)		Cinclidotus fontilaloides	Thuidium tamariscinum		Fraxinus Excelsior (Ash)	✓		
Crepis capillaris (Smooth Hawks Beard)		Menyanthes trifoliata (Bogbean)		Stellaria media (Common Chickweed)		Carex flacca (Glaucous Sedge)	✓	Lolium perenne (Perennial Rye-grass)		Cirriphyllum piliiferum	Zygodon viridissimus		Fuchsia magellanica (Fuchsia)			
Crepis paludosa (Marsh Hawks Beard)		Myosis discolor (Changing Forget-me-not)		Stellaria uliginosa (Bog Stitchwort)		Carex hirta (Hairy Sedge)	✓	Melica uniflora (Wood Melick)		Climacium dendroides			Hippophae rhamnoides (Sea-buckthorn)			
Dactylorhiza fuchsii (Common Spotted-orchid)		Myostis scorpioides (Water Forget-me-not)		Succisa pratensis (Devils-bit Scabious)		Carex laevigata (Smooth Stalked Sedge)		Molinea caerulea (Purple-moor Grass)		Cryphaea heteromalla			Ilex Aquifolium (Holly)			
Dactylorhiza maculata (Heath Spotted-orchid)		Narthecium ossifragum (Bog Asphodel)		Taraxacum agg. (Dandelions)		Carex nigra (Common Sedge)		Nardus stricta (Mat Grass)		Ctenidium molluscum			Juniperus communis (Juniper)			
Daucus carota (Wild Carrot)		Orchis mascula (Early-purple Orchid)		Teucrium scorodonia (Wood Sage)		Carex ovalis (Oval Sedge)		Phalaris arundinacea (Reed Canary-grass)		Dicranum majus			Larix spp (Larches)			
Digitalis purpurea (Foxglove)		Orchis morio (Green-winged Orchid)		Thymus polytricus (Wild Thyme)		Carex panicea (Carnation Sedge)	✓	Phleum pratense (Timothy)	✓	Dicranum scoparium			Picea abies (Norway Spruce)			
Drosera anglica (Great Sundew)		Origanum vulgare (Marjoram)		Torilis japonica (Upright Hedge Parsley)		Carex paniculata (Greater Tussock)		Phragmites australis (Common Reed)								
Drosera intermedia (Oblong-leaved Sundew)		Pedicularis palustris (Marsh Lousewort)		Trifolium pratensis (Red Clover)	✓	Carex pendula (Pendulous Sedge)		Poa annua (Annual Meadowgrass)	✓							
Drosera rotundifolia (Round-leaved Sundew)		Pedicularis sylvatica (Lousewort)		Trifolium repens (White Clover)	✓	Carex pilulifera (Pill Sedge)		Poa nemoralis (Wood Bluegrass)								
		Petasites hybridus (Butterbur)		Tussilago farfara (Coltsfoot)		Carex pulicaris (Flea Sedge)		Poa pratensis (Smooth Meadowgrass)								
		Pilosella officinarum (Mouse-ear Hawkweed)		Urtica dioica (Nettle)		Carex remota (Remote sedge)										

Table 2: Windmill Plant Species List

Woody		Herbs		Herbs		Herbs		Sedges			Mosses		Liverworts		Trees	
Calluna vulgaris (Ling heather)	✓	Epilobium hirsutum (Great Willowherb)		Pimpinella saxifraga (Burnet Saxifrage)		Valeriana officinalis (Common Valerian)		Carex rostrata (Bottle Sedge)		Poa trivialis (Rough Meadowgrass)	Eurhynchium striatum		Calypogeia fissa		Picea sitchensis (Sitka Spruce)	
Crataegus monogyna (Hawthorn)		Epilobium parviflorum (Hoary Willowherb)		Pinguicula vulgaris (Common Butterwort)		Veronica beccabunga (Brookelime)		Carex strigosa (Starved Wood Sedge)		Sesleria caerulea (Blue Moor-grass)	Fissidens adianthoides		Calypogeia muellleriana		Pinus contorta (Lodgepole Pine)	
Empetrum nigrum (Crowberry)		Euphrasaia officinalis (Eyebright)		Plantago lanceolata (Ribwort Plantain)		Veronica chamedrys (Germander Speedwell)		Carex sylvatica (Wood Sedge)		Trisetum flavescens (Yellow Oat Grass)	Fissidens bryoides		Chiloscyphus polyanthos		Pinus Sylvestris (Scots Pine)	✓
Erica cinerea (Bell-heather)		Filipendula ulmaria (Meadow-sweet)		Plantago major (Greater Plantain)		Veronica montana (Wood Speedwell)		Carex vesicaria (Bladder Sedge)			Fissidens taxifolius		Conocephalum conicum		Populus spp (Poplars)	
Erica tetralix (Cross-leaved heath)	✓	Galium aparine (Goose-grass,Clevers)		Polygala serpyllifolia (Heath Milkwort)		Veronica officinales (Heath Speedwell)		Carex viridula (Yellow Sedge)		**Horsetails**	Fontinalis antipyretica		Diplophyllum albicans		Prunus laurocerasus (Cherry Laurel)	
Hedera helix (Ivy)		Galium odoratum (Sweet Woodruff)		Polygala vulgaris (Milkwort)		Veronica persica (Common Field-speedwell)				Equisetum arvense (Field Horsetail)	Homalothecium sericeum		Lejeunea (micolejeunea) ulicina		Prunus spinosa (Blackthorn)	
Myrica gale (Bog-myrtle)		Galium palustre (Marsh Bedstraw)		Potentilla anserina (Silverweed)		Veronica serpyllifolia (Thyme-leaved Speedwell)		**Grasses**		Equisetum fluviatile (Water Horsetail)	Hookeria lucens		Lepidozia reptans		Quercus pettraea (Sessile Oak)	
Prunus spinosa (Blackthorn)		Galium saxatile (Heath Bedstraw)		Potentilla erecta (Tormentil)		Vicia cracca (Tufted Vetch)		Agrostis canina (Velvet Bent)		Equisetum palustre (Marsh Horsetail)	Hylocomium brevirostre		Lophocolea bidentata		Quercus Robur (Pedunculate Oak)	
Rubus fruticosus agg (Bramble)	✓	Galium verum (Lady's Bedstraw)		Potentilla palustris (Marsh Cinquefoil)		Viola canina (Heath Dog-violet)		Agrostis capillaris (Common Bent)		Equisetum sylvaticum (Wood Horsetail)	Hylocomium splendens		Lunularia cruciata		Rhododendron ponticum (Rhododendron)	
Solanum dulcamara (Bittersweet)		Gentianella amarella (Autumn Gentian)		Potentilla reptans (Creeping Cinqefoil)		Vicia sepium (Bush Vetch)		Agrostis stolonifera (Creeping Bent)		Equisetum telmateia (Great Horsetail)	Hylocomium armoricum		Marchesini mach mackaii		Rosa canina (Dog-rose)	
Ulex europaeus (Gorse)		Geranium robertianum (Herb Robert)		Potentilla sterilis (Barren Strawberry)		Viola palustris (Marsh Violet)		Alopecurus geniculatus (Water/ Marsh foxtail)			Hypnum cupressiforme		Metzgeria fruticulosa		Rosa spp (Erect or Scrambling roses)	
Ulex gallii (Autumn Gorse)		Gymnadenia conopsea (Fragrant Orchid)		Primula veris (Cowslip)		Viola reichenbachiana (Early Dog-violet)		Alopecurus pratensis (Meadow Foxtail)		**Ferns**	Hypnum jutlandicum	✓	Metzgeria furcata		Salix cinerea ssp. oleifolia (Rusty Willow)	
Vaccinium myrtillus (Bilberry)		Hydrocotyle vulgaris (Marsh Pennywort)		Primula vulgaris (Primrose)		Viola riviniana (Common Dog-violet)		Anisantha sterilis (Barren Brome)		Asplenium trichomanes (maindenhair spleenwort)	Isopterygium elegans		Pellia endiviifolia		Salix spp (Willows)	✓
		Heracleum sphondylium (Hogweed)		Prunella vulgaris (Selfheal)		Viola sp.		Anthoxanthum odoratum (Sweet Vernal-grass)		Asplenium scolopendrium (harts tongue)	Isothecium alopecuroides		Pellia epiphylla		Sambucus nigra (Elder)	
Herbs		Hypericum maculatum (Imperforate St John's-wort)		Ranunculus acris (Meadow Buttercup)				Arrhenatherum elatius (False Oat-grass)		Athyrium filix-femina (Lady Fern)	Kindbergia praelonga		Plagiochila asplenioides		Sorbus aucuparia (Rowan)	
Achillea millefolium (Yarrow)		Hypericum perforatum (Perforate St John's-wort)		Ranunculus bulbosus (Bulbous Buttercup)		**Rushes**		Brachypodium pinnatum (Heath False Brome)		Blechnum spicant (Hard Fern)	Leucobryum glaucum		Plagiochila porelloides		Symphoricarpos albus (Snowberry)	
Achillea ptarmica (Sneezewort)		Hypericum pulchrum (Slender St John's-wort)		Ranunculus flammula (Lesser Spearwort)		Juncus acutifloras (Sharp-flowered Rush)		Brachypodium sylvaticum (False Brome)		Dryopteris aemula (Hay-scented Buckler Fern)	Mnium hornum		Saccogyna viticulosa		Taxis Baccata (Yew)	
Ajuga reptans (Bugle)		Hypericum tetrapterum (Square stalked St John's-wort)		Ranunculus repens (Creeping Buttercup)		Juncus articulatus (Jointed Rush)		Briza media (Quaking Grass)		Dryopteris affinis (Western Scaly Male Fern)	Neckera crispa		Scapania gracilis		Tilia spp (Limes)	
Anacamptis pyramidalis (Pyramidal Orchid)		Hypochaeris radicata (Cat's Ear)		Rhinanthus minor (Yellow Rattle)		Juncus bufonius (Toad Rush)		Bromus erectus (Meadow Brome)		Dryopteris carthusiana (Narrow Buckler Fern)	Orthotrichum affine		Scapania nemorera		Ulmus spp (Elms)	
Anagallis arvensis (Scarlet Pimpernel)		Iris pseudacorus (Yellow iris/flag)		Rumex acetosa (Common Sorrel)		Juncus bulbosus (Bulbous Rush)		Bromus hordeaceus (Soft Brome)		Dryopteris dilatata (Broad Buckler Fern)	Oxyrrhynchium hians		Scapania undulata			
Angelica sylvestris (Wild Angelica)		Knautia arvensis (Field Scabious)		Rumex acetosella (Sheep Sorrel)		Juncus conglomeratus (Compact Rush)		Bromus ramosus (Hairy Brome)		Dryopteris filix-mas (Male Fern)	Pleurozium schreberi		Tricolea tomentella			
Anthriscus sylvestris (Cow-parsley)		Lapsana communis (Nipplewort)		Rumex conglomeratus (Clustered Dock)		Juncus effusus (Soft Rush)		Cynosurus cristatus (Crested Dog's-tail)		Ophioglossom vulgatum (Common Adderstongue)	Pliothecium denticulatum					
Anthyllis vulneraria (Kidney Vetch)		Lathyrus linifolius (Bitter Vetch)		Rumex crispus (Curled Dock)		Juncus inflexus (Hard Rush)		Dactylis glomerata (Cock's Foot)		Osmunda regalis (Royal Fern)	Pliothecium undulatum		**Trees**		**Other species**	
Bellis perennis (Daisy)		Lathyrus pratensis (Meadow Vetchling)		Rumex obtusifolius (Broad Dock)		Juncus squarrosus (Heath Rush)		Danthonia decumbens (Common Heath Grass)		Phyllitis scolopendrium (Harts Tongue)	Plagiomnium undulatum		Acer Pseudoplatanus (Sycamore)		Eriophorum angustifolium (Common Cotton	✓
Blackstonia perfoliata (Yellow-wort)		Leontodon autumnalis (Autumn Hawkbit)		Sagina procumbens (Procumbent Pearlwort)		Luzula campestris (Field Wood-rush)		Deschampsia cespitosa (Tufted Hair Grass)		Polystichum setiferum (Soft Shield Fern)	Polytrichum commune		Aesculus Hippocastanum (Horse Chestnu		Eriophorum vaginatum (Hairs-tail Cottongra	✓
Caltha palustris (Marsh-marigold)		Leucanthemum vulgare (Ox-eye Daisy)		Sanguisorba minor (Burnet Salad)		Luzula pilosa (Hairy Wood-rush)		Deschampsia flexuosa (Wavy Hair Grass)		Pteridium aquilinum (Bracken)	Polytrichum formosum		Alnus Glutinosa (Alder)		Tricophorum caespitosum (Deergrass)	✓
Campanula rotundifolia (Harebell)		Linum catharticum (Fairy Flax)		Scutellaria galericulata (Skullcap)		Luzula multiflora (Heath Wood-rush)		Festuca altissima (Wood Fescue)			Pseudoscleropodium purum		Betula pubescenes (Downy Birch)	✓	Cladonia portentosa (Reindeer Lichen)	✓
Cardamine flexuosa (Wavy Bittercrss)		Listeria ovata (Common Twayblade)		Senecio aquaticus (Marsh Ragwort)		Luzula sylvatica (Great Wood-rush)		Festuca arundinacea (Tall Fescue)			Rhizomnium punctatum		Betula spp (Birch)		Cladonia floerkeana	✓
Cardamine hirsuta (Hairy Bittercress)		Lotus corniculatus (Common Bird's-foot-trefoil)		Senecio jacobaea (Common Ragwort)				Festuca ovina (Sheep's Fescue)			Rhynchostegium riparioides		Buddleja davidii (Butterfly-bush)		Sphagnum spp.	✓
Cardamine pratensis (Cukoo Flower / Lady's Smock)		Lotus pedunculatus (Greater Birds-foot-trefoil)		Silene dioica (Red Campion)		**Sedges**		Festuca pratensis (Meadow Fescue)		**Mosses**	Rhytidiadelphus loreus		Buxus sempervirens (Box)			
Carlina vulgaris (Carline Thistle)		Lychnis flos-cuculi (Ragged Robin)		Solidago virgaurea (Goldenrod)		Carex acutiformus (Lesser Pond Sedge)		Festuca rubra (Red Fescue)		Amblystegium serpens	Rhytidiadelphus squarrosus		Carpinus Betulus (Hornbeam)			
Centaurea nigra (Knapweed)		Lysimachia nemorum (Yellow pimpernel)		Sonchus asper (Prickly Sow Thistle)		Carex binervis (Green Ribbed Sedge)		Festuca gigantea (Giant Fescue)		Atrichum undulatum	Rhytidiadelphus triquetrus		Castanea Sativa (Spanish Chestnut)			
Cerastium fontanum (Common Mouse-ear)		Lysimachia nummularia (Creeping-jenny)		Soncus oleraceus (Smooth Sow Thistle)		Carex caryophyllea (Spring Sedge)		Glyceria fluitans (Sweet Floating Grass)		Brachythecium rivulare	Sphagnum capillifolium	✓	Corylus Avellana (Hazel)			
Cirsium arvense (Creeping Thistle)		Lysimachia vulgaris (Yellow-loosestrife)		Stachys palustris (Marsh Woundwort)		Carex demissa (Common Yellow Sedge)		Helictotrichon pubescens (Downy Oat Grass)		Brachythecium rutabulum	Sphagnum cuspidatum		Cotoneaster spp (Cotoneaster spp)			
Cirsium palustre (Marsh Thistle)		Lythrum salicaria (Purple-loosestrife)		Stachys sylvatica (Hedge Woundwort)		Carex disticha (Brown Sedge)		Holcus lanatus (Yorkshire Fog)		Calliergonella cordifolium	Sphagnum palustre	✓	Cytisus scoparius (Broom)			
Cirsium vulgare (Spear Thistle)		Medicago lupulina (Black Medick)		Stellaria graminea (Lesser Stitchwort)		Carex echinata (Star Sedge)		Holcus mollis (Creeping Velvet Grass)		Calliergonella cuspidata	Thamnobryum alopecurum		Fagus Sylvatica (Beech)			
Conopodium majus (Pignut)		Mentha aquatica (Water Mint)		Stellaria holostea (Greater Stitchwort)		Carex elata (Bowles Golden Sedge)		Koeleria macrantha (Crested Hair Grass)		Cinclidotus fontilaloides	Thuidium tamariscinum		Fraxinus Excelsior (Ash)			
Crepis capillaris (Smooth Hawks Beard)		Menyanthes trifoliata (Bogbean)		Stellaria media (Common Chickweed)		Carex flacca (Glaucous Sedge)		Lolium perenne (Perennial Rye-grass)		Cirriphyllum piliiferum	Zygodon viridissimus		Fuchsia magellanica (Fuchsia)			
Crepis paludosa (Marsh Hawks Beard)		Myosis discolor (Changing Forget-me-not)		Stellaria uliginosa (Bog Stitchwort)		Carex hirta (Hairy Sedge)		Melica uniflora (Wood Melick)		Climacium dendroides			Hippophae rhamnoides (Sea-buckthorn)			
Dactylorhiza fuchsii (Common Spotted-orchid)		Myostis scorpioides (Water Forget-me-not)		Succisa pratensis (Devils-bit Scabious)		Carex laevigata (Smooth Stalked Sedge)		Molinea caerulea (Purple-moor Grass)		Cryphaea heteromalla			Ilex Aquifolium (Holly)			
Dactylorhiza maculata (Heath Spotted-orchid)		Narthecium ossifragum (Bog Asphodel)	✓	Taraxacum agg. (Dandelions)		Carex nigra (Common Sedge)		Nardus stricta (Mat Grass)		Ctenidium molluscum			Juniperus communis (Juniper)			
Daucus carota (Wild Carrot)		Orchis mascula (Early-purple Orchid)		Teucrium scorodonia (Wood Sage)		Carex ovalis (Oval Sedge)		Phalaris arundinacea (Reed Canary-grass)		Dicranum majus			Larix spp (Larches)			
Digitalis purpurea (Foxglove)		Orchis morio (Green-winged Orchid)		Thymus polytricus (Wild Thyme)		Carex panicea (Carnation Sedge)		Phleum pratense (Timothy)		Dicranum scoparium			Picea abies (Norway Spruce)			
Drosera anglica (Great Sundew)		Origanum vulgare (Marjoram)		Torilis japonica (Upright Hedge Parsley)		Carex paniculata (Greater Tussock)		Phragmites australis (Common Reed)								
Drosera intermedia (Oblong-leaved Sundew)		Pedicularis palustris (Marsh Lousewort)		Trifolium pratensis (Red Clover)		Carex pendula (Pendulous Sedge)		Poa annua (Annual meadowgrass)								
Drosera rotundifolia (Round-leaved Sundew)	✓	Pedicularis sylvatica (Lousewort)		Trifolium repens (White Clover)		Carex pilulifera (Pill Sedge)		Poa nemoralis (Wood Bluegrass)								
		Petasites hybridus (Butterbur)		Tussilago farfara (Coltsfoot)		Carex pulicaris (Flea Sedge)		Poa pratensis (Smooth Meadowgrass)								
		Pilosella officinarum (Mouse-ear Hawkweed)		Urtica dioica (Nettle)		Carex remota (remote sedge)										

Table 3: Drehid Plant Species List

Woody		Herbs		Herbs		Herbs		Sedges				Mosses		Liverworts		Trees	
Calluna vulgaris (Ling heather)	✓	Epilobium hirsutum (Great Willowherb)	✓	Pimpinella saxifraga (Burnet Saxifrage)		Valeriana officinalis (Common Valerian)		Carex rostrata (Bottle Sedge)		Poa trivialis (Rough Meadowgrass)		Eurhynchium striatum		Calypogeia fissa		Picea sitchensis (Sitka Spruce)	✓
Crataegus monogyna (Hawthorn)	✓	Epilobium parviflorum (Hoary Willowherb)		Pinguicula vulgaris (Common Butterwort)		Veronica beccabunga (Brookelime)		Carex strigosa (Starved Wood Sedge)		Sesleria caerulea (Blue Moor-grass)		Fissidens adianthoides		Calypogeia muellleriana		Pinus contorta (Lodgepole Pine)	
Empetrum nigrum (Crowberry)		Euphrasaia officinalis (Eyebright)		Plantago lanceolata (Ribwort Plantain)	✓	Veronica chamedrys (Germander Speedwell)		Carex sylvatica (Wood Sedge)		Trisetum flavescens (Yellow Oat Grass)		Fissidens bryoides		Chiloscyphus polyanthos		Pinus Sylvestris (Scots Pine)	✓
Erica cinerea (Bell-heather)		Filipendula ulmaria (Meadow-sweet)		Plantago major (Greater Plantain)	✓	Veronica montana (Wood Speedwell)		Carex vesicaria (Bladder Sedge)				Fissidens taxifolius		Conocephalum conicum		Populus spp (Poplars)	
Erica tetralix (Cross-leaved heath)	✓	Galium aparine (Goose-grass,Clevers)		Polygala serpyllifolia (Heath Milkwort)	✓	Veronica officinales (Heath Speedwell)		Carex viridula (Yellow Sedge)		**Horsetails**		Fontinalis antipyretica		Diplophyllum albicans		Prunus laurocerasus (Cherry Laurel)	
Hedera helix (Ivy)	✓	Galium odoratum (Sweet Woodruff)		Polygala vulgaris (Milkwort)	✓	Veronica persica (Common Field-speedwell)				Equisetum arvense (Field Horsetail)		Homalothecium sericeum		Lejeunea (micolejeunea) ulicina		Prunus spinosa (Blackthorn)	
Myrica gale (Bog-myrtle)		Galium palustre (Marsh Bedstraw)		Potentilla anserina (Silverweed)		Veronica serpyllifolia (Thyme-leaved Speedwell)		**Grasses**		Equisetum fluviatile (Water Horsetail)	✓	Hookeria lucens		Lepidozia reptans		Quercus pettraea (Sessile Oak)	✓
Prunus spinosa (Blackthorn)		Galium saxatile (Heath Bedstraw)		Potentilla erecta (Tormentil)	✓	Vicia cracca (Tufted Vetch)		Agrostis canina (Velvet Bent)		Equisetum palustre (Marsh Horsetail)	✓	Hylocomium brevirostre		Lophocolea bidentata		Quercus Robur (Pedunculate Oak)	
Rubus fruticosus agg (Bramble)	✓	Galium verum (Lady's Bedstraw)		Potentilla palustris (Marsh Cinquefoil)		Viola canina (Heath Dog-violet)		Agrostis capillaris (Common Bent)		Equisetum sylvaticum (Wood Horsetail)		Hylocomium splendens		Lunularia cruciata		Rhododendron ponticum (Rhododendron)	
Solanum dulcamara (Bittersweet)		Gentianella amarella (Autumn Gentian)		Potentilla reptans (Creeping Cinqefoil)	✓	Vicia sepium (Bush Vetch)		Agrostis stolonifera (Creeping Bent)	✓	Equisetum telmateia (Great Horsetail)		Hyocomium armoricum		Marchesini mach mackaii		Rosa canina (Dog-rose)	
Ulex europaeus (Gorse)	✓	Geranium robertianum (Herb Robert)	✓	Potentilla sterilis (Barren Strawberry)		Viola palustris (Marsh Violet)		Alopecurus geniculatus (Water/ Marsh foxtail)	✓			Hypnum cupressiforme		Metzgeria fruticulosa		Rosa spp (Erect or Scrambling roses)	
Ulex gallii (Autumn Gorse)		Gymnadenia conopsea (Fragrant Orchid)	✓	Primula veris (Cowslip)		Viola reichenbachiana (Early Dog-violet)		Alopecurus pratensis (Meadow Foxtail)	✓	**Ferns**		Hypnum jutlandicum	✓	Metzgeria furcata		Salix cinerea ssp. oleifolia (Rusty Willow)	✓
Vaccinium myrtillus (Bilberry)		Hydrocotyle vulgaris (Marsh Pennywort)	✓	Primula vulgaris (Primrose)		Viola riviniana (Common Dog-violet)		Anisantha sterilis (Barren Brome)		Asplenium trichomanes (maindenhair spleenwort)		Isopterygium elegans		Pellia endiviifolia		Salix spp (Willows)	✓
		Heracleum sphondylium (Hogweed)	✓	Prunella vulgaris (Selfheal)	✓	Viola sp.		Anthoxanthum odoratum (Sweet Vernal-grass)	✓	Asplenium scolopendrium (harts tongue)		Isothecium alopecuroides		Pellia epiphylla		Sambucus nigra (Elder)	✓
Herbs		Hypericum maculatum (Imperforate St John's-wort)		Ranunculus acris (Meadow Buttercup)	✓			Arrhenatherum elatius (False Oat-grass)	✓	Athyrium filix-femina (Lady Fern)		Kindbergia praelonga		Plagiochila asplenioides		Sorbus aucuparia (Rowan)	
Achillea millefolium (Yarrow)		Hypericum perforatum (Perforate St John's-wort)	✓	Ranunculus bulbosus (Bulbous Buttercup)		**Rushes**		Brachypodium pinnatum (Heath False Brome)		Blechnum spicant (Hard Fern)		Leucobryum glaucum		Plagiochila porelloides		Symphoricarpos albus (Snowberry)	✓
Achillea ptarmica (Sneezewort)		Hypericum pulchrum (Slender St John's-wort)		Ranunculus flammula (Lesser Spearwort)		Juncus acutiflorus (Sharp-flowered Rush)		Brachypodium sylvaticum (False Brome)		Dryopteris aemula (Hay-scented Buckler Fern)		Mnium hornum		Saccogyna viticulosa		Taxis Baccata (Yew)	
Ajuga reptans (Bugle)		Hypericum tetrapterum (Square stalked St John's-wort)		Ranunculus repens (Creeping Buttercup)	✓	Juncus articulatus (Jointed Rush)	✓	Briza media (Quaking Grass)	✓	Dryopteris affinis (Western Scaly Male Fern)		Neckera crispa		Scapania gracilis		Tilia spp (Limes)	
Anacamptis pyramidalis (Pyramidal Orchid)		Hypochaeris radicata (Cat's Ear)		Rhinanthus minor (Yellow Rattle)		Juncus bufonius (Toad Rush)		Bromus erectus (Meadow Brome)		Dryopteris carthusiana (Narrow Buckler Fern)		Orthotrichum affine		Scapania nemorera		Ulmus spp (Elms)	
Anagallis arvensis (Scarlet Pimpernel)		Iris pseudacorus (Yellow iris/flag)		Rumex acetosa (Common Sorrel)		Juncus bulbosus (Bulbous Rush)	✓	Bromus hordeaceus (Soft Brome)		Dryopteris dilatata (Broad Buckler Fern)		Oxyrrhynchium hians		Scapania undulata			
Angelica sylvestris (Wild Angelica)		Knautia arvensis (Field Scabious)		Rumex acetosella (Sheep Sorrel)		Juncus congclomeratus (Compact Rush)		Bromus ramosus (Hairy Brome)		Dryopteris filix-mas (Male Fern)		Pleurozium schreberi		Tricolea tomentella			
Anthriscus sylvestris (Cow-parsley)		Lapsana communis (Nipplewort)		Rumex conglomeratus (Clustered Dock)		Juncus effusus (Soft Rush)	✓	Cynosurus cristatus (Crested Dog's-tail)	✓	Ophioglossom vulgatum (Common Adderstongue)		Pliothecium denticulatum					
Anthyllis vulneraria (Kidney Vetch)		Lathyrus linifolius (Bitter Vetch)		Rumex crispus (Curled Dock)	✓	Juncus inflexus (Hard Rush)	✓	Dactylis glomerata (Cock's Foot)	✓	Osmunda regalis (Royal Fern)	✓	Pliothecium undulatum		**Trees**		**Other species**	
Bellis perennis (Daisy)	✓	Lathyrus pratensis (Meadow Vetchling)		Rumex obtusifolius (Broad Dock)	✓	Juncus squarrosus (Heath Rush)	✓	Danthonia decumbens (Common Heath Grass)		Phyllitis scolopendrium (Harts Tongue)		Plagiomnium undulatum		Acer Pseudoplatanus (Sycamore)	✓	Eriophorum angustifolium (Common Cotton	✓
Blackstonia perfoliata (Yellow-wort)		Leontodon autumnalis (Autumn Hawkbit)	✓	Sagina procumbens (Procumbent Pearlwort)		Luzula campestris (Field Wood-rush)		Deschampsia cespitosa (Tufted Hair Grass)	✓	Polystichum setiferum (Soft Shield Fern)		Polytrichum commune		Aesculus Hippocastanum (Horse Chestnu		Eriophorum vaginatum (Hairs-tail Cottongra	✓
Caltha palustris (Marsh-marigold)		Leucanthemum vulgare (Ox-eye Daisy)	✓	Sanguisorba minor (Burnet Salad)		Luzula pilosa (Hairy Wood-rush)		Deschampsia flexuosa (Wavy Hair Grass)		Pteridium aquilinum (Bracken)	✓	Polytrichum formosum		Alnus Glutinosa (Alder)		Sparganium erectum (Branched Bur-reed)	✓
Campanula rotundifolia (Harebell)		Linum catharticum (Fairy Flax)		Scutellaria galericulata (Skullcap)		Luzula multiflora (Heath Wood-rush)	✓	Festuca altissima (Wood Fescue)				Pseudoscleropodium purum		Betula pubescenes (Downy Birch)		Potamogeton spp. (Pondweed spp)	✓
Cardamine flexuosa (Wavy Bittercrss)		Listeria ovata (Common Twayblade)		Senecio aquaticus (Marsh Ragwort)		Luzula sylvatica (Great Wood-rush)		Festuca arundinacea (Tall Fescue)				Rhizomnium punctatum		Betula spp (Birch)	✓	Typha latifolia (Bullrush)	✓
Cardamine hirsuta (Hairy Bittercress)		Lotus corniculatus (Common Bird's-foot-trefoil)		Senecio jacobaea (Common Ragwort)	✓			Festuca ovina (Sheep's Fescue)				Rhynchostegium riparioides		Buddleja davidii (Butterfly-bush)		Epipactis palustris (Marsh Helleborine)	✓
Cardamine pratensis (Cukoo Flower / Lady's Smock)		Lotus pedunculatus (Greater Birds-foot-trefoil)		Silene dioica (Red Campion)		**Sedges**		Festuca pratensis (Meadow Fescue)		**Mosses**		Rhytidiadelphus loreus		Buxus sempervirens (Box)		Cirsium spp. (Thistle spp)	✓
Carlina vulgaris (Carline Thistle)		Lychnis flos-cuculi (Ragged Robin)		Solidago virgaurea (Goldenrod)		Carex acutiformus (Lesser Pond Sedge)		Festuca rubra (Red Fescue)	✓	Amblystegium serpens		Rhytidiadelphus squarrosus		Carpinus Betulus (Hornbeam)		Chamerion angustifolium (Rosebay Willowh	✓
Centaurea nigra (Knapweed)		Lysimachia nemorum (Yellow pimpernel)		Sonchus asper (Prickly Sow Thistle)		Carex binervis (Green Ribbed Sedge)	✓	Festuca gigantea (Giant Fescue)		Atrichum undulatum		Rhytidiadelphus triquetrus		Castanea Sativa (Spanish Chestnut)		Racomitrium lanuginosum	✓
Cerastium fontanum (Common Mouse-ear)		Lysimachia nummularia (Creeping-jenny)		Soncus oleraceus (Smooth Sow Thistle)		Carex caryophyllea (Spring Sedge)		Glyceria fluitans (Sweet Floating Grass)		Brachythecium rivulare		Sphagnum capillifolium	✓	Corylus Avellana (Hazel)	✓	Cladonia portentosa (Reindeer Lichen)	✓
Cirsium arvense (Creeping Thistle)		Lysimachia vulgaris (Yellow-loosestrife)		Stachys palustris (Marsh Woundwort)		Carex demissa (Common Yellow Sedge)		Helictotrichon pubescens (Downy Oat Grass)		Brachythecium rutabulum		Sphagnum cuspidatum	✓	Cotoneaster spp (Cotoneaster spp)		Cladonia floerkeana	✓
Cirsium palustre (Marsh Thistle)		Lythrum salicaria (Purple-loosestrife)		Stachys sylvatica (Hedge Woundwort)		Carex disticha (Brown Sedge)		Holcus lanatus (Yorkshire Fog)	✓	Calliergonella cordifolium		Sphagnum palustre		Cytisus scoparius (Broom)		Sphagnum papillosum	✓
Cirsium vulgare (Spear Thistle)		Medicago lupulina (Black Medick)	✓	Stellaria graminea (Lesser Stitchwort)		Carex echinata (Star Sedge)	✓	Holcus mollis (Creeping Velvet Grass)		Calliergonella cuspidata		Thamnobryum alopecurum		Fagus Sylvatica (Beech)	✓	Sphagnum magellanicum	✓
Conopodium majus (Pignut)	✓	Mentha aquatica (Water Mint)		Stellaria holostea (Greater Stitchwort)		Carex elata (Bowles Golden Sedge)		Koeleria macrantha (Crested Hair Grass)		Cinclidotus fontilaloides		Thuidium tamariscinum		Fraxinus Excelsior (Ash)	✓	Andromeda polifollia (Bog Rosemary)	✓
Crepis capillaris (Smooth Hawks Beard)		Menyanthes trifoliata (Bogbean)	✓	Stellaria media (Common Chickweed)		Carex flacca (Glaucous Sedge)		Lolium perenne (Perennial Rye-grass)	✓	Cirriphyllum piliiferum		Zygodon viridissimus		Fuchsia magellanica (Fuchsia)		Narthecium ossifragum (Bog Asphodel)	✓
Crepis paludosa (Marsh Hawks Beard)		Myosis discolor (Changing Forget-me-not)		Stellaria uliginosa (Bog Stitchwort)		Carex hirta (Hairy Sedge)		Melica uniflora (Wood Melick)		Climacium dendroides				Hippophae rhamnoides (Sea-buckthorn)		Tricophorum caespitosum (Deergrass)	✓
Dactylorhiza fuchsii (Common Spotted-orchid)	✓	Myostis scorpioides (Water Forget-me-not)		Succisa pratensis (Devils-bit Scabious)	✓	Carex laevigata (Smooth Stalked Sedge)		Molinea caerulea (Purple-moor Grass)	✓	Cryphaea heteromalla				Ilex Aquifolium (Holly)	✓	Rhyncospora alba (White-beaked Sedge)	✓
Dactylorhiza maculata (Heath Spotted-orchid)		Narthecium ossifragum (Bog Asphodel)		Taraxacum agg. (Dandelions)	✓	Carex nigra (Common Sedge)	✓	Nardus stricta (Mat Grass)		Ctenidium molluscum				Juniperus communis (Juniper)		Drosera rotundifolia (Round-leaved Sundew	✓
Daucus carota (Wild Carrot)		Orchis mascula (Early-purple Orchid)		Teucrium scorodonia (Wood Sage)		Carex ovalis (Oval Sedge)		Phalaris arundinacea (Reed Canary-grass)		Dicranum majus				Larix spp (Larches)		Vaccinium oxycoccos (Bog Cranberry)	✓
Digitalis purpurea (Foxglove)		Orchis morio (Green-winged Orchid)		Thymus polytricus (Wild Thyme)		Carex panicea (Carnation Sedge)	✓	Phleum pratense (Timothy)		Dicranum scoparium	✓			Picea abies (Norway Spruce)		Sphagnum subnitens	✓
Drosera anglica (Great Sundew)		Origanum vulgare (Marjoram)		Torilis japonica (Upright Hedge Parsley)		Carex paniculata (Greater Tussock)		Phragmites australis (Common Reed)								Sphagnum austinii	✓
Drosera intermedia (Oblong-leaved Sundew)		Pedicularis palustris (Marsh Lousewort)		Trifolium pratensis (Red Clover)	✓	Carex pendula (Pendulous Sedge)		Poa annua (Annual meadowgrass)	✓							Sphagnum fuscum	✓
Drosera rotundifolia (Round-leaved Sundew)		Pedicularis sylvatica (Lousewort)		Trifolium repens (White Clover)	✓	Carex pilulifera (Pill Sedge)		Poa nemoralis (Wood Bluegrass)								Campylous introflexus	✓
		Petasites hybridus (Butterbur)		Tussilago farfara (Coltsfoot)		Carex pulicaris (Flea Sedge)		Poa pratensis (Smooth Meadowgrass)								Odontoshisma sphagni	✓
		Pilosella officinarum (Mouse-ear Hawkweed)		Urtica dioica (Nettle)	✓	Carex remota (remote sedge)											

Table 4: Hortland Plant Species List

Woody		Herbs		Herbs		Herbs		Sedges			Mosses		Liverworts		Trees	
Calluna vulgaris (Ling heather)	✓	Epilobium hirsutum (Great Willowherb)	✓	Pimpinella saxifraga (Burnet Saxifrage)		Valeriana officinalis (Common Valerian)	✓	Carex rostrata (Bottle Sedge)		Poa trivialis (Rough Meadowgrass)	✓	Eurhynchium striatum		Calypogeia fissa		Picea sitchensis (Sitka Spruce)	✓
Crataegus monogyna (Hawthorn)	✓	Epilobium parviflorum (Hoary Willowherb)		Pinguicula vulgaris (Common Butterwort)		Veronica beccabunga (Brookelime)	✓	Carex strigosa (Starved Wood Sedge)		Sesleria caerulea (Blue Moor-grass)		Fissidens adianthoides		Calypogeia muellleriana		Pinus contorta (Lodgepole Pine)	✓
Empetrum nigrum (Crowberry)		Euphrasaia officinalis (Eyebright)		Plantago lanceolata (Ribwort Plantain)	✓	Veronica chamedrys (Germander Speedwell)	✓	Carex sylvatica (Wood Sedge)		Trisetum flavescens (Yellow Oat Grass)		Fissidens bryoides		Chiloscyphus polyanthos		Pinus Sylvestris (Scots Pine)	✓
Erica cinerea (Bell-heather)	✓	Filipendula ulmaria (Meadow-sweet)	✓	Plantago major (Greater Plantain)	✓	Veronica montana (Wood Speedwell)	✓	Carex vesicaria (Bladder Sedge)				Fissidens taxifolius		Conocephalum conicum		Populus spp (Poplars)	
Erica tetralix (Cross-leaved heath)	✓	Galium aparine (Goose-grass,Clevers)	✓	Polygala serpyllifolia (Heath Milkwort)	✓	Veronica officinales (Heath Speedwell)		Carex viridula (Yellow Sedge)		**Horsetails**		Fontinalis antipyretica		Diplophyllum albicans		Prunus laurocerasus (Cherry Laurel)	
Hedera helix (Ivy)	✓	Galium odoratum (Sweet Woodruff)		Polygala vulgaris (Milkwort)	✓	Veronica persica (Common Field-speedwell)				Equisetum arvense (Field Horsetail)	✓	Homalothecium sericeum		Lejeunea (micolejeunea) ulicina		Prunus spinosa (Blackthorn)	✓
Myrica gale (Bog-myrtle)	✓	Galium palustre (Marsh Bedstraw)		Potentilla anserina (Silverweed)	✓	Veronica serpyllifolia (Thyme-leaved Speedwell)		**Grasses**		Equisetum fluviatile (Water Horsetail)	✓	Hookeria lucens		Lepidozia reptans		Quercus pettraea (Sessile Oak)	
Prunus spinosa (Blackthorn)	✓	Galium saxatile (Heath Bedstraw)	✓	Potentilla erecta (Tormentil)	✓	Vicia cracca (Tufted Vetch)	✓	Agrostis canina (Velvet Bent)	✓	Equisetum palustre (Marsh Horsetail)		Hylocomium brevirostre		Lophocolea bidentata		Quercus Robur (Pedunculate Oak)	
Rubus fruticosus agg (Bramble)	✓	Galium verum (Lady's Bedstraw)		Potentilla palustris (Marsh Cinquefoil)	✓	Viola canina (Heath Dog-violet)		Agrostis capillaris (Common Bent)	✓	Equisetum sylvaticum (Wood Horsetail)		Hylocomium splendens		Lunularia cruciata		Rhododendron ponticum (Rhododendron)	✓
Solanum dulcamara (Bittersweet)		Gentianella amarella (Autumn Gentian)		Potentilla reptans (Creeping Cinqefoil)		Vicia sepium (Bush Vetch)		Agrostis stolonifera (Creeping Bent)	✓	Equisetum telmateia (Great Horsetail)		Hyocomium armoricum		Marchesini mach mackaii		Rosa canina (Dog-rose)	✓
Ulex europaeus (Gorse)	✓	Geranium robertianum (Herb Robert)	✓	Potentilla sterilis (Barren Strawberry)		Viola palustris (Marsh Violet)		Alopecurus geniculatus (Water/ Marsh foxtail)				Hypnum cupressiforme		Metzgeria fruticulosa		Rosa spp (Erect or Scrambling roses)	
Ulex gallii (Autumn Gorse)		Gymnadenia conopsea (Fragrant Orchid)		Primula veris (Cowslip)		Viola reichenbachiana (Early Dog-violet)		Alopecurus pratensis (Meadow Foxtail)	✓	**Ferns**		Hypnum jutlandicum		Metzgeria furcata		Salix cinerea ssp. oleifolia (Rusty Willow)	
Vaccinium myrtillus (Bilberry)	✓	Hydrocotyle vulgaris (Marsh Pennywort)		Primula vulgaris (Primrose)	✓	Viola riviniana (Common Dog-violet)	✓	Anisantha sterilis (Barren Brome)		Asplenium trichomanes (maindenhair spleenwort)		Isopterygium elegans		Pellia endiviifolia		Salix spp (Willows)	✓
		Heracleum sphondylium (Hogweed)	✓	Prunella vulgaris (Selfheal)	✓	Viola sp.		Anthoxanthum odoratum (Sweet Vernal-grass)	✓	Asplenium scolopendrium (harts tongue)		Isothecium alopecuroides		Pellia epiphylla		Sambucus nigra (Elder)	✓
Herbs		Hypericum maculatum (Imperforate St John's-wort)		Ranunculus acris (Meadow Buttercup)	✓			Arrhenatherum elatius (False Oat-grass)	✓	Athyrium filix-femina (Lady Fern)		Kindbergia praelonga		Plagiochila asplenioides		Sorbus aucuparia (Rowan)	✓
Achillea millefolium (Yarrow)	✓	Hypericum perforatum (Perforate St John's-wort)		Ranunculus bulbosus (Bulbous Buttercup)		**Rushes**		Brachypodium pinnatum (Heath False Brome)		Blechnum spicant (Hard Fern)		Leucobryum glaucum		Plagiochila porelloides		Symphoricarpos albus (Snowberry)	
Achillea ptarmica (Sneezewort)		Hypericum pulchrum (Slender St John's-wort)		Ranunculus flammula (Lesser Spearwort)	✓	Juncus acutifloras (Sharp-flowered Rush)		Brachypodium sylvaticum (False Brome)	✓	Dryopteris aemula (Hay-scented Buckler Fern)		Mnium hornum		Saccogyna viticulosa		Taxis Baccata (Yew)	
Ajuga reptans (Bugle)		Hypericum tetrapterum (Square stalked St John's-wort)	✓	Ranunculus repens (Creeping Buttercup)	✓	Juncus articulatus (Jointed Rush)		Briza media (Quaking Grass)		Dryopteris affinis (Western Scaly Male Fern)		Neckera crispa		Scapania gracilis		Tilia spp (Limes)	
Anacamptis pyramidalis (Pyramidal Orchid)		Hypochaeris radicata (Cat's Ear)	✓	Rhinanthus minor (Yellow Rattle)		Juncus bufonius (Toad Rush)		Bromus erectus (Meadow Brome)		Dryopteris carthusiana (Narrow Buckler Fern)	✓	Orthotrichum affine		Scapania nemorera		Ulmus spp (Elms)	
Anagallis arvensis (Scarlet Pimpernel)		Iris pseudacorus (Yellow iris/flag)	✓	Rumex acetosa (Common Sorrel)	✓	Juncus bulbosus (Bulbous Rush)	✓	Bromus hordeaceus (Soft Brome)		Dryopteris dilatata (Broad Buckler Fern)	✓	Oxyrrhynchium hians		Scapania undulata			
Angelica sylvestris (Wild Angelica)		Knautia arvensis (Field Scabious)		Rumex acetosella (Sheep Sorrel)	✓	Juncus congclomeratus (Compact Rush)	✓	Bromus ramosus (Hairy Brome)		Dryopteris filix-mas (Male Fern)		Pleurozium schreberi		Tricolea tomentella			
Anthriscus sylvestris (Cow-parsley)	✓	Lapsana communis (Nipplewort)	✓	Rumex conglomeratus (Clustered Dock)		Juncus effusus (Soft Rush)	✓	Cynosurus cristatus (Crested Dog's-tail)	✓	Ophioglossom vulgatum (Common Adderstongue)		Pliothecium denticulatum					
Anthyllis vulneraria (Kidney Vetch)		Lathyrus linifolius (Bitter Vetch)		Rumex crispus (Curled Dock)	✓	Juncus inflexus (Hard Rush)		Dactylis glomerata (Cock's Foot)	✓	Osmunda regalis (Royal Fern)		Pliothecium undulatum		**Trees**		**Other species**	
Bellis perennis (Daisy)	✓	Lathyrus pratensis (Meadow Vetchling)	✓	Rumex obtusifolius (Broad Dock)	✓	Juncus squarrosus (Heath Rush)		Danthonia decumbens (Common Heath Grass)		Phyllitis scolopendrium (Harts Tongue)		Plagiomnium undulatum		Acer Pseudoplatanus (Sycamore)	✓	Eriophorum vaginatum (Hairs Tail Cottongrass)	
Blackstonia perfoliata (Yellow-wort)		Leontodon autumnalis (Autumn Hawkbit)		Sagina procumbens (Procumbent Pearlwort)		Luzula campestris (Field Wood-rush)		Deschampsia cespitosa (Tufted Hair Grass)		Polystichum setiferum (Soft Shield Fern)		Polytrichum commune		Aesculus Hippocastanum (Horse Chestnu		Eriophorum angustifolium (Common Cottongrass)	
Caltha palustris (Marsh-marigold)		Leucanthemum vulgare (Ox-eye Daisy)	✓	Sanguisorba minor (Burnet Salad)		Luzula pilosa (Hairy Wood-rush)		Deschampsia flexuosa (Wavy Hair Grass)		Pteridium aquilinum (Bracken)	✓	Polytrichum formosum		Alnus Glutinosa (Alder)	✓	Rhyncospora alba (White Beaked-sedge)	
Campanula rotundifolia (Harebell)		Linum catharticum (Fairy Flax)	✓	Scutellaria galericulata (Skullcap)		Luzula multiflora (Heath Wood-rush)	✓	Festuca altissima (Wood Fescue)				Pseudoscleropodium purum		Betula pubescenes (Downy Birch)	✓	Eleocharis acicularis (Dwarf Hairgrass)	
Cardamine flexuosa (Wavy Bittercrss)	✓	Listeria ovata (Common Twayblade)		Senecio aquaticus (Marsh Ragwort)		Luzula sylvatica (Great Wood-rush)		Festuca arundinacea (Tall Fescue)				Rhizomnium punctatum		Betula spp (Birch)		Asplenium ruta-muraria (Wall Rue)	
Cardamine hirsuta (Hairy Bittercress)		Lotus corniculatus (Common Bird's-foot-trefoil)		Senecio jacobaea (Common Ragwort)	✓			Festuca ovina (Sheep's Fescue)				Rhynchostegium riparioides		Buddleja davidii (Butterfly-bush)		Arctium lappa (Greater Burdock)	
Cardamine pratensis (Cukoo Flower / Lady's S	✓	Lotus pedunculatus (Greater Birds-foot-trefoil)		Silene dioica (Red Campion)		**Sedges**		Festuca pratensis (Meadow Fescue)	✓	**Mosses**		Rhytidiadelphus loreus		Buxus sempervirens (Box)		Scirpus atrovirens (Common Bullrush)	
Carlina vulgaris (Carline Thistle)		Lychnis flos-cuculi (Ragged Robin)		Solidago virgaurea (Goldenrod)		Carex acutiformus (Lesser Pond Sedge)		Festuca rubra (Red Fescue)	✓	Amblystegium serpens		Rhytidiadelphus squarrosus		Carpinus Betulus (Hornbeam)		Potamogeton natans (Broad-leaved Pondweed)	
Centaurea nigra (Knapweed)	✓	Lysimachia nemorum (Yellow pimpernel)		Sonchus asper (Prickly Sow Thistle)	✓	Carex binervis (Green Ribbed Sedge)		Festuca gigantea (Giant Fescue)		Atrichum undulatum		Rhytidiadelphus triquetrus		Castanea Sativa (Spanish Chestnut)		Lamium purpureum (Red Dead Nettle)	
Cerastium fontanum (Common Mouse-ear)	✓	Lysimachia nummularia (Creeping-jenny)		Soncus oleraceus (Smooth Sow Thistle)	✓	Carex caryophyllea (Spring Sedge)		Glyceria fluitans (Sweet Floating Grass)	✓	Brachythecium rivulare		Sphagnum capillifolium		Corylus Avellana (Hazel)	✓	Odontites vernus (Red Bartsia)	
Cirsium arvense (Creeping Thistle)	✓	Lysimachia vulgaris (Yellow-loosestrife)		Stachys palustris (Marsh Woundwort)		Carex demissa (Common Yellow Sedge)		Helictotrichon pubescens (Downy Oat Grass)		Brachythecium rutabulum		Sphagnum cuspidatum		Cotoneaster spp (Cotoneaster spp)		Hypericum androsaemum (Tutsan)	
Cirsium palustre (Marsh Thistle)	✓	Lythrum salicaria (Purple-loosestrife)	✓	Stachys sylvatica (Hedge Woundwort)		Carex disticha (Brown Sedge)		Holcus lanatus (Yorkshire Fog)	✓	Calliergonella cordifolium		Sphagnum palustre		Cytisus scoparius (Broom)		Euonymus europaeus (Common Spindle)	
Cirsium vulgare (Spear Thistle)	✓	Medicago lupulina (Black Medick)	✓	Stellaria graminea (Lesser Stitchwort)	✓	Carex echinata (Star Sedge)		Holcus mollis (Creeping Velvet Grass)		Calliergonella cuspidata		Thamnobryum alopecurum		Fagus Sylvatica (Beech)	✓	Betula pendula (Silver Birch)	
Conopodium majus (Pignut)		Mentha aquatica (Water Mint)	✓	Stellaria holostea (Greater Stitchwort)		Carex elata (Bowles Golden Sedge)		Koeleria macrantha (Crested Hair Grass)	✓	Cinclidotus fontilaloides		Thuidium tamariscinum		Fraxinus Excelsior (Ash)	✓		
Crepis capillaris (Smooth Hawks Beard)	✓	Menyanthes trifoliata (Bogbean)		Stellaria media (Common Chickweed)	✓	Carex flacca (Glaucous Sedge)	✓	Lolium perenne (Perennial Rye-grass)	✓	Cirriphyllum piliiferum		Zygodon viridissimus		Fuchsia magellanica (Fuchsia)			
Crepis paludosa (Marsh Hawks Beard)		Myosis discolor (Changing Forget-me-not)		Stellaria uliginosa (Bog Stitchwort)		Carex hirta (Hairy Sedge)		Melica uniflora (Wood Melick)		Climacium dendroides				Hippophae rhamnoides (Sea-buckthorn)			
Dactylorhiza fuchsii (Common Spotted-orchid)	✓	Myostis scorpioides (Water Forget-me-not)		Succisa pratensis (Devils-bit Scabious)		Carex laevigata (Smooth Stalked Sedge)		Molinea caerulea (Purple-moor Grass)	✓	Cryphaea heteromalla				Ilex Aquifolium (Holly)	✓		
Dactylorhiza maculata (Heath Spotted-orchid)		Narthecium ossifragum (Bog Asphodel)	✓	Taraxacum agg. (Dandelions)	✓	Carex nigra (Common Sedge)		Nardus stricta (Mat Grass)		Ctenidium molluscum				Juniperus communis (Juniper)			
Daucus carota (Wild Carrot)		Orchis mascula (Early-purple Orchid)		Teucrium scorodonia (Wood Sage)		Carex ovalis (Oval Sedge)		Phalaris arundinacea (Reed Canary-grass)	✓	Dicranum majus				Larix spp (Larches)	✓		
Digitalis purpurea (Foxglove)	✓	Orchis morio (Green-winged Orchid)		Thymus polytricus (Wild Thyme)		Carex panicea (Carnation Sedge)		Phleum pratense (Timothy)	✓	Dicranum scoparium				Picea abies (Norway Spruce)			
Drosera anglica (Great Sundew)		Origanum vulgare (Marjoram)		Torilis japonica (Upright Hedge Parsley)		Carex paniculata (Greater Tussock)		Phragmites australis (Common Reed)	✓								
Drosera intermedia (Oblong-leaved Sundew)		Pedicularis palustris (Marsh Lousewort)		Trifolium pratensis (Red Clover)	✓	Carex pendula (Pendulous Sedge)		Poa annua (Annual Meadowgrass)	✓								
Drosera rotundifolia (Round-leaved Sundew)		Pedicularis sylvatica (Lousewort)	✓	Trifolium repens (White Clover)	✓	Carex pilulifera (Pill Sedge)		Poa nemoralis (Wood Bluegrass)									
		Petasites hybridus (Butterbur)		Tussilago farfara (Coltsfoot)	✓	Carex pulicaris (Flea Sedge)		Poa pratensis (Smooth Meadowgrass)									
		Pilosella officinarum (Mouse-ear Hawkweed)		Urtica dioica (Nettle)	✓	Carex remota (remote sedge)											

Table 5: Derrybrennan Plant Species List

Woody		Herbs		Herbs		Herbs		Sedges			Mosses		Liverworts		Trees	
Calluna vulgaris (Ling heather)		Epilobium hirsutum (Great Willowherb)	✓	Pimpinella saxifraga (Burnet Saxifrage)		Valeriana officinalis (Common Valerian)	✓	Carex rostrata (Bottle Sedge)		Poa trivialis (Rough Meadowgrass)	Eurhynchium striatum		Calypogeia fissa		Picea sitchensis (Sitka Spruce)	✓
Crataegus monogyna (Hawthorn)		Epilobium parviflorum (Hoary Willowherb)		Pinguicula vulgaris (Common Butterwort)		Veronica beccabunga (Brookelime)	✓	Carex strigosa (Starved Wood Sedge)		Sesleria caerulea (Blue Moor-grass)	Fissidens adianthoides		Calypogeia muellleriana		Pinus contorta (Lodgepole Pine)	
Empetrum nigrum (Crowberry)		Euphrasaia officinalis (Eyebright)	✓	Plantago lanceolata (Ribwort Plantain)		Veronica chamedrys (Germander Speedwell)	✓	Carex sylvatica (Wood Sedge)		Trisetum flavescens (Yellow Oat Grass)	Fissidens bryoides		Chiloscyphus polyanthos		Pinus Sylvestris (Scots Pine)	✓
Erica cinerea (Bell-heather)		Filipendula ulmaria (Meadow-sweet)	✓	Plantago major (Greater Plantain)		Veronica montana (Wood Speedwell)		Carex vesicaria (Bladder Sedge)			Fissidens taxifolius		Conocephalum conicum		Populus spp (Poplars)	
Erica tetralix (Cross-leaved heath)		Galium aparine (Goose-grass,Clevers)		Polygala serpyllifolia (Heath Milkwort)		Veronica officinales (Heath Speedwell)		Carex viridula (Yellow Sedge)		**Horsetails**	Fontinalis antipyretica		Diplophyllum albicans		Prunus laurocerasus (Cherry Laurel)	
Hedera helix (Ivy)		Galium odoratum (Sweet Woodruff)		Polygala vulgaris (Milkwort)		Veronica persica (Common Field-speedwell)	✓			Equisetum arvense (Field Horsetail)	Homalothecium sericeum		Lejeunea (micolejeunea) ulicina		Prunus spinosa (Blackthorn)	
Myrica gale (Bog-myrtle)		Galium palustre (Marsh Bedstraw)	✓	Potentilla anserina (Silverweed)	✓	Veronica serpyllifolia (Thyme-leaved Speedwell)		**Grasses**		Equisetum fluviatile (Water Horsetail)	✓ Hookeria lucens		Lepidozia reptans		Quercus pettraea (Sessile Oak)	
Prunus spinosa (Blackthorn)		Galium saxatile (Heath Bedstraw)		Potentilla erecta (Tormentil)	✓	Vicia cracca (Tufted Vetch)	✓	Agrostis canina (Velvet Bent)		Equisetum palustre (Marsh Horsetail)	Hylocomium brevirostre		Lophocolea bidentata		Quercus Robur (Pedunculate Oak)	
Rubus fruticosus agg (Bramble)		Galium verum (Lady's Bedstraw)	✓	Potentilla palustris (Marsh Cinquefoil)		Viola canina (Heath Dog-violet)		Agrostis capillaris (Common Bent)		Equisetum sylvaticum (Wood Horsetail)	Hylocomium splendens		Lunularia cruciata		Rhododendron ponticum (Rhododendron)	
Solanum dulcamara (Bittersweet)		Gentianella amarella (Autumn Gentian)		Potentilla reptans (Creeping Cinqefoil)		Vicia sepium (Bush Vetch)		Agrostis stolonifera (Creeping Bent)	✓	Equisetum telmateia (Great Horsetail)	Hyocomium armoricum		Marchesini mach mackaii		Rosa canina (Dog-rose)	
Ulex europaeus (Gorse)		Geranium robertianum (Herb Robert)		Potentilla sterilis (Barren Strawberry)		Viola palustris (Marsh Violet)		Alopecurus geniculatus (Water/ Marsh foxtail)			Hypnum cupressiforme		Metzgeria fruticulosa		Rosa spp (Erect or Scrambling roses)	
Ulex gallii (Autumn Gorse)		Gymnadenia conopsea (Fragrant Orchid)		Primula veris (Cowslip)		Viola reichenbachiana (Early Dog-violet)		Alopecurus pratensis (Meadow Foxtail)	✓	**Ferns**	Hypnum jutlandicum		Metzgeria furcata		Salix cinerea ssp. oleifolia (Rusty Willow)	✓
Vaccinium myrtillus (Bilberry)		Hydrocotyle vulgaris (Marsh Pennywort)		Primula vulgaris (Primrose)		Viola riviniana (Common Dog-violet)	✓	Anisantha sterilis (Barren Brome)		Asplenium trichomanes (maindenhair spleenwort)	Isopterygium elegans		Pellia endiviifolia		Salix spp (Willows)	✓
		Heracleum sphondylium (Hogweed)		Prunella vulgaris (Selfheal)	✓	Viola sp.		Anthoxanthum odoratum (Sweet Vernal-grass)	✓	Asplenium scolopendrium (harts tongue)	Isothecium alopecuroides		Pellia epiphylla		Sambucus nigra (Elder)	
Herbs		Hypericum maculatum (Imperforate St John's-wort)		Ranunculus acris (Meadow Buttercup)	✓			Arrhenatherum elatius (False Oat-grass)	✓	Athyrium filix-femina (Lady Fern)	Kindbergia praelonga		Plagiochila asplenioides		Sorbus aucuparia (Rowan)	✓
Achillea millefolium (Yarrow)	✓	Hypericum perforatum (Perforate St John's-wort)	✓	Ranunculus bulbosus (Bulbous Buttercup)		**Rushes**		Brachypodium pinnatum (Heath False Brome)		Blechnum spicant (Hard Fern)	Leucobryum glaucum		Plagiochila porelloides		Symphoricarpos albus (Snowberry)	
Achillea ptarmica (Sneezewort)		Hypericum pulchrum (Slender St John's-wort)		Ranunculus flammula (Lesser Spearwort)		Juncus acutifloras (Sharp-flowered Rush)	✓	Brachypodium sylvaticum (False Brome)		Dryopteris aemula (Hay-scented Buckler Fern)	Mnium hornum		Saccogyna viticulosa		Taxis Baccata (Yew)	
Ajuga reptans (Bugle)		Hypericum tetrapterum (Square stalked St John's-wort)		Ranunculus repens (Creeping Buttercup)	✓	Juncus articulatus (Jointed Rush)	✓	Briza media (Quaking Grass)	✓	Dryopteris affinis (Western Scaly Male Fern)	Neckera crispa		Scapania gracilis		Tilia spp (Limes)	
Anacamptis pyramidalis (Pyramidal Orchid)		Hypochaeris radicata (Cat's Ear)		Rhinanthus minor (Yellow Rattle)		Juncus bufonius (Toad Rush)	✓	Bromus erectus (Meadow Brome)		Dryopteris carthusiana (Narrow Buckler Fern)	Orthotrichum affine		Scapania nemorera		Ulmus spp (Elms)	
Anagallis arvensis (Scarlet Pimpernel)		Iris pseudacorus (Yellow iris/flag)		Rumex acetosa (Common Sorrel)		Juncus bulbosus (Bulbous Rush)		Bromus hordeaceus (Soft Brome)		Dryopteris dilatata (Broad Buckler Fern)	Oxyrrhynchium hians		Scapania undulata			
Angelica sylvestris (Wild Angelica)		Knautia arvensis (Field Scabious)		Rumex acetosella (Sheep Sorrel)		Juncus congclomeratus (Compact Rush)	✓	Bromus ramosus (Hairy Brome)		Dryopteris filix-mas (Male Fern)	Pleurozium schreberi		Tricolea tomentella			
Anthriscus sylvestris (Cow-parsley)		Lapsana communis (Nipplewort)		Rumex conglomeratus (Clustered Dock)		Juncus effusus (Soft Rush)	✓	Cynosurus cristatus (Crested Dog's-tail)	✓	Ophioglossom vulgatum (Common Adderstongue)	Pliothecium denticulatum					
Anthyllis vulneraria (Kidney Vetch)		Lathyrus linifolius (Bitter Vetch)		Rumex crispus (Curled Dock)	✓	Juncus inflexus (Hard Rush)	✓	Dactylis glomerata (Cock's Foot)	✓	Osmunda regalis (Royal Fern)	Pliothecium undulatum		**Trees**		**Other species**	
Bellis perennis (Daisy)		Lathyrus pratensis (Meadow Vetchling)		Rumex obtusifolius (Broad Dock)	✓	Juncus squarrosus (Heath Rush)		Danthonia decumbens (Common Heath Grass)		Phyllitis scolopendrium (Harts Tongue)	Plagiomnium undulatum		Acer Pseudoplatanus (Sycamore)		Typha latifolia (Bullrush)	✓
Blackstonia perfoliata (Yellow-wort)		Leontodon autumnalis (Autumn Hawkbit)		Sagina procumbens (Procumbent Pearlwort)		Luzula campestris (Field Wood-rush)		Deschampsia cespitosa (Tufted Hair Grass)		Polystichum setiferum (Soft Shield Fern)	Polytrichum commune		Aesculus Hippocastanum (Horse Chestnu		Cupressus spp. (Cypress spp)	✓
Caltha palustris (Marsh-marigold)		Leucanthemum vulgare (Ox-eye Daisy)	✓	Sanguisorba minor (Burnet Salad)		Luzula pilosa (Hairy Wood-rush)		Deschampsia flexuosa (Wavy Hair Grass)		Pteridium aquilinum (Bracken)	Polytrichum formosum		Alnus Glutinosa (Alder)	✓		
Campanula rotundifolia (Harebell)		Linum catharticum (Fairy Flax)		Scutellaria galericulata (Skullcap)		Luzula multiflora (Heath Wood-rush)		Festuca altissima (Wood Fescue)			Pseudoscleropodium purum		Betula pubescenes (Downy Birch)	✓		
Cardamine flexuosa (Wavy Bittercrss)		Listeria ovata (Common Twayblade)		Senecio aquaticus (Marsh Ragwort)		Luzula sylvatica (Great Wood-rush)		Festuca arundinacea (Tall Fescue)			Rhizomnium punctatum		Betula spp (Birch)			
Cardamine hirsuta (Hairy Bittercress)		Lotus corniculatus (Common Bird's-foot-trefoil)	✓	Senecio jacobaea (Common Ragwort)	✓			Festuca ovina (Sheep's Fescue)	✓		Rhynchostegium riparioides		Buddleja davidii (Butterfly-bush)			
Cardamine pratensis (Cukoo Flower / Lady's Smock)		Lotus pedunculatus (Greater Birds-foot-trefoil)		Silene dioica (Red Campion)		**Sedges**		Festuca pratensis (Meadow Fescue)		**Mosses**	Rhytidiadelphus loreus		Buxus sempervirens (Box)			
Carlina vulgaris (Carline Thistle)		Lychnis flos-cuculi (Ragged Robin)		Solidago virgaurea (Goldenrod)		Carex acutiformus (Lesser Pond Sedge)	✓	Festuca rubra (Red Fescue)		Amblystegium serpens	Rhytidiadelphus squarrosus		Carpinus Betulus (Hornbeam)			
Centaurea nigra (Knapweed)	✓	Lysimachia nemorum (Yellow pimpernel)		Sonchus asper (Prickly Sow Thistle)		Carex binervis (Green Ribbed Sedge)		Festuca gigantea (Giant Fescue)		Atrichum undulatum	Rhytidiadelphus triquetrus		Castanea Sativa (Spanish Chestnut)			
Cerastium fontanum (Common Mouse-ear)		Lysimachia nummularia (Creeping-jenny)		Soncus oleraceus (Smooth Sow Thistle)	✓	Carex caryophyllea (Spring Sedge)		Glyceria fluitans (Sweet Floating Grass)		Brachythecium rivulare	Sphagnum capillifolium		Corylus Avellana (Hazel)			
Cirsium arvense (Creeping Thistle)		Lysimachia vulgaris (Yellow-loosestrife)		Stachys palustris (Marsh Woundwort)		Carex demissa (Common Yellow Sedge)	✓	Helictotrichon pubescens (Downy Oat Grass)		Brachythecium rutabulum	Sphagnum cuspidatum		Cotoneaster spp (Cotoneaster spp)			
Cirsium palustre (Marsh Thistle)		Lythrum salicaria (Purple-loosestrife)		Stachys sylvatica (Hedge Woundwort)		Carex disticha (Brown Sedge)	✓	Holcus lanatus (Yorkshire Fog)	✓	Calliergonella cordifolium	Sphagnum palustre		Cytisus scoparius (Broom)			
Cirsium vulgare (Spear Thistle)		Medicago lupulina (Black Medick)		Stellaria graminea (Lesser Stitchwort)		Carex echinata (Star Sedge)		Holcus mollis (Creeping Velvet Grass)		Calliergonella cuspidata	Thamnobryum alopecurum		Fagus Sylvatica (Beech)	✓		
Conopodium majus (Pignut)		Mentha aquatica (Water Mint)		Stellaria holostea (Greater Stitchwort)		Carex elata (Bowles Golden Sedge)		Koeleria macrantha (Crested Hair Grass)		Cinclidotus fontilaloides	Thuidium tamariscinum		Fraxinus Excelsior (Ash)	✓		
Crepis capillaris (Smooth Hawks Beard)		Menyanthes trifoliata (Bogbean)		Stellaria media (Common Chickweed)		Carex flacca (Glaucous Sedge)	✓	Lolium perenne (Perennial Rye-grass)	✓	Cirriphyllum piliiferum	Zygodon viridissimus		Fuchsia magellanica (Fuchsia)			
Crepis paludosa (Marsh Hawks Beard)		Myosis discolor (Changing Forget-me-not)		Stellaria uliginosa (Bog Stitchwort)		Carex hirta (Hairy Sedge)		Melica uniflora (Wood Melick)		Climacium dendroides			Hippophae rhamnoides (Sea-buckthorn)			
Dactylorhiza fuchsii (Common Spotted-orchid)	✓	Myostis scorpioides (Water Forget-me-not)		Succisa pratensis (Devils-bit Scabious)	✓	Carex laevigata (Smooth Stalked Sedge)		Molinea caerulea (Purple-moor Grass)	✓	Cryphaea heteromalla			Ilex Aquifolium (Holly)			
Dactylorhiza maculata (Heath Spotted-orchid)		Narthecium ossifragum (Bog Asphodel)		Taraxacum agg. (Dandelions)	✓	Carex nigra (Common Sedge)		Nardus stricta (Mat Grass)		Ctenidium molluscum			Juniperus communis (Juniper)			
Daucus carota (Wild Carrot)		Orchis mascula (Early-purple Orchid)		Teucrium scorodonia (Wood Sage)		Carex ovalis (Oval Sedge)	✓	Phalaris arundinacea (Reed Canary-grass)		Dicranum majus			Larix spp (Larches)			
Digitalis purpurea (Foxglove)		Orchis morio (Green-winged Orchid)		Thymus polytricus (Wild Thyme)		Carex panicea (Carnation Sedge)	✓	Phleum pratense (Timothy)	✓	Dicranum scoparium			Picea abies (Norway Spruce)			
Drosera anglica (Great Sundew)		Origanum vulgare (Marjoram)		Torilis japonica (Upright Hedge Parsley)		Carex paniculata (Greater Tussock)		Phragmites australis (Common Reed)								
Drosera intermedia (Oblong-leaved Sundew)		Pedicularis palustris (Marsh Lousewort)		Trifolium pratensis (Red Clover)	✓	Carex pendula (Pendulous Sedge)		Poa annua (Annual meadowgrass)	✓							
Drosera rotundifolia (Round-leaved Sundew)		Pedicularis sylvatica (Lousewort)		Trifolium repens (White Clover)	✓	Carex pilulifera (Pill Sedge)		Poa nemoralis (Wood Bluegrass)								
		Petasites hybridus (Butterbur)		Tussilago farfara (Coltsfoot)		Carex pulicaris (Flea Sedge)		Poa pratensis (Smooth Meadowgrass)								
		Pilosella officinarum (Mouse-ear Hawkweed)		Urtica dioica (Nettle)		Carex remota (remote sedge)	✓									

Table 6: Cloncumber Plant Species List

Woody		Herbs		Herbs		Herbs		Sedges			Mosses		Liverworts		Trees	
Calluna vulgaris (Ling heather)		Epilobium hirsutum (Great Willowherb)	✓	Pimpinella saxifraga (Burnet Saxifrage)		Valeriana officinalis (Common Valerian)		Carex rostrata (Bottle Sedge)	✓	Poa trivialis (Rough Meadowgrass)	✓	Eurhynchium striatum		Calypogeia fissa		Picea sitchensis (Sitka Spruce)	✓
Crataegus monogyna (Hawthorn)	✓	Epilobium parviflorum (Hoary Willowherb)		Pinguicula vulgaris (Common Butterwort)		Veronica beccabunga (Brookelime)		Carex strigosa (Starved Wood Sedge)		Sesleria caerulea (Blue Moor-grass)		Fissidens adianthoides		Calypogeia muellleriana		Pinus contorta (Lodgepole Pine)	
Empetrum nigrum (Crowberry)		Euphrasaia officinalis (Eyebright)		Plantago lanceolata (Ribwort Plantain)	✓	Veronica chamedrys (Germander Speedwell)		Carex sylvatica (Wood Sedge)		Trisetum flavescens (Yellow Oat Grass)		Fissidens bryoides		Chiloscyphus polyanthos		Pinus Sylvestris (Scots Pine)	✓
Erica cinerea (Bell-heather)		Filipendula ulmaria (Meadow-sweet)	✓	Plantago major (Greater Plantain)	✓	Veronica montana (Wood Speedwell)		Carex vesicaria (Bladder Sedge)				Fissidens taxifolius		Conocephalum conicum		Populus spp (Poplars)	
Erica tetralix (Cross-leaved heath)		Galium aparine (Goose-grass,Clevers)		Polygala serpyllifolia (Heath Milkwort)		Veronica officinales (Heath Speedwell)		Carex viridula (Yellow Sedge)		**Horsetails**		Fontinalis antipyretica		Diplophyllum albicans		Prunus laurocerasus (Cherry Laurel)	
Hedera helix (Ivy)	✓	Galium odoratum (Sweet Woodruff)		Polygala vulgaris (Milkwort)		Veronica persica (Common Field-speedwell)				Equisetum arvense (Field Horsetail)		Homalothecium sericeum		Lejeunea (micolejeunea) ulicina		Prunus spinosa (Blackthorn)	
Myrica gale (Bog-myrtle)		Galium palustre (Marsh Bedstraw)		Potentilla anserina (Silverweed)	✓	Veronica serpyllifolia (Thyme-leaved Speedwell)		**Grasses**		Equisetum fluviatile (Water Horsetail)	✓	Hookeria lucens		Lepidozia reptans		Quercus pettraea (Sessile Oak)	✓
Prunus spinosa (Blackthorn)		Galium saxatile (Heath Bedstraw)		Potentilla erecta (Tormentil)		Vicia cracca (Tufted Vetch)	✓	Agrostis canina (Velvet Bent)		Equisetum palustre (Marsh Horsetail)		Hylocomium brevirostre		Lophocolea bidentata		Quercus Robur (Pedunculate Oak)	
Rubus fruticosus agg (Bramble)	✓	Galium verum (Lady's Bedstraw)	✓	Potentilla palustris (Marsh Cinquefoil)		Viola canina (Heath Dog-violet)		Agrostis capillaris (Common Bent)	✓	Equisetum sylvaticum (Wood Horsetail)		Hylocomium splendens		Lunularia cruciata		Rhododendron ponticum (Rhododendron)	
Solanum dulcamara (Bittersweet)		Gentianella amarella (Autumn Gentian)		Potentilla reptans (Creeping Cinqefoil)		Vicia sepium (Bush Vetch)		Agrostis stolonifera (Creeping Bent)	✓	Equisetum telmateia (Great Horsetail)		Hyocomium armoricum		Marchesini mach mackaii		Rosa canina (Dog-rose)	
Ulex europaeus (Gorse)		Geranium robertianum (Herb Robert)		Potentilla sterilis (Barren Strawberry)		Viola palustris (Marsh Violet)		Alopecurus geniculatus (Water/ Marsh foxtail)	✓			Hypnum cupressiforme		Metzgeria fruticulosa		Rosa spp (Erect or Scrambling roses)	
Ulex gallii (Autumn Gorse)		Gymnadenia conopsea (Fragrant Orchid)		Primula veris (Cowslip)		Viola reichenbachiana (Early Dog-violet)		Alopecurus pratensis (Meadow Foxtail)	✓	**Ferns**		Hypnum jutlandicum		Metzgeria furcata		Salix cinerea ssp. oleifolia (Rusty Willow)	
Vaccinium myrtillus (Bilberry)		Hydrocotyle vulgaris (Marsh Pennywort)		Primula vulgaris (Primrose)		Viola riviniana (Common Dog-violet)		Anisantha sterilis (Barren Brome)		Asplenium trichomanes (maindenhair spleenwort)		Isopterygium elegans		Pellia endiviifolia		Salix spp (Willows)	✓
		Heracleum sphondylium (Hogweed)		Prunella vulgaris (Selfheal)	✓	Viola sp.		Anthoxanthum odoratum (Sweet Vernal-grass)	✓	Asplenium scolopendrium (harts tongue)		Isothecium alopecuroides		Pellia epiphylla		Sambucus nigra (Elder)	✓
Herbs		Hypericum maculatum (Imperforate St John's-wort)		Ranunculus acris (Meadow Buttercup)	✓			Arrhenatherum elatius (False Oat-grass)	✓	Athyrium filix-femina (Lady Fern)		Kindbergia praelonga		Plagiochila asplenioides		Sorbus aucuparia (Rowan)	
Achillea millefolium (Yarrow)	✓	Hypericum perforatum (Perforate St John's-wort)	✓	Ranunculus bulbosus (Bulbous Buttercup)		**Rushes**		Brachypodium pinnatum (Heath False Brome)		Blechnum spicant (Hard Fern)		Leucobryum glaucum		Plagiochila porelloides		Symphoricarpos albus (Snowberry)	
Achillea ptarmica (Sneezewort)		Hypericum pulchrum (Slender St John's-wort)		Ranunculus flammula (Lesser Spearwort)	✓	Juncus acutifloras (Sharp-flowered Rush)	✓	Brachypodium sylvaticum (False Brome)		Dryopteris aemula (Hay-scented Buckler Fern)		Mnium hornum		Saccogyna viticulosa		Taxis Baccata (Yew)	
Ajuga reptans (Bugle)		Hypericum tetrapterum (Square stalked St John's-wort)		Ranunculus repens (Creeping Buttercup)	✓	Juncus articulatus (Jointed Rush)		Briza media (Quaking Grass)		Dryopteris affinis (Western Scaly Male Fern)		Neckera crispa		Scapania gracilis		Tilia spp (Limes)	
Anacamptis pyramidalis (Pyramidal Orchid)		Hypochaeris radicata (Cat's Ear)		Rhinanthus minor (Yellow Rattle)	✓	Juncus bufonius (Toad Rush)		Bromus erectus (Meadow Brome)		Dryopteris carthusiana (Narrow Buckler Fern)		Orthotrichum affine		Scapania nemorera		Ulmus spp (Elms)	
Anagallis arvensis (Scarlet Pimpernel)		Iris pseudacorus (Yellow iris/flag)	✓	Rumex acetosa (Common Sorrel)		Juncus bulbosus (Bulbous Rush)		Bromus hordeaceus (Soft Brome)		Dryopteris dilatata (Broad Buckler Fern)		Oxyrrhynchium hians		Scapania undulata			
Angelica sylvestris (Wild Angelica)		Knautia arvensis (Field Scabious)		Rumex acetosella (Sheep Sorrel)		Juncus congclomeratus (Compact Rush)		Bromus ramosus (Hairy Brome)		Dryopteris filix-mas (Male Fern)		Pleurozium schreberi		Tricolea tomentella			
Anthriscus sylvestris (Cow-parsley)	✓	Lapsana communis (Nipplewort)		Rumex conglomeratus (Clustered Dock)		Juncus effusus (Soft Rush)	✓	Cynosurus cristatus (Crested Dog's-tail)	✓	Ophioglossom vulgatum (Common Adderstongue)		Pliothecium denticulatum					
Anthyllis vulneraria (Kidney Vetch)		Lathyrus linifolius (Bitter Vetch)		Rumex crispus (Curled Dock)		Juncus inflexus (Hard Rush)	✓	Dactylis glomerata (Cock's Foot)	✓	Osmunda regalis (Royal Fern)		Pliothecium undulatum		**Trees**		**Other species**	
Bellis perennis (Daisy)	✓	Lathyrus pratensis (Meadow Vetchling)		Rumex obtusifolius (Broad Dock)	✓	Juncus squarrosus (Heath Rush)		Danthonia decumbens (Common Heath Grass)		Phyllitis scolopendrium (Harts Tongue)		Plagiomnium undulatum		Acer Pseudoplatanus (Sycamore)		Schoenoplectus lacustris (Bullrush)	
Blackstonia perfoliata (Yellow-wort)		Leontodon autumnalis (Autumn Hawkbit)	✓	Sagina procumbens (Procumbent Pearlwort)		Luzula campestris (Field Wood-rush)		Deschampsia cespitosa (Tufted Hair Grass)	✓	Polystichum setiferum (Soft Shield Fern)		Polytrichum commune		Aesculus Hippocastanum (Horse Ch	✓	Sparganium emersum (European Bur-reed)	✓
Caltha palustris (Marsh-marigold)		Leucanthemum vulgare (Ox-eye Daisy)		Sanguisorba minor (Burnet Salad)		Luzula pilosa (Hairy Wood-rush)		Deschampsia flexuosa (Wavy Hair Grass)		Pteridium aquilinum (Bracken)		Polytrichum formosum		Alnus Glutinosa (Alder)	✓	Papavar rhoeas (Common Poppy)	✓
Campanula rotundifolia (Harebell)		Linum catharticum (Fairy Flax)	✓	Scutellaria galericulata (Skullcap)		Luzula multiflora (Heath Wood-rush)		Festuca altissima (Wood Fescue)				Pseudoscleropodium purum		Betula pubescenes (Downy Birch)	✓	Apium nodiflorum (Fools-water-cress)	✓
Cardamine flexuosa (Wavy Bittercrss)		Listeria ovata (Common Twayblade)		Senecio aquaticus (Marsh Ragwort)		Luzula sylvatica (Great Wood-rush)		Festuca arundinacea (Tall Fescue)				Rhizomnium punctatum		Betula spp (Birch)	✓	Glyceria maxima (Reed Sweet Grass)	✓
Cardamine hirsuta (Hairy Bittercress)		Lotus corniculatus (Common Bird's-foot-trefoil)		Senecio jacobaea (Common Ragwort)				Festuca ovina (Sheep's Fescue)				Rhynchostegium riparioides		Buddleja davidii (Butterfly-bush)		Phragmites australis (Common Reed)	✓
Cardamine pratensis (Cukoo Flower / Lady's Smock)		Lotus pedunculatus (Greater Birds-foot-trefoil)		Silene dioica (Red Campion)		**Sedges**		Festuca pratensis (Meadow Fescue)		**Mosses**		Rhytidiadelphus loreus	✓	Buxus sempervirens (Box)		Phalaris arundinaceae (Reed Canary Grass)	✓
Carlina vulgaris (Carline Thistle)		Lychnis flos-cuculi (Ragged Robin)		Solidago virgaurea (Goldenrod)		Carex acutiformus (Lesser Pond Sedge)		Festuca rubra (Red Fescue)		Amblystegium serpens		Rhytidiadelphus squarrosus		Carpinus Betulus (Hornbeam)		Lemna spp. (Duckweed spp.)	✓
Centaurea nigra (Knapweed)	✓	Lysimachia nemorum (Yellow pimpernel)		Sonchus asper (Prickly Sow Thistle)		Carex binervis (Green Ribbed Sedge)		Festuca gigantea (Giant Fescue)		Atrichum undulatum		Rhytidiadelphus triquetrus		Castanea Sativa (Spanish Chestnut)		Matricaria discoidea (Pineappleweed)	✓
Cerastium fontanum (Common Mouse-ear)		Lysimachia nummularia (Creeping-jenny)		Soncus oleraceus (Smooth Sow Thistle)		Carex caryophyllea (Spring Sedge)		Glyceria fluitans (Sweet Floating Grass)	✓	Brachythecium rivulare		Sphagnum capillifolium		Corylus Avellana (Hazel)		Malus sylvestris (European Crab Apple)	✓
Cirsium arvense (Creeping Thistle)	✓	Lysimachia vulgaris (Yellow-loosestrife)		Stachys palustris (Marsh Woundwort)		Carex demissa (Common Yellow Sedge)		Helictotrichon pubescens (Downy Oat Grass)		Brachythecium rutabulum		Sphagnum cuspidatum		Cotoneaster spp (Cotoneaster spp)			
Cirsium palustre (Marsh Thistle)	✓	Lythrum salicaria (Purple-loosestrife)		Stachys sylvatica (Hedge Woundwort)		Carex disticha (Brown Sedge)		Holcus lanatus (Yorkshire Fog)	✓	Calliergonella cordifolium		Sphagnum palustre		Cytisus scoparius (Broom)			
Cirsium vulgare (Spear Thistle)		Medicago lupulina (Black Medick)		Stellaria graminea (Lesser Stitchwort)		Carex echinata (Star Sedge)		Holcus mollis (Creeping Velvet Grass)		Calliergonella cuspidata		Thamnobryum alopecurum		Fagus Sylvatica (Beech)	✓		
Conopodium majus (Pignut)		Mentha aquatica (Water Mint)	✓	Stellaria holostea (Greater Stitchwort)		Carex elata (Bowles Golden Sedge)		Koeleria macrantha (Crested Hair Grass)		Cinclidotus fontilaloides		Thuidium tamariscinum		Fraxinus Excelsior (Ash)	✓		
Crepis capillaris (Smooth Hawks Beard)		Menyanthes trifoliata (Bogbean)	✓	Stellaria media (Common Chickweed)		Carex flacca (Glaucous Sedge)		Lolium perenne (Perennial Rye-grass)	✓	Cirriphyllum piliiferum		Zygodon viridissimus		Fuchsia magellanica (Fuchsia)			
Crepis paludosa (Marsh Hawks Beard)		Myosis discolor (Changing Forget-me-not)		Stellaria uliginosa (Bog Stitchwort)		Carex hirta (Hairy Sedge)		Melica uniflora (Wood Melick)		Climacium dendroides				Hippophae rhamnoides (Sea-buckthorn)			
Dactylorhiza fuchsii (Common Spotted-orchid)		Myostis scorpioides (Water Forget-me-not)		Succisa pratensis (Devils-bit Scabious)	✓	Carex laevigata (Smooth Stalked Sedge)		Molinea caerulea (Purple-moor Grass)	✓	Cryphaea heteromalla				Ilex Aquifolium (Holly)			
Dactylorhiza maculata (Heath Spotted-orchid)		Narthecium ossifragum (Bog Asphodel)		Taraxacum agg. (Dandelions)		Carex nigra (Common Sedge)		Nardus stricta (Mat Grass)		Ctenidium molluscum				Juniperus communis (Juniper)			
Daucus carota (Wild Carrot)		Orchis mascula (Early-purple Orchid)		Teucrium scorodonia (Wood Sage)		Carex ovalis (Oval Sedge)		Phalaris arundinacea (Reed Canary-grass)	✓	Dicranum majus				Larix spp (Larches)			
Digitalis purpurea (Foxglove)		Orchis morio (Green-winged Orchid)		Thymus polytricus (Wild Thyme)		Carex panicea (Carnation Sedge)	✓	Phleum pratense (Timothy)	✓	Dicranum scoparium				Picea abies (Norway Spruce)			
Drosera anglica (Great Sundew)		Origanum vulgare (Marjoram)		Torilis japonica (Upright Hedge Parsley)		Carex paniculata (Greater Tussock)		Phragmites australis (Common Reed)	✓								
Drosera intermedia (Oblong-leaved Sundew)		Pedicularis palustris (Marsh Lousewort)		Trifolium pratensis (Red Clover)	✓	Carex pendula (Pendulous Sedge)		Poa annua (Annual meadowgrass)	✓								
Drosera rotundifolia (Round-leaved Sundew)		Pedicularis sylvatica (Lousewort)		Trifolium repens (White Clover)	✓	Carex pilulifera (Pill Sedge)		Poa nemoralis (Wood Bluegrass)									
		Petasites hybridus (Butterbur)		Tussilago farfara (Coltsfoot)		Carex pulicaris (Flea Sedge)		Poa pratensis (Smooth Meadowgrass)									
		Pilosella officinarum (Mouse-ear Hawkweed)		Urtica dioica (Nettle)	✓	Carex remota (Remote sedge)	✓										

Appendix F5 – Peatland Survey Reports

Hortland – Raised Bog Site Report

General site and survey details

Site Name	Hortland Bog
WSI Site Code	GE_20
Area (ha) (high bog)	55
Orginal extent of bog (ha)	372
Grid Reference (IG)	N: 235290 ; E:279140
Designation	None
Townlands	Annaghmore and Gorteen
County	Kildare
Survey Date	12/12/2013
Weather conditions	Good
Surveyors	Barry O'Loughlin & Brendan Kirwan

Summary results of survey – presence of EU Annex habitat types

Annex Habitat	Presence	Area (ha)
Active Raised Bog 7110	Yes	0.9
Degraded raised bog 7120	YES[1]	54.1
Bog Woodland 91D0	NO	NA
Depressions on peat substrates 7150	NO	NA

Previous site information

The area was mapped as being outside of designated areas and un-surveyed by NPWS (2007)[2]. No information on any previous ecological surveys of the site were identified during a literature review. Furthermore, no previous baseline information was available following a review of the Map of Irish Wetlands (www.wetlandsurveysireland.com).

Description of habitats present on the high bog

The site comprises an intact section of raised bog habitat located on a flat low lying area surrounded by cutover bog and conifer forestry (see **Plate 1**). The dominant vegetation recorded throughout the site comprises *Calluna vulgaris, Eriophorum vaginatum, Trichophorum cespitosum*, and *Narthecium ossifragum.* Other abundant species include *Cladonia portentosa* and *Sphagnum* mosses.

The high bog supports two discrete areas of active peat forming communities in the south-western part of the bog (see **Figure 1**). Active areas contain sub-central ecotope dominated by *Sphagnum* mosses (see data relating to plot locations in **Appendix 2**). The sub-central ecotope (active peat forming areas) are typically dominated by *Eriophorum vaginatum and Rhynchospora alba* together with a good diversity of *Sphagnum* mosses including *Sphagnum magellanicum, Sphagnum papillosum, Sphagnum capillifolium, Sphagnum cuspidatum, Sphagnum subnitens* and *Sphagnum fallax*. Areas supporting this ecotope type comprise 50-60% *Sphagnum* moss cover (see **Plate 2**). Substrate is soft underfoot. The microtopography is relatively well developed and comprises low hummocks, S*phagnum* lawns, and occasional pools. The formation of active peat forming areas is

[1] Hydrological investigations would be required to determine whether physical conditions at the site are capable of supporting Active Raised Bog. In the absence of such conditions the habitat would not conform to the Annex habitat 'Degraded raised bog capable of natural regeneration'. See NPWS (2014), National Raised Bog SAC Management Plan.

[2] NPWS (2007) The Status of EU Protected Habitats and Species in Ireland: backing Documents, Article 17 forms, Maps Volume 3. Conservation Status in Ireland of Habitats and Species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.

likely to be attributed to secondary re-wetting of the high bog caused by subsidence due to drainage and peat extraction activities. In addition, the site supports three other ecotope types that conform to degraded raised bog (face bank, marginal and sub-marginal).

Conditions are progressively drier towards the edge of the bog, with sub-marginal and marginal ecotopes prominent. A map and associated target notes are presented in **Appendix 1**. Further more detailed information on the ecotopes recorded on the high bog is presented in **Appendix 2**. The site is of conservation value for the presence of the priority EU Annex I habitat 'Active raised bog 7110'.

Past drainage of the high bog is evident by the presence of functional drainage ditches in the southern part of the site (see **Figure 1**).

The southern margins of the high bog comprise actively cut face banks that are progressively intruding into the high bog. An extensive area of industrially cutaway bog adjoins the western part of the site. Active cutting is no longer occurring along northern and eastern margins (see **Figure 1**).

Description of marginal habitats surrounding high bog

A large extensive area of cutaway bare peat occurs to the west of the high bog and includes a dense network of functional drainage ditches running east-west with associated culverts installed (see **Figure 1**). This area is intensively managed for industrial peat harvesting operations. Conifer forestry comprising Sitka Spruce (*Picea sitchensis*) bounds the eastern part of the site while an area of old cutover that has regenerated to wet heath occurs to the north. Active mechanical peat cutting is ongoing along the southern margin of the high bog (see **Figure 1**). *Sphagnum* mosses have successfully regenerated on cutover areas adjacent south of the high bog. Mosses recorded include *Sphagnum magellanicum, Sphagnum papillosum, Sphagnum capillifolium, Sphagnum cuspidatum,* and *Sphagnum fallax* (see **Plate 3**).

Summary evaluation of the site

The bog is a remnant area of raised bog that has been severely impacted by long term peat extraction and associated drainage. The site continues to support a small area of active raised bog, a habitat that is rare throughout Ireland. The site is deemed to be of high conservation value due to the presence of 'Active Raised Bog (7110)', a priority habitat listed on Annex I of the EU Habitats Directive.

Sensitivity of site to wind farm development

The raised bog habitat present within the site would be sensitive to habitat loss and disturbance should site infrastructure be located within the remaining area of high bog. Such development on the high bog would also be expected to have hydrological effects on the surrounding bog habitat.

The remnant raised bog is also susceptible to further drying out and degradation should drainage in surrounding areas affect the hydrological integrity of the high bog.

Potential impacts of proposed wind farm layout (24 February 2015)

The avoidance of high bog ensures that no direct impacts (such as habitat loss or surface damage) will occur.

The potential for indirect impacts such as hydrological alteration is deemed to be low as all turbine locations and associated infrastructure are proposed to be located in areas well removed from the high bog. The hydrology the area surrounding the proposed turbine locations has also been heavily modified due to forestry and associated drainage. An assessment of potential impacts on the hydrology of the area is presented in the Hydrology chapter of the EIS (Chapter 9).

Plates 1-3

Plate 1: The site occurs on a flat, low lying area of intact raised bog. The high bog comprises two discrete areas of active raised bog.

Plate 2: Sub-central ecotope is dominated by Sphagnum mosses (ca 50-60% cover) with *Eriophorum vaginatum* and *Rhynchospora alba*. The ecotope type conforms to the priority EU Annex I listed habitat 'active raised bogs 7110'.

Plate 3: *Sphagnum* mosses have regenerated in a small section of cutover bog located south of the area of intact bog.

Appendix 1

Site Map and Associated Target Notes

Appendix 1 (Site map and associate target notes)

Legend

- High Bog Boundary
- Active Raised Bog
- Plot Location
- Descriptive Note
- Face bank
- Marginal
- Sub marginal
- Sub central

N
W E
S

Scale: 1:5,000

0 37.5 75 150 225 Meters

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www.WetlandSurveysIreland.com

Date: 20/06/2014

Figure 1: Map showing the results of raised bog survey.

Table 1: Target notes recorded during field survey of Hortland Bog. See Figure 1 for corresponding location referred to by each note.

Note Number	Note Type	Bog Name	Bog Code	Note Text	Ecotope
445	Flora	Hortland	GE_20	This area of cutover bog comprises a good diversity of regenerating Sphagnum mosses and other bog plants	Descriptive Note
446	Flora	Hortland	GE_20	Sphagnum cover is ca 20% in this area with Sphagnum capillifolium and Sphagnum papillosum	Sub marginal
447	Plot Location	Hortland	GE_20	Plot 1	Plot Location
448	Habitat	Hortland	GE_20	This area comprises Birch Scrub dominated by Betula pubescens	Descriptive Note
449	Habitat	Hortland	GE_20	Area of cutover bog dominated by bare peat with some recolonising bog plants including Molinia caerulea, Eriophorum vaginatum and Calluna vulgaris. Other species typical of grassland such as Holcus lanatus, Cerastium fontanum, Juncus effusus also occur.	Descriptive Note
450	Management	Hortland	GE_20	Mechanical removal of peat from high bog. Plant machinery observed operating on site.	Descriptive Note
451	Habitat	Hortland	GE_20	Cutover bog. This area is heavily compacted due to plant machinery.	Descriptive Note
452	Habitat	Hortland	GE_20	Area of cutover bog with regenerating Sphagnum mosses including Sphagnum cuspidatum, Sphagnum magellanicum, Sphagnum fallax, Sphagnum capillifolium and Sphagnum papillosum. Other plant species include Eriophorum vaginatum and Calluna vulgaris	Descriptive Note
453	Ecotope	Hortland	GE_20	Marginal ecotope. Dominated by Eriophorum angustifolium, Trichophorum cespitosum and Calluna vulgaris. Other species include Cladonia portentosa, Erica tetralix and Eriophorum vaginatum. Rare occurrences of Sphagnum tenellum	Marginal
454	Ecotope	Hortland	GE_20	Marginal ecotope dominated by dense tussocks of Trichophorum cespitosum. Calluna vulgaris, Erica tetralix, Cladonia portentosa and Rhynchospora alba are abundant. Several algal pools occur throughout this area. Ground is firm underfoot	Marginal
455	Ecotope	Hortland	GE_20	Marginal ecotope dominated by Trichophorum cespitosum and Calluna vulgaris. Other species include Cladonia portentosa, Erica tetralix and Eriophorum vaginatum, Rhynchospora alba and Campylopus spp.	Marginal
456	Ecotope	Hortland	GE_20	Sub marginal ecotope with > 20% Sphagnum cover and includes Sphagnum cuspidatum. Dominated by Trichophorum cespitosum. Other species recorded include Eriophorum vaginatum, Eriophorum angustifolium, Rhynchospora alba and Calluna vulgaris.	Sub marginal
457	Ecotope	Hortland	GE_20	Marginal and sub marginal ecotope boundary. Sub marginal areas support ca 20-25% Sphagnum cover including Sphagnum papillosum, Sphagnum capillifolium and Sphagnum tenellum with rare occurrences of Sphagnum cuspidatum. Conditions are soft underfoot.	Sub marginal
458	Ecotope	Hortland	GE_20	Marginal ecotope. Area comprises <10% Sphagnum cover. This part of the high bog comprises Campylopus introflexus, Cladonia floerkeana and Cladonia portentosa. Sphagnum mosses include Sphagnum papillosum, Sphagnum tenellum and Sphagnum capillifolium.	Marginal
459	Ecotope	Hortland	GE_20		Sub marginal
460	Management	Hortland	GE_20	The site appears to have been affected by burning. There is evidence of erosion of the high bog through the formation of hag heads.	Marginal
461	Ecotope	Hortland	GE_20	Sub marginal and marginal ecotope boundary	Sub marginal
462	Ecotope	Hortland	GE_20		Sub marginal
463	Ecotope	Hortland	GE_20		Sub marginal
464	Ecotope	Hortland	GE_20		Sub marginal
465	Ecotope	Hortland	GE_20	Sub marginal ecotope (marginal to the north) dominated by Eriophorum vaginatum, Calluna vulgaris and Rhynchospora alba. Abundance of Cladonia portentosa, Eriophorum angustifolium and Erica tetralix.	Sub marginal
466	Management	Hortland	GE_20	Evidence of quad tracks across the high bog	Sub marginal
467	Ecotope	Hortland	GE_20	Transition from area of sub marginal ecotope to marginal ecotope. Ground conditions are firm underfoot. Sphagnum cover <10% in an area dominated by Trichophorum cespitosum, Calluna vulgaris and Cladonia portentosa. Noticeable decline Sphagnum cover.	Marginal
468	Fauna	Hortland	GE_20	Four snipe recorded in this area.	Marginal
469	Ecotope	Hortland	GE_20	Marginal ecotope dominated by Trichophorum cespitosum occurs to the east	Marginal
470	Ecotope	Hortland	GE_20	Marginal and sub marginal ecotope boundary.	Sub marginal
471	Ecotope	Hortland	GE_20	Marginal and sub marginal ecotope boundary	Marginal
472	Ecotope	Hortland	GE_20	Face bank ca 3m deep dominated by dense stands of Calluna vulgaris.	Face bank
473	Ecotope	Hortland	GE_20	This area is dominated by Calluna vulgaris and Narthecium ossifragum. Conditions are firm underfoot. Sphagnum cover is <5%.	Marginal
474	Ecotope	Hortland	GE_20	Sub marginal ecotope. Ground conditions are firm to soft underfoot. Sphagnum cover is ca 15% with Sphagnum papillosum, Sphagnum capillifolium and Sphagnum tenellum recorded. Calluna vulgaris and Narthecium ossifragum dominate.	Sub marginal
475	Habitat	Hortland	GE_20	This area of cutover bog is dominated by dense stands of Calluna vulgaris with Eriophorum vaginatum. The area appears to have been hand cut in the past however peat cutting has since been abandoned in modern times.	Descriptive Note
476	Ecotope	Hortland	GE_20	Ground conditions are firm underfoot. This area is dominated by Narthecium ossifragum and Calluna vulgaris. Sphagnum moss cover is <10%.	Marginal
477	Ecotope	Hortland	GE_20	Sphagnum cover is ca 15% in this area with Sphagnum tenellum, Sphagnum papillosum and some rare occurrences of Sphagnum magellanicum and Sphagnum cuspidatum. Conditions are firm to soft underfoot.	Sub marginal
478	Habitat	Hortland	GE_20	Large extensive area of cutover bog dominated by bare peat. A network of functional drainage ditches traverse the site.	Descriptive Note
479	Ecotope	Hortland	GE_20	Sub marginal and marginal ecotope boundary	Sub marginal
480	Ecotope	Hortland	GE_20		Marginal
481	Habitat	Hortland	GE_20	Cutover bog dominated by bare peat	Descriptive Note
482	Ecotope	Hortland	GE_20		Sub marginal
483	Ecotope	Hortland	GE_20	Sub marginal and marginal ecotope boundary	Sub marginal
484	Habitat	Hortland	GE_20	Small section of birch scrub ca 10m high dominated by Betula pubescens	Descriptive Note
485	Ecotope	Hortland	GE_20	Sub marginal and marginal ecotope boundary	Sub marginal
486	Ecotope	Hortland	GE_20	Sub marginal and marginal ecotope boundary	Sub marginal
487	Ecotope	Hortland	GE_20		Sub marginal
488	Ecotope	Hortland	GE_20		Sub marginal

Note Number	Note Type	Bog Name	Bog Code	Note Text	Ecotope
489	Ecotope	Hortland	GE_20		Marginal
490	Ecotope	Hortland	GE_20	Boundary between marginal and sub marginal ecotope.	Sub marginal
491	Habitat	Hortland	GE_20	Conifer plantation dominated by Picea sitchensis with occasional Pinus sylvestris	Descriptive Note
492	Ecotope	Hortland	GE_20	Marginal ecotope. Firm underfoot. Sphagnum cover ca <10%. Area dominated by Trichophorum cespitosum, Calluna vulgaris and Cladonia portentosa. Evidence of cracking recorded in proximity to the face bank.	Marginal
493	Ecotope	Hortland	GE_20	Sub-marginal ecotope with well developed Sphagnum hummock topography	Sub marginal
494	Ecotope	Hortland	GE_20	Sub marginal ecotope. Sphagnum cover is ca 20% with Sphagnum papillosum, Sphagnum tenellum and Sphagnum capillifolium. Firm underfoot in an area dominated by Trichophorum cespitosum and Calluna vulgaris. Other species include Cladonia floerkeana	Sub marginal
495	Ecotope	Hortland	GE_20		Sub marginal
496	Ecotope	Hortland	GE_20		Sub marginal
497	Ecotope	Hortland	GE_20	Boundary between marginal (outer margins) and sub marginal (to the bog centre) ecotope. Carex panicea and Narthecium ossifragum are abundant in this area.	Sub marginal
498	Habitat	Hortland	GE_20	Small linear section of cutover bog with regenerating Sphagnum mosses and bog plants with surface water including Sphagnum cuspidatum, Sphagnum papillosum, Sphagnum magellanicum and Sphagnum capillifolium. Other species include Rhynchospora alba	Descriptive Note
499	Ecotope	Hortland	GE_20	Sub marginal ecotope with greater than 20% Sphagnum moss cover.	Sub marginal
500	Ecotope	Hortland	GE_20	Sub marginal ecotope to the north of this point. Marginal ecotope occurs to the south. Marginal areas are very firm underfoot dominated by Narthecium ossifragum, Calluna vulgaris and Cladonia portentosa. Sub marginal dominated by Rhynchospora alba.	Sub marginal
501	Ecotope	Hortland	GE_20	Face bank ca 2.5m deep dominated by dense stands of Calluna vulgaris.	Face bank
502	Ecotope	Hortland	GE_20	Sub marginal ecotope with greater than 30% Sphagnum moss cover. Conditions are soft underfoot. The main plants include Eriophorum vaginatum, Calluna vulgaris and an abundance of Erica tetralix, Cladonia portentosa and Eriophorum angustifolium.	Sub marginal
503	Habitat	Hortland	GE_20	Area of cutover bog with bare peat and recolonising grassland species.	Descriptive Note
504	Ecotope	Hortland	GE_20		Marginal
505	Habitat	Hortland	GE_20	Area of cutover bog with recolonising bog plants including Calluna vulgaris. Peat extraction has ceased in this area with few regenerating Sphagnum mosses including Sphagnum capillifolium and Sphagnum tenellum.	Descriptive Note
506	Habitat	Hortland	GE_20	Area of cutover bog comprises dense stands of Calluna vulgaris with some regenerating Sphagnum mosses including Sphagnum cuspidatum. Other species present include Rhynchospora alba.	Descriptive Note
507	Habitat	Hortland	GE_20	Evidence of former mechanical peat extraction operations of the high bog.	Descriptive Note
508	Habitat	Hortland	GE_20	This area comprises birch scrub dominated by Betula pubescens	Descriptive Note
509	Ecotope	Hortland	GE_20	Sub marginal ecotope. Conditions are firm underfoot. Sphagnum cover is ca. 20%. Microtopography is well developed with hollows recorded in this area	Sub marginal
510	Ecotope	Hortland	GE_20	Sub marginal ecotope. Sphagnum cover is ca 40% and comprises Sphagnum papillosum, Sphagnum capillifolium and rare occurrences of Sphagnum magellanicum. Ground is firm underfoot. No hummocks or hollows were recorded.	Sub marginal
511	Ecotope	Hortland	GE_20	Marginal ecotope. Condition are firm underfoot with Sphagnum cover <5%. Dominated by Eriophorum vaginatum and Calluna vulgaris. Cladonia portentosa was also recorded	Marginal
512	Ecotope	Hortland	GE_20	Sub central ecotope boundary	Sub central
513	Ecotope	Hortland	GE_20	This area comprises ca 40% Sphagnum cover and includes Sphagnum cuspidatum, Sphagnum magellanicum, Sphagnum papillosum, Sphagnum capillifolium and Sphagnum fallax. Ground conditions are very soft underfoot.	Sub central
514	Ecotope	Hortland	GE_20	Area of sub central ecotope occurs in a large hollow possibly as a result of subsidence and secondary rewetting. The ecotope conforms to active raised bog capable of peat formation. Sphagnum moss cover ca 40-50% with Eriophorum vaginatum	Sub central
515	Ecotope	Hortland	GE_20	Sub central ecotope. Sphagnum cover ca 50-60% includes Sphagnum cuspidatum, Sphagnum magellanicum, Sphagnum capillifolium, Sphagnum papillosum and Sphagnum fallax. This area is dominated by Sphagnum mosses and Eriophorum vaginatum.	Sub central
516	Ecotope	Hortland	GE_20	Boundary of sub central ecotope.	Sub marginal
517	Ecotope	Hortland	GE_20	Sub central ecotope boundary. Located in depression likely to have arisen as a result of secondary rewetting of the high bog.	Sub central
518	Ecotope	Hortland	GE_20	Sphagnum cover ca 15%. Bog surface is very firm underfoot. Dominated by Trichophorum cespitosum and Calluna vulgaris.	Sub marginal
519	Hydrology	Hortland	GE_20	Functional drain runs north-south, ca 1m in depth.	Sub marginal
520	Ecotope	Hortland	GE_20		Sub central
521	Ecotope	Hortland	GE_20	Marginal ecotope. Conditions are firm underfoot. Dominated by Trichophorum cespitosum and Calluna vulgaris. Other species include Cladonia portentosa, Eriophorum vaginatum and Cladonia floerkeana. Rare occurrences of Sphagnum tenellum.	Marginal
522	Hydrology	Hortland	GE_20	Functional drainage ditch	Marginal
523	Ecotope	Hortland	GE_20		Marginal
524	Habitat	Hortland	GE_20	Cutover bog dominated by Calluna vulgaris	Descriptive Note
525	Ecotope	Hortland	GE_20	Sphagnum cover is ca 40-50% with Sphagnum cuspidatum, Sphagnum fallax, Sphagnum magellanicum, Sphagnum capillifolium, Sphagnum papillosum. Dominated by Sphagnum mosses and Rhynchospora alba. Conditions are soft underfoot	Sub central
526	Ecotope	Hortland	GE_20		Sub central
527	Ecotope	Hortland	GE_20	This area conforms to the EU Annex I listed habitat 'active raised bog (7110)'.	Sub central
528	Plot Location	Hortland	GE_20	Plot 2	Plot Location
529	Ecotope	Hortland	GE_20	Sub central and marginal ecotope boundary	Sub central
530	Ecotope	Hortland	GE_20		Marginal
531	Hydrology	Hortland	GE_20	This area of sub central ecotope occurs in a large hollow possibly as a result of secondary wetting.	Sub central

Appendix 2

Detailed Site Data

Green Element

Raised Bog Survey 2013 - 2014

Bog Name:	Hortland	**Site Easting & Northing:**	279140 235290
Bog Code:	20	**Site contains Raised Bog Habitat:**	YES
County:	Kildare	**Active Raised Bog 7110:**	YES
Survey Date:	12/12/2013	**Bog Woodland 91D0:**	NO
Name of Surveyor/s:	B. O'Loughlin & B. Kirwan	**Degraded raised bog 7120:**	YES
		Depressions on peat substrates 7150:	NO

Ecotope	Present/Absent	Comment
Central:	Absent	N/A
Sub-Central:	Present	Two discrete areas of sub-central ecotope occur in the south western part of the site. Both areas occur in a depression possibly as a result of subsidence which has led to secondary re-wetting of this area. The area is dominated by *Sphagnum* mosses and *Eriophorum vaginatum* and *Rhyncospora alba.* The plots conforms to community complex 10/9 and 10-4. The ground is very soft underfoot. Areas of active peat formation conforms to annex I EU habitat.
Sub-Marginal:	Present	Sub-marginal ecotope is widespread and dominates the site and conforms to community complex 10/9/7. This ecotope is soft underfoot and comprises hummocks and hollows dominated by *Sphagnum* moss (see target notes).
Marginal:	Present	This ecotope occurs along the outer margins of the high bog and is dominated by dense tussocks of *Trichophorum*. The ecotope conforms to community complex 9/7/6 and 7/6.
Facebank:	Present	Slumping and cracking occur along the facebank due to peat extraction operations. *Calluna vulgaris* and *Hypnum jutlandicum* is high at the bog edge.

High Bog area (ha): 54.10 **Area of Active Raised Bog (ha):** 0.9 **% ARB:** 1.66

Site Description:

The site is located in a flat low lying area surrounded by bog woodland to the east and cutover bog to the north, west and south. The site is managed for commercial peat extraction and is heavily modified due to mechanical removal of peat. It is possible that two discrete areas along the southern margin of the site and the northern part of the site were managed for hand cutting of peat. *Sphagnum* moss and other bog plant communities have regenerated and recolonised in these cutover areas.

The site comprises four ecotope types including facebank, marginal , sub-marginal and sub-central. The marginal ecotope is dominated by dense tussocks of *Trichophorum cespitosum*. *Sphagnum* mosses cover less than 10% and comprise Sphagnum tenellum and Sphagnum capillifolium. The sub-marginal ecotope within the high bog is dominant and widespread across the site. This ecotope largely corresponds to 9/7/6 and 10/9/7 community type and comprises good examples of low hummocks and hollows. *Sphagnum* cover is circa 30% in these areas and the surface is soft underfoot.

The site comprises two active peat forming sub-central ecotope areas located in the southwestern part of the site. This ecotope is characterised by a dominance of *Sphagnum* mosses including *S. cuspidatum, S. capillifolium, S. magellanicum, S. papillosum, S. subnitens*, *S. fallax,* and *S. austinii* and is very soft underfoot. The sub-central ecotope conforms to community type 4/10 and 10/9. These areas occur in depressions likely to be the result of subsidence due to drainage and peat harvesting operations and are likely to have arisen from secondary re-wetting. The ecotopes are capable of peat formation and correspond to annex I priority habitat active raised bog 7110 listed on

the EU habitats directive. The main threats to the site include burning, drainage and peat extraction operations.

Landscape setting:
The site is located in flat low lying landscape surrounded by conifer forestry and improved grassland managed for agriculture.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Hortland **Site Code:** 20

	Present/Absent	Comment
Positive Bog Features		
High Bog Features		
Pool system:	Present	The site comprises a small number of pools in sub-central ecotope usually dominated by *Sphagnum* mosses including *S. cuspidatum* and *S. fallax*.
Good Hummock Hollow topography:	Present	The site comprises good hummock hollow topography particularly in the sub-marginal ecotope of the high bog.
High Bog Flush:	Absent	
High Bog Woodland:	Absent	
High Bog Swallow Hole System:	Absent	
Other High Bog Feature:	Absent	
Marginal Features		
Semi-natural Margin:	Absent	
Positive High Bog Species		
Sphagnum fuscum	Absent	
Sphagnum austinii	Present	*Sphagnum austinii* present in sub-central ecotope in southern part of the site.
Sphagnum pulchrum	Absent	
Sphagnum cuspidatum	Present	*Sphagnum cuspidatum* occurs in hollows and pools in wet areas particularly in sub-central ecotopes in the south western part of the site.
Sphagnum denticulatum	Absent	
Cladonia portentosa	Present	Abundance of *Cladonia portentosa* throughout the site.

Noteworthy / Rare Species

The site supports two discrete sections of subcentral ecotope in the south western part of the site. The ecotope conforms to active raised bog priority annex I habitat listed under the EU habitats directive.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Hortland **Site Code:** 20

	Present/Absent	Impact	Comment
Impact and Activities on High Bog			
Peat Extraction on High Bog Surface:	YES	High	Active commercial peat extraction of high bog. Machinery operating on site. Much of the cutover area to the south and west has been largely affected by mechanical large scale peat cutting operations.
Marginal Peat Extraction:	YES	High Medium	Marginal peat extraction to the north, west and south. The northern part of the site appears to have been hand cut and peat cutting activity has been abandoned in this part of the site.
Hand Cutting of Peat:			Likely former hand cutting of peat in the northern part of the site. This activity has since been abandoned. The area is dominated by dense stands of *Calluna vulgaris*.
Mechanical Removal of Peat:	YES	High	Active commercial peat extraction of high bog. Machinery operating on site. Much of the cutover area to the south and west has been largely affected by mechanical large scale peat cutting operations to the south and west.
Commercial Peat Extraction:	YES	High	The site is heavily modified and managed for commercial peat harvesting particularly in the southern and western parts of the site. Mechanical machinery including diggers were observed on site.
Domestic Peat Extraction:	NO		Unknown
Bog Burst:	NO		
Cracking or Peat Slumping at Edge of High Bog:	YES	High	Cracking and slumping is evident especially on the southern and western margins of the high bog, occurring as far as 20-30 m in to the high bog.
Forestry Planting on High Bog:	NO		
Forestry Felling on High Bog:	NO		
Invasive Species on High Bog:	NO		
Drainage on High Bog:	YES	High	A series of drainage ditches traverse the western section of the high bog.
Functional Drains on High Bog:	YES	High	Functional drainage ditches occur on the high bog particularly along the high bog margins.
Non-functional Drains on High Bog:	NO		
Reduced function Drains on High Bog:	NO		
Burning on High Bog:	YES	Medium	Evidence of burning in the site. Recolonisers present including *Campylopus introflexus* and *Cladonia floerkeana* lichen.
Fertilisation on High Bog:	NO		

Green Element

Raised Bog Survey 2013 - 2014

Dumping on High Bog:	NO	
Grazing on High Bog:	NO	
Paths tracks on High Bog:	YES	Machinery access likely quads traversing high bog as indicated by tracks.

General Impacts and Activities Comment:

The main impacts that affect the high bog include peat extraction, drainage and burning.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Hortland **Site Code:** 20

	Present/Absent & Grid Ref	Comment
Cutover Assessment		
Regenerating *Sphagnum* Areas Occur:	Present	Regenerating *Sphagnum* including *S. cuspidatum, S. capillifolium* and *S. papillosum* on two discrete areas in the southern part of the site. These areas may have been traditionally hand cut in the past.
Active Peat Fields with Bare Peat:	Present	An extensive area of bare peat occurs immediately west and south of the high bog. This area is heavily modified by peat extraction operations with intensive drainage network established in this area.
Cutover with Mix of Wet and Dry Bog Vegetation:	Present	Established in two small sections in the southern part of the site comprises occasional *Sphagnum* mosses, while *Calluna* and *Eriophorum* spp dominate.
Cutover Recolonised mainly by Dry Vegetation:	Present	Present in the northern part of the site with dominance of *Calluna vulgaris*. Dry bog communities including *Calluna* and *Eriophorum vaginatum, Narthecium, Trichophorum, Campylopus introflexus*, *Betula pubescens* and *Erica tetralix* establishing in the southern part of the site.
Cutover Recolonised mainly by Wet Vegetation:		
Cutover with Transition Mire / Fen Vegetation:		
Cutover Reclaimed to Grassland:	Present	A small section of cutover bog has been reclaimed for improved grassland the south eastern part of the site.
Other Cutover Habitat Occurrence:		

Topography of Cutover Comment:
Flat

Drainage of Cutover Comment:
Extensive and highly modified functional drainage network exists to the south and west of the site. A large functional drainage ditch surrounds the high bog.

Comments on Restoration Potential of Cutover:
Some of the areas where *Sphagnum* moss communities colonise are capable of restoration, however, these areas are largely confined to traditionally hand cut areas.

Green Element

Bog Name: Hortland
Bog Code: 20
Plot Code Number: 1
Plot Survey Date: 12/12/2013
Plot Surveyor/s: B. O'Loughlin & B. Kirwan

Ecotope Type Present: Sub Central Ecotope
Community Complex: Complex 10/9

Plot Easting: **Northing:** **Plot Photo. Numbers:** Bol Samsung, BK Nikon

Ground Firmness: Very Soft
Burning Evidence: No burning
Algae in Hollows %: no
Algae in Pools %: no
Bare Peat %: no
Calluna Height (cm + / - 5 cm): 50-60
Cladonia Cover %: 3
Macro-topography: Depression
Pools Occurrence: Present
Pools % Cover: 20
Sphagnum % Cover: 50
Narthecium % Cover: no

Micro-topography:
Lawns and pools, low hummocks, lawns dominant and pools occasional.

Tussocks Occurrence: Present
Tussocks *Eriophorum vaginatum*: Yes **% cover** 50
Tussocks *Trichophorum germanicum*: **% cover**
Tussocks *Molinia caerulea*: **% cover**
Tussocks Other: **% cover**

Plot Degradation or Regeneration Evidence:
No

Plot Noteworthy or Rare Species (Flora/Fauna):

Plot General Comments:
The plot occurs in a depression possibly as a result of subsidence that has led to secondary re-wetting in this area. The area is dominated by *Sphagnum* mosses and *Eriophorum vaginatum*. The plot conforms to 10/9. The ground is very soft underfoot. Area of active peat formation conforms to annex I EU habitat.

Plot Species Recorded:

Present	Domin Cover Value
Andromeda polifolia	3
Calluna vulgaris	5
Cladonia portentosa	3

Green Element

Raised Bog Survey 2013 - 2014	Plot Data	Hortland
Erica tetralix	4	
Eriophorum angustifolium	3	
Eriophorum vaginatum	7	
Rhynchospora alba	3	
Sphagnum capillifolium	3	
Sphagnum cuspidatum	5	
Sphagnum fallax	5	
Sphagnum magellanicum	5	
Sphagnum papillosum	5	
Vaccinium oxycoccus	2	
Odontoshisma sphagni	2	

Green Element

Raised Bog Survey 2013 - 2014 **Plot Data** **Hortland**

Bog Name: Hortland
Bog Code: 20
Plot Code Number: 2
Plot Survey Date: 12/12/2013
Plot Surveyor/s: B. O'Loughlin & B. Kirwan

Ecotope Type Present: Sub Central Ecotope
Community Complex: Complex 10/4

Plot Easting: **Northing:** **Plot Photo. Numbers:** Bol Samsung, BK Nikon

Ground Firmness: Very Soft
Burning Evidence: No burning
Algae in Hollows %: no
Algae in Pools %: no
Bare Peat %: no
Calluna Height (cm + / - 5 cm): 40
Cladonia Cover %: 3
Macro-topography: Depression
Pools Occurrence: Absent
Pools % Cover:
Sphagnum % Cover: 60
Narthecium % Cover: no

Micro-topography:
Low hummocks and lawns, flat.

Tussocks Occurrence: Present
Tussocks *Eriophorum vaginatum*: Yes **% cover** 25
Tussocks *Trichophorum germanicum*: **% cover**
Tussocks *Molinia caerulea*: **% cover**
Tussocks Other: **% cover**

Plot Degradation or Regeneration Evidence:
No

Plot Noteworthy or Rare Species (Flora/Fauna):

Plot General Comments:
The plot occurs in a depression possibly as a result of subsidence that has led to secondary re-wetting in this area. The area is dominated by *Sphagnum* mosses and *Rhyncospora alba*. The plot conforms to 10/4. The ground is very soft underfoot. Area of active peat formation conforms to annex I EU habitat.

Plot Species Recorded:

Present	Domin Cover Value
Andromeda polifolia	3
Calluna vulgaris	5
Cladonia portentosa	3

Green Element

Erica tetralix	5
Eriophorum angustifolium	3
Eriophorum vaginatum	6
Narthecium ossifragum	2
Rhynchospora alba	6
Sphagnum capillifolium	4
Sphagnum cuspidatum	5
Sphagnum fallax	4
Sphagnum magellanicum	5
Sphagnum papillosum	7
Sphagnum subnitens	3
Vaccinium oxycoccus	2
Odontoschisma sphagni	3

Green Element

Raised Bog Survey 2013 - 2014

Bog Name:	Hortland	**Site Easting & Northing:**	279140 235290
Bog Code:	20	**Site contains Raised Bog Habitat:**	YES
County:	Kildare	**Active Raised Bog 7110:**	YES
Survey Date:	12/12/2013	**Bog Woodland 91D0:**	NO
Name of Surveyor/s:	B. O'Loughlin & B. Kirwan	**Degraded raised bog 7120:**	YES
		Depressions on peat substrates 7150:	NO

Ecotope	Present/Absent	Comment
Central:	Absent	N/A
Sub-Central:	Present	Two discrete areas of sub-central ecotope occur in the south western part of the site. Both areas occur in a depression possibly as a result of subsidence which has led to secondary re-wetting of this area. The area is dominated by *Sphagnum* mosses and *Eriophorum vaginatum* and *Rhyncospora alba.* The plots conforms to community complex 10/9 and 10-4. The ground is very soft underfoot. Areas of active peat formation conforms to annex I EU habitat.
Sub-Marginal:	Present	Sub-marginal ecotope is widespread and dominates the site and conforms to community complex 10/9/7. This ecotope is soft underfoot and comprises hummocks and hollows dominated by *Sphagnum* moss (see target notes).
Marginal:	Present	This ecotope occurs along the outer margins of the high bog and is dominated by dense tussocks of *Trichophorum*. The ecotope conforms to community complex 9/7/6 and 7/6.
Facebank:	Present	Slumping and cracking occur along the facebank due to peat extraction operations. *Calluna vulgaris* and *Hypnum jutlandicum* is high at the bog edge.

High Bog area (ha): 54.10 **Area of Active Raised Bog (ha):** 0.9 **% ARB:** 1.66

Site Description:

The site is located in a flat low lying area surrounded by bog woodland to the east and cutover bog to the north, west and south. The site is managed for commercial peat extraction and is heavily modified due to mechanical removal of peat. It is possible that two discrete areas along the southern margin of the site and the northern part of the site were managed for hand cutting of peat. *Sphagnum* moss and other bog plant communities have regenerated and recolonised in these cutover areas.

The site comprises four ecotope types including facebank, marginal , sub-marginal and sub-central. The marginal ecotope is dominated by dense tussocks of *Trichophorum cespitosum*. *Sphagnum* mosses cover less than 10% and comprise Sphagnum tenellum and Sphagnum capillifolium. The sub-marginal ecotope within the high bog is dominant and widespread across the site. This ecotope largely corresponds to 9/7/6 and 10/9/7 community type and comprises good examples of low hummocks and hollows. *Sphagnum* cover is circa 30% in these areas and the surface is soft underfoot.

The site comprises two active peat forming sub-central ecotope areas located in the southwestern part of the site. This ecotope is characterised by a dominance of *Sphagnum* mosses including *S. cuspidatum, S. capillifolium, S. magellanicum, S. papillosum, S. subnitens*, *S. fallax,* and *S. austinii* and is very soft underfoot. The sub-central ecotope conforms to community type 4/10 and 10/9. These areas occur in depressions likely to be the result of subsidence due to drainage and peat harvesting operations and are likely to have arisen from secondary re-wetting. The ecotopes are capable of peat formation and correspond to annex I priority habitat active raised bog 7110 listed on

the EU habitats directive. The main threats to the site include burning, drainage and peat extraction operations.

Landscape setting:
The site is located in flat low lying landscape surrounded by conifer forestry and improved grassland managed for agriculture.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Hortland **Site Code:** 20

	Present/Absent	Comment
Positive Bog Features		
High Bog Features		
Pool system:	Present	The site comprises a small number of pools in sub-central ecotope usually dominated by *Sphagnum* mosses including *S. cuspidatum* and *S. fallax*.
Good Hummock Hollow topography:	Present	The site comprises good hummock hollow topography particularly in the sub-marginal ecotope of the high bog.
High Bog Flush:	Absent	
High Bog Woodland:	Absent	
High Bog Swallow Hole System:	Absent	
Other High Bog Feature:	Absent	
Marginal Features		
Semi-natural Margin:	Absent	
Positive High Bog Species		
Sphagnum fuscum	Absent	
Sphagnum austinii	Present	*Sphagnum austinii* present in sub-central ecotope in southern part of the site.
Sphagnum pulchrum	Absent	
Sphagnum cuspidatum	Present	*Sphagnum cuspidatum* occurs in hollows and pools in wet areas particularly in sub-central ecotopes in the south western part of the site.
Sphagnum denticulatum	Absent	
Cladonia portentosa	Present	Abundance of *Cladonia portentosa* throughout the site.

Noteworthy / Rare Species

The site supports two discrete sections of subcentral ecotope in the south western part of the site. The ecotope conforms to active raised bog priority annex I habitat listed under the EU habitats directive.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Hortland **Site Code:** 20

	Present/Absent	Impact	Comment
Impact and Activities on High Bog			
Peat Extraction on High Bog Surface:	YES	High	Active commercial peat extraction of high bog. Machinery operating on site. Much of the cutover area to the south and west has been largely affected by mechanical large scale peat cutting operations.
Marginal Peat Extraction:	YES	High Medium	Marginal peat extraction to the north, west and south. The northern part of the site appears to have been hand cut and peat cutting activity has been abandoned in this part of the site.
Hand Cutting of Peat:			Likely former hand cutting of peat in the northern part of the site. This activity has since been abandoned. The area is dominated by dense stands of *Calluna vulgaris*.
Mechanical Removal of Peat:	YES	High	Active commercial peat extraction of high bog. Machinery operating on site. Much of the cutover area to the south and west has been largely affected by mechanical large scale peat cutting operations to the south and west.
Commercial Peat Extraction:	YES	High	The site is heavily modified and managed for commercial peat harvesting particularly in the southern and western parts of the site. Mechanical machinery including diggers were observed on site.
Domestic Peat Extraction:	NO		Unknown
Bog Burst:	NO		
Cracking or Peat Slumping at Edge of High Bog:	YES	High	Cracking and slumping is evident especially on the southern and western margins of the high bog, occurring as far as 20-30 m in to the high bog.
Forestry Planting on High Bog:	NO		
Forestry Felling on High Bog:	NO		
Invasive Species on High Bog:	NO		
Drainage on High Bog:	YES	High	A series of drainage ditches traverse the western section of the high bog.
Functional Drains on High Bog:	YES	High	Functional drainage ditches occur on the high bog particularly along the high bog margins.
Non-functional Drains on High Bog:	NO		
Reduced function Drains on High Bog:	NO		
Burning on High Bog:	YES	Medium	Evidence of burning in the site. Recolonisers present including *Campylopus introflexus* and *Cladonia floerkeana* lichen.
Fertilisation on High Bog:	NO		

Green Element

Raised Bog Survey 2013 - 2014

Dumping on High Bog:	NO	
Grazing on High Bog:	NO	
Paths tracks on High Bog:	YES	Machinery access likely quads traversing high bog as indicated by tracks.

General Impacts and Activities Comment:

The main impacts that affect the high bog include peat extraction, drainage and burning.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Hortland **Site Code:** 20

	Present/Absent & Grid Ref	Comment
Cutover Assessment		
Regenerating *Sphagnum* Areas Occur:	Present	Regenerating *Sphagnum* including *S. cuspidatum, S. capillifolium* and *S. papillosum* on two discrete areas in the southern part of the site. These areas may have been traditionally hand cut in the past.
Active Peat Fields with Bare Peat:	Present	An extensive area of bare peat occurs immediately west and south of the high bog. This area is heavily modified by peat extraction operations with intensive drainage network established in this area.
Cutover with Mix of Wet and Dry Bog Vegetation:	Present	Established in two small sections in the southern part of the site comprises occasional *Sphagnum* mosses, while *Calluna* and *Eriophorum* spp dominate.
Cutover Recolonised mainly by Dry Vegetation:	Present	Present in the northern part of the site with dominance of *Calluna vulgaris*. Dry bog communities including *Calluna* and *Eriophorum vaginatum, Narthecium, Trichophorum, Campylopus introflexus*, *Betula pubescens* and *Erica tetralix* establishing in the southern part of the site.
Cutover Recolonised mainly by Wet Vegetation:		
Cutover with Transition Mire / Fen Vegetation:		
Cutover Reclaimed to Grassland:	Present	A small section of cutover bog has been reclaimed for improved grassland the south eastern part of the site.
Other Cutover Habitat Occurrence:		

Topography of Cutover Comment:
Flat

Drainage of Cutover Comment:
Extensive and highly modified functional drainage network exists to the south and west of the site. A large functional drainage ditch surrounds the high bog.

Comments on Restoration Potential of Cutover:
Some of the areas where *Sphagnum* moss communities colonise are capable of restoration, however, these areas are largely confined to traditionally hand cut areas.

Green Element

Bog Name: Hortland
Bog Code: 20
Plot Code Number: 1
Plot Survey Date: 12/12/2013
Plot Surveyor/s: B. O'Loughlin & B. Kirwan

Ecotope Type Present: Sub Central Ecotope
Community Complex: Complex 10/9

Plot Easting: **Northing:** **Plot Photo. Numbers:** Bol Samsung, BK Nikon

Ground Firmness: Very Soft
Burning Evidence: No burning
Algae in Hollows %: NA
Algae in Pools %: None
Bare Peat %: NA
Calluna Height (cm + / - 5 cm): 50-60
Cladonia Cover %: 3
Macro-topography: Depression
Pools Occurrence: Present
Pools % Cover: 20
Sphagnum % Cover: 50
Narthecium % Cover: NA

Micro-topography:
Lawns and pools, low hummocks, lawns dominant and pools occasional.

Tussocks Occurrence: Present
Tussocks *Eriophorum vaginatum*: Yes **% cover** 50
Tussocks *Trichophorum germanicum*: **% cover**
Tussocks *Molinia caerulea*: **% cover**
Tussocks Other: **% cover**

Plot Degradation or Regeneration Evidence:
No

Plot Noteworthy or Rare Species (Flora/Fauna):

Plot General Comments:
The plot occurs in a depression possibly as a result of subsidence that has led to secondary re-wetting in this area. The area is dominated by *Sphagnum* mosses and *Eriophorum vaginatum*. The plot conforms to 10/9. The ground is very soft underfoot. Area of active peat formation conforms to annex I EU habitat.

Plot Species Recorded:

Present	Domin Cover Value
Andromeda polifolia	3
Calluna vulgaris	5
Cladonia portentosa	3

Green Element

Raised Bog Survey 2013 - 2014	Plot Data	Hortland
Erica tetralix	4	
Eriophorum angustifolium	3	
Eriophorum vaginatum	7	
Rhynchospora alba	3	
Sphagnum capillifolium	3	
Sphagnum cuspidatum	5	
Sphagnum fallax	5	
Sphagnum magellanicum	5	
Sphagnum papillosum	5	
Vaccinium oxycoccus	2	
Odontoshisma sphagni	2	

Green Element

Bog Name: Hortland
Bog Code: 20
Plot Code Number: 2
Plot Survey Date: 12/12/2013
Plot Surveyor/s: B. O'Loughlin & B. Kirwan

Ecotope Type Present: Sub Central Ecotope
Community Complex: Complex 10/4

Plot Easting: **Northing:** **Plot Photo. Numbers:** Bol Samsung, BK Nikon

Ground Firmness: Very Soft
Burning Evidence: No burning
Algae in Hollows %: NA
Algae in Pools %: NA
Bare Peat %: NA
Calluna Height (cm + / - 5 cm): 40
Cladonia Cover %: 3
Macro-topography: Depression
Pools Occurrence: Absent
Pools % Cover: NA
Sphagnum % Cover: 60
Narthecium % Cover: NA

Micro-topography:
Low hummocks and lawns, flat.

Tussocks Occurrence: Present
Tussocks *Eriophorum vaginatum*: Yes **% cover** 25
Tussocks *Trichophorum germanicum*: **% cover**
Tussocks *Molinia caerulea*: **% cover**
Tussocks Other: **% cover**

Plot Degradation or Regeneration Evidence:
No

Plot Noteworthy or Rare Species (Flora/Fauna):

Plot General Comments:
The plot occurs in a depression possibly as a result of subsidence that has led to secondary re-wetting in this area. The area is dominated by *Sphagnum* mosses and *Rhyncospora alba*. The plot conforms to 10/4. The ground is very soft underfoot. Area of active peat formation conforms to annex I EU habitat.

Plot Species Recorded:

Present	Domin Cover Value
Andromeda polifolia	3
Calluna vulgaris	5
Cladonia portentosa	3

Green Element

Erica tetralix	5
Eriophorum angustifolium	3
Eriophorum vaginatum	6
Narthecium ossifragum	2
Rhynchospora alba	6
Sphagnum capillifolium	4
Sphagnum cuspidatum	5
Sphagnum fallax	4
Sphagnum magellanicum	5
Sphagnum papillosum	7
Sphagnum subnitens	3
Vaccinium oxycoccus	2
Odontoschisma sphagni	3

Windmill Bog – Raised Bog Site Report

General site and survey details

Site Name	Windmill Bog
WSI Site Code	GE_08
Area (ha) (high bog)	67
Original extent of bog (ha)	219
Grid Reference (IG)	N: 236984 ; E: 268403
Designation	None
Townlands	Ballinderry, Nurney, Williamstown, Freagh, Haggard and Knockcor
County	Kildare
Survey Date	12/12/2013
Weather conditions	Good
Surveyors	Barry O'Loughlin & Brendan Kirwan

Summary results of survey – presence of EU Annex habitat types

Annex Habitat	Presence	Area (ha)
Active Raised Bog 7110	Yes	0.1
Degraded raised bog 7120	Yes[1]	66.9
Bog Woodland 91D0	NO	NA
Depressions on peat substrates 7150	NO	NA

Previous site information

The area was not included in maps produced showing the extent of high bog in Ireland by the NPWS (2007)[2]. Carbury Bog Natural Heritage Area (NHA) (NPWS Site Code: 1388) is located adjacent to the south of the high bog. The NPWS site synopsis for Carbury Bog identifies raised bog as the main feature of conservation interest for the NHA. The site synopsis for the NHA describes the high bog located to the north-west (site under consideration) as active cutover bog and has been excluded from the NHA. The site is listed as Haggard Bog on the Map of Irish Wetlands (www.wetlandsurveysireland.com).

Description of habitats present on the high bog

The site comprises an intact section of raised bog habitat located on a flat, low lying area that slopes gently to the east (see **Figure 1, Appendix 1**). The dominant vegetation recorded throughout the site comprises *Calluna vulgaris, Eriophorum vaginatum*, and *Narthecium ossifragum.* Other frequently encountered species include *Cladonia portentosa* and *Sphagnum* mosses.

The high bog supports a small area (ca 0.1ha) of active peat forming communities in the north-eastern part of the site (see **Figure 1**). This active area support sub-central ecotope dominated by *Sphagnum* mosses and *Eriophorum vaginatum* (see data relating to plot locations in **Appendix 2**). There is a good cover of *Sphagnum* mosses (over 45%) including *Sphagnum magellanicum, Sphagnum papillosum, Sphagnum capillifolium, Sphagnum cuspidatum,* and *Sphagnum subnitens* (see **Plate 2**). Substrate conditions are soft underfoot. The microtopography is relatively well

[1] Hydrological investigations would be required to determine whether physical conditions at the site are capable of supporting Active Raised Bog. In the absence of such conditions the habitat would not conform to the Annex habitat 'Degraded raised bog capable of natural regeneration'. See NPWS (2014), National Raised Bog SAC Management Plan.

[2] NPWS (2007) The Status of EU Protected Habitats and Species in Ireland: backing Documents, Article 17 forms, Maps Volume 3. Conservation Status in Ireland of Habitats and Species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.

developed with low hummocks. Conditions are progressively drier towards the edge of the bog, with marginal ecotope occurring throughout. A map and associated target notes are presented in **Appendix 1**. Further more detailed information on the ecotopes recorded on the high bog is presented in **Appendix 2**. The site is of conservation value for the presence of the priority EU Annex I habitat 'Active raised bog 7110'. In addition, the site supports three other ecotope types that conform to degraded raised bog (face bank, marginal, and sub-marginal).

Past drainage of the high bog is evident by the presence of functional drainage ditches along the eastern margin of the intact bog (see **Figure 1**). Recent site drainage works has resulted in the spreading of catotelm peat and surface scraghs over the high bog surface.

Actively cut face banks (cut for fuel) occur along the eastern boundary of the high bog which are progressively intruding into the high bog. An extensive peat mining operation adjoins the northern section of the high bog. Active cutting no longer occurs along the western margins of the high bog (see **Figure 1**).

Description of marginal habitats surrounding high bog

An extensive area of industrially cutaway (operational) bog occurs to the north of the site and includes a network of drainage ditches running south-north with associated culverts installed. This area is intensively managed for industrial peat harvesting operations and is dominated by bare peat (see **Figure 1**). Regenerating bog woodland with *Betula pubescens* occurs on old cutover areas to the north-west / west of the high bog. An area of conifer plantation dominated by mix stands of *Pinus sylvestris* and *Picea sitchensis* occurs to the south. *Sphagnum* mosses including *Sphagnum papillosum, Sphagnum fallax, Sphagnum cuspidatum and Sphagnum palustre* are regenerating in old cutover areas to the west. Active mechanical peat cutting occurs to the east and bog plants including *Calluna vulgaris, Eriophorum vaginatum*, and *Molinia caerulea* have recolonised areas of bare peat.

Summary evaluation of the site

The bog is a remnant area of raised bog that has been severely impacted by long term peat extraction and associated drainage. The site continues to support a small area of active raised bog, a habitat that is rare throughout Ireland. The site is deemed to be of high conservation value due to the presence of Active Raised Bog, a priority habitat listed on Annex I of the EU Habitats Directive. The site is also of value for range, being one of the most eastern examples of the habitat in Ireland and adjoins the designated Carbury Bog NHA to the south.

Sensitivity of site to wind farm development

The raised bog habitat present within the site would be sensitive to habitat loss and disturbance should site infrastructure be located within the remaining area of high bog. Such development on the high bog would also be expected to have hydrological effects on the surrounding bog habitat.

The remnant raised bog is also susceptible to further drying out and degradation should drainage in surrounding areas affect the hydrological integrity of the high bog.

Potential impacts of proposed wind farm layout (24 February 2015)

The avoidance of high bog ensures that no direct impacts (such as habitat loss or surface damage) will occur.

The potential for indirect impacts such as hydrological alteration is deemed to be low as all turbine locations and associated infrastructure are proposed to be located in areas removed from the high

bog (heavily modified cutaway peatland to the north). The hydrology of the area has been heavily modified due to drainage associated with the peat harvesting operation which surrounds the proposed wind farm infrastructure. An assessment of potential impacts on the hydrology of the area is presented in the Hydrology chapter of the EIS (Chapter 9).

Plates 1-2

Plate 1: The site comprises an area of intact raised bog. The high bog comprises a small area of active raised bog (sub-central ecotope) in the north-eastern part of the high bog.

Plate 2: Sub-central ecotope with *Sphagnum* mosses (ca 45% cover) and *Eriophorum vaginatum*. The ecotope type conforms to the priority EU Annex I listed habitat 'active raised bogs 7110'.

Appendix 1

Site Map and Associated Target Notes

Appendix 1 (Site map and associate target notes)

Legend

- High Bog Boundary
- Active Raised Bog
- Plot Location
- Descriptive Note
- Face bank
- Marginal
- Sub marginal
- Sub central

N
W E
S

Scale: 1:5,000

0 37.5 75 150 225 Meters

wetland surveys ireland
www.WetlandSurveysIreland.com

Date: 20/06/2014

Figure 1: Map showing the results of raised bog survey.

Table 1: Target notes recorded during field survey of Windmill Bog. See Figure 1 for corresponding location referred to by each note.

Note Number	Note Type	Bog Name	Bog Code	Note Text	Ecotope
557	Habitat	Windmill	GE_08	Area of cutover bog managed for large scale industrial peat extraction operations. A large series of functional drainage ditches traverse this area. The cutover bog is dominated by bare peat.	Descriptive Note
558	Ecotope	Windmill	GE_08	Face bank, ca 3.5m deep. With drainage channel ca 2.5m wide and 3m deep.	Face bank
559	Habitat	Windmill	GE_08	Birch scrub dominated by stands of Betula pubescens ca 12-14m tall. Understory comprises dense bracken and Calluna vulgaris	Descriptive Note
560	Ecotope	Windmill	GE_08	Sub marginal ecotope dominated by Calluna vulgaris and Eriophorum vaginatum. Cladonia portentosa, Erica tetralix and Trichophorum cespitosum are abundant. Sphagnum cover is ca 15% with Sphagnum capillifolium, Sphagnum papillosum and Sphagnum tenellum.	Sub marginal
561	Fauna	Windmill	GE_08	Snipe (3) recorded from this location	Sub central
562	Ecotope	Windmill	GE_08	Sub central ecotope. Sphagnum cover ca 40% includes Sphagnum papillosum, Sphagnum capillifolium, Sphagnum cuspidatum, Sphagnum magellanicum, Sphagnum subnitens and Sphagnum fallax. Dominated by Sphagnum mosses and Eriophorum vaginatum.	Sub central
563	Ecotope	Windmill	GE_08	Western extent of sub central ecotope.	Sub central
564	Plot Location	Windmill	GE_08	Plot 1	Plot Location
565	Ecotope	Windmill	GE_08	Sub marginal ecotope dominated by Calluna vulgaris and Eriophorum vaginatum. Sphagnum cover ca 20% with Sphagnum papillosum, Sphagnum subnitens, Sphagnum capillifolium and Sphagnum tenellum.	Sub marginal
566	Ecotope	Windmill	GE_08	Sub marginal ecotope. Plant and lichen species recorded include Erica tetralix, Eriophorum angustifolium, Cladonia portentosa and Cladonia uncialis.	Sub marginal
567	Fauna	Windmill	GE_08	Common frog recorded	Sub marginal
568	Hydrology	Windmill	GE_08	Western extent of functional drainage ditches	Sub marginal
569	Management	Windmill	GE_08	Surface damage caused by compaction due to plant machinery movements over the high bog.	Sub marginal
570	Ecotope	Windmill	GE_08	Marginal ecotope occurs to the south of this point, sub marginal to the north. Marginal areas are firm underfoot. Sphagnum cover is <5% and dominated by Calluna vulgaris, Eriophorum vaginatum and Cladonia portentosa.	Marginal
571	Habitat	Windmill	GE_08	Area of cutover bog has reverted to wet heath dominated by Calluna vulgaris with Molinia caerulea. Sphagnum mosses including Sphagnum cuspidatum, Sphagnum palustre, Sphagnum fallax and Sphagnum papillosum were recorded in amongst the ground layer.	Descriptive Note
572	Habitat	Windmill	GE_08	Conifer plantation dominated by mixed stands of Pinus sylvestris and Picea sitchensis.	Descriptive Note
573	Management	Windmill	GE_08	Evidence of compaction of high bog due to machinery crossings over the site.	Sub marginal
574	Ecotope	Windmill	GE_08	Sub marginal ecotope dominated by Narthecium ossifragum and Calluna vulgaris.	Sub marginal
575	Ecotope	Windmill	GE_08		Marginal
576	Ecotope	Windmill	GE_08		Marginal
577	Ecotope	Windmill	GE_08		Marginal
578	Hydrology	Windmill	GE_08	Functional drainage ditch	Marginal
579	Fauna	Windmill	GE_08	Two snipe recorded from this location	Sub marginal
580	Ecotope	Windmill	GE_08	Sub marginal ecotope dominated by Calluna vulgaris, Eriophorum vaginatum and Narthecium ossifragum. Conditions are soft underfoot. Sphagnum cover is ca 15-20% with Sphagnum papillosum, Sphagnum tenellum and Sphagnum capillifolium.	Sub marginal
581	Fauna	Windmill	GE_08	Snipe recorded at this location	Sub marginal
582	Fauna	Windmill	GE_08	Snipe recorded in this area.	Sub marginal
583	Ecotope	Windmill	GE_08	Area dominated by Calluna vulgaris and Narthecium ossifragum with an abundance of Eriophorum vaginatum, Cladonia portentosa and Erica tetralix. Sphagnum cover is ca 15% with Sphagnum tenellum, Sphagnum capillifolium and Sphagnum papillosum	Sub marginal
584	Management	Windmill	GE_08	Evidence of disturbance of the high bog at this location. Areas of bare peat with algal hollows.	Sub marginal
585	Ecotope	Windmill	GE_08		Marginal
586	Management	Windmill	GE_08	High bog is heavily disturbed in this area. Some minor planting (ca 10 trees) of Lodge pole Pine. Afforestation a threat to high bog. Exposed surface scraghs and catotelm peat spread over high bog	Sub marginal
587	Management	Windmill	GE_08	Trampling and compaction of surface bog due to heavy machinery accessing this part of the site.	Sub marginal
588	Ecotope	Windmill	GE_08	Area dominated by Eriophorum vaginatum and Calluna vulgaris. Sphagnum cover is ca 15% with Sphagnum subnitens, Sphagnum tenellum and Sphagnum papillosum. Erica tetralix and Cladonia portentosa are abundant. Ground conditions are firm to soft underfoot.	Sub marginal
589	Ecotope	Windmill	GE_08	Sub marginal ecotope dominated by Eriophorum angustifolium. Calluna vulgaris and Erica tetralix are abundant. Sphagnum cover is ca 15% with Sphagnum capillifolium, Sphagnum papillosum and Sphagnum tenellum.	Sub marginal
590	Habitat	Windmill	GE_08	Birch woodland occurs in cutover areas dominated by stands of Betula pubescens. Approximately 8-10m high.	Descriptive Note
591	Ecotope	Windmill	GE_08	Sub marginal ecotope dominated by Narthecium ossifragum and Calluna vulgaris.	Sub marginal
592	Ecotope	Windmill	GE_08	Marginal ecotope. Conditions are firm underfoot. Dominated by Calluna vulgaris and Narthecium ossifragum. Sphagnum cover is <5%. Campylopus atrovirens is the most abundant moss species present.	Marginal
593	Ecotope	Windmill	GE_08	Marginal ecotope dominated by Trichophorum cespitosum and Narthecium ossifragum.	Marginal
594	Ecotope	Windmill	GE_08		Marginal
595	Management	Windmill	GE_08	Evidence of machinery tracks recorded over the high bog. The area is disturbed due to compaction of the high bog.	Marginal
596	Management	Windmill	GE_08	This area appears to have been managed for traditional peat cutting in the past, however peat cutting has been abandoned in modern times. This area has reverted to Bog woodland dominated by Betula pubescens. Old turf banks recorded in this area.	Descriptive Note
597	Fauna	Windmill	GE_08	Snipe recorded on high bog	Marginal
598	Management	Windmill	GE_08	Functional drainage ditch installed on high bog. Small scale planting of Lodge pole pine at this location. Afforestation a threat to the high bog,	Sub marginal
599	Fauna	Windmill	GE_08	Hare recorded at this location	Sub marginal

Note Number	Note Type	Bog Name	Bog Code	Note Text	Ecotope
600	Management	Windmill	GE_08	Trampling and compaction of the high bog caused by plant machinery movements across the site.	Sub marginal
601	Hydrology	Windmill	GE_08	Recently excavated drainage ditches. Area is disturbed due to spreading of surface scraghs and catotelm peat on the high bog	Sub marginal
602	Hydrology	Windmill	GE_08	Functional drainage ditches in this area are ca 1.3m deep	Sub marginal
603	Habitat	Windmill	GE_08	Cutover bog reverting to wet heath.	Descriptive Note
604	Ecotope	Windmill	GE_08	Marginal ecotope firm underfoot with little or no Sphagnum cover.	Marginal
605	Flora	Windmill	GE_08	Rhododendron ponticom occurs at this location	Descriptive Note
606	Flora	Windmill	GE_08	Numerous stands of Rhododendron ponticom occur at this location	Marginal
607	Habitat	Windmill	GE_08	Area of cutover bog dominated by bare peat	Marginal
608	Habitat	Windmill	GE_08	Area of cutover bog dominated by Eriophorum vaginatum, Calluna vulgaris, Molinia caerulea and grassland species.	Descriptive Note
609	Ecotope	Windmill	GE_08	Sub central ecotope dominated by Sphagnum mosses and Eriophorum vaginatum. Conditions are very soft underfoot. This area conforms to the EU Annex I listed habitat 'active raised bogs (7110)'.	Sub central
610	Ecotope	Windmill	GE_08	Sub central ecotope boundary	Sub central
611	Ecotope	Windmill	GE_08	Sub central ecotope boundary	Sub central
612	Ecotope	Windmill	GE_08	Sub marginal and sub central ecotope boundary	Sub marginal
613	Ecotope	Windmill	GE_08		Sub marginal
614	Ecotope	Windmill	GE_08	Marginal ecotope. Dominated by Calluna vulgaris and Cladonia portentosa. Erica tetralix, Eriophorum vaginatum and Hypnum jutlandicum are abundant. Other species include Cladonia uncialis, Campylopus spp. and Cladonia floerkeana	Marginal
615	General	Windmill	GE_08	The high bog slopes to the north at this point	Marginal
616	Hydrology	Windmill	GE_08	Functional drainage ditch	Marginal
617	Ecotope	Windmill	GE_08	Marginal ecotope. Algal pools occur in this area	Marginal
618	Fauna	Windmill	GE_08	Snipe (3) recorded at this location	Sub marginal
619	Ecotope	Windmill	GE_08	Marginal ecotope boundary. Dominated by Calluna vulgaris, Narthecium ossifragum and Eriophorum vaginatum. Frequent occurrences of Cladonia portentosa, Erica tetralix, Trichophorum cespitosum and Eriophorum angustifolium.	Marginal
620	Flora	Windmill	GE_08	Mosses include Hypnum jutlandicum. Sphagnum cover is < 10%	Marginal
621	Habitat	Windmill	GE_08	Bog woodland dominated by Betula pubescens and occasional Pinus sylvestris. Tree stands are ca 8-15m high. The understory comprises dense bracken (Pteridium aquilinum) and Calluna vulgaris. Does not conform to 'Bog Woodland 91D0'.	Descriptive Note
622	Ecotope	Windmill	GE_08	Face bank ecotope dominated by dense stands of Calluna vulgaris together with Erica tetralix and Hypnum jutlandicum	Face bank
623	Fauna	Windmill	GE_08	Jay recorded from this area of bog woodland	Descriptive Note
624	Management	Windmill	GE_08	Small area of disturbed ground. Exposed catotelm peat and surface scraghs were recorded over high bog. Some compaction and trampling on high bog due to machinery movements across the high bog	Sub marginal
625	Ecotope	Windmill	GE_08		Sub marginal
626	Ecotope	Windmill	GE_08		Marginal
627	Site Description	Windmill	GE_08	The site slopes gently to the south at this location	Descriptive Note
628	Ecotope	Windmill	GE_08	Marginal ecotope dominated by Calluna vulgaris, Narthecium ossifragum and Cladonia portentosa. Erica tetralix and Eriophorum vaginatum are abundant. Sphagnum mosses include Sphagnum capillifolium and Sphagnum papillosum	Marginal
629	Flora	Windmill	GE_08	Stands of Pinus sylvestris becoming more frequent in this part of high bog	Marginal
630	Ecotope	Windmill	GE_08		Sub marginal
631	Designated Site	Windmill	GE_08	Carbury Bog NHA (NPWS Site Code: 1388). The site under consideration occurs outside the NHA	Descriptive Note
632	Flora	Windmill	GE_08	Sphagnum cover is <10% in marginal areas. Sphagnum capillifolium and Sphagnum tenellum were recorded from this area	Marginal
633	Hydrology	Windmill	GE_08	A series of functional drainage ditches occur along the eastern boundary of the high bog. Area is heavily disturbed due to spreading of surface scraghs and catotelm peat on high bog as a result of recently excavated functional drainage ditches	Marginal

Appendix 2

Detailed Site Data

Green Element

Raised Bog Survey 2013 - 2014

Bog Name:	Windmill	**Site Easting & Northing:**	268403 236984
Bog Code:	8	**Site contains Raised Bog Habitat:**	YES
County:	Kildare	**Active Raised Bog 7110:**	YES
Survey Date:	12/12/2013	**Bog Woodland 91D0:**	NO
Name of Surveyor/s:	B. O'Loughlin & B. Kirwan	**Degraded raised bog 7120:**	YES
		Depressions on peat substrates 7150:	NO

Ecotope	Present/Absent	Comment
Central:	Absent	N/A
Sub-Central:	Present	Sub-central ecotope occurs in the northern part of the site. The area is dominated by *Sphagnum* mosses (>40%) and *Eriophorom vaginatum.* The plot conforms to community complex 10/9. The ground is very soft underfoot. Areas of active peat formation conforms to annex I EU habitat.
Sub-Marginal:	Present	Sub-marginal ecotope is dominant and widespread throughout the high bog. The ecotype on site conforms to community complex 9/7/6, 9/7/4, 7/6, 9/7, 9a.
Marginal:	Present	This ecotope occurs along the outer margins of the high bog and areas of drainage ditches and is dominated by *Calluna vulgaris, Narthecium ossifragum* and *Calluna vulgaris*. The ecotope conforms to community complex 9/7/6 and 7/6.
Facebank:	Present	The facebank occurs throughout high bog boundary and usually comprises dense stands of *Calluna vulgaris* and *Hypnum jutlandicum.*

High Bog area (ha): 66.90 **Area of Active Raised Bog (ha):** 0.1 **% ARB:** 0.15

Site Description:

The site comprises a low dome of remnant high bog. The high bog can be divided into three discrete sections - the northern, central and southern. To west, the bog is surrounded by cutover bog (bog woodland comprising *Pinus sylvestris* and *Betula pubescens)*. Agricultural grassland and active quarries surround this peatland site.

The site is intensively managed for peat extraction to produce compost peat for the horticultural industry. A highly modified drainage network occurs within a large extensive area of cutover bog to the north and east. The high bog has also been drained in recent years to facilitate this commercial practice. Functional drainage ditches circa 1 m to 1.5 m deep traverse the north eastern part of the site with surface water and culverts installed.

Four ecotope types are present (facebank, marginal, sub-marginal and sub-central). The sub-central area occurs in the northern part of the site and is dominated by *Sphagnum* mosses (>40% cover) and *Eriophorum vaginatum*. Ground conditions are soft underfoot with low hummocks and hollows. The ecotope type conforms to community complex 10/9 and the annex I habitat active raised bogs 7110. The sub-marginal ecotope type is widespread throughout the high bog and comprises low hummocks with few hollows recorded. The marginal ecotope occurs on the outer areas of the high bog. Old turf banks are present along the western and southern parts of the high bog. No recent cutting and these areas have regenerated with wet heath and bog woodland.

The main threats to the site include peat extraction, drainage, the introduction of invasive alien species (*Rhododendron ponticum*) and afforestation. The site is of importance for the presence of active raised bog 7110. Its location at the eastern extent of the range of the habitat is also of note.

Landscape setting:
Low dome that adjoins Carbury Bog NHA (1388) to the south and industrially cut bog to the north.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Windmill **Site Code:** 8

	Present/Absent	Comment
Positive Bog Features		
High Bog Features		
Pool system:	Absent	
Good Hummock Hollow topography:	Absent	Occasional hummocks and hollows.
High Bog Flush:	Absent	
High Bog Woodland:	Absent	Occurs in the immediate surroundings in cutover areas.
High Bog Swallow Hole System:	Absent	
Other High Bog Feature:	Absent	
Marginal Features		
Semi-natural Margin:	Absent	
Positive High Bog Species		
Sphagnum fuscum	Absent	
Sphagnum austinii	Absent	
Sphagnum pulchrum	Absent	
Sphagnum cuspidatum		Occurs in hollows in sub-marginal ecotope and reduced functional drainage ditches and subcentral ecotope in the northern part of the site.
Sphagnum denticulatum	Absent	
Cladonia portentosa	Present	*Cladonia portentosa* is widespread throughout the site with different degrees of % cover.

Noteworthy / Rare Species

Presence of active peat sub-central ecotope in northern part of site.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Windmill **Site Code:** 8

	Present/Absent	Impact	Comment
Impact and Activities on High Bog			
Peat Extraction on High Bog Surface:	YES	High	Active commercial peat extraction of high bog. Machinery operating on site. An extensive area of the high bog to the south and east has been largely affected by mechanical large scale peat cutting. A peat harvesting plant occurs on
Marginal Peat Extraction:	YES	High	Marginal peat extraction on the northern and eastern parts of the site by mechanical machinery. Turf cutting along the southern and western parts of the high bog has been abandoned and it appears that this area was hand cut.
Hand Cutting of Peat:	YES	Medium	This traditional practice of peat cutting by hand has been abandoned along the southern and western parts of the site as indicated by old abandoned turf banks. The cutover area is colonised by regenerating cutover bog communities including established bog woodland, wet heath and dense bracken.
Mechanical Removal of Peat:	YES	High	Large scale intensive mechanical removal of peat from the high bog particularly in the northern and eastern parts of the high bog. Machinery including harvesters and diggers observed operating onsite.
Commercial Peat Extraction:	YES	High	The site is managed and highly modified for commercial use managed for compost peat to serve the horticultural industry. A peat extraction processing plant occurs on site. Large peat stockpiles observed on site.
Domestic Peat Extraction:	NO		Unknown
Bog Burst:	NO		
Cracking or Peat Slumping at Edge of High Bog:	YES	Medium	High along the northern and eastern parts of the site where the high bog has been managed for large scale peat extraction activities.
Forestry Planting on High Bog:	YES	Low	Evidence of forestry planting of Lodgepole pine (circa 20 saplings) observed in northern part of site.
Forestry Felling on High Bog:	NO		
Invasive Species on High Bog:	YES	Medium	Potential threat of spread of *Rhododendron ponticum* recorded growing in adjacent area of bog woodland and cutover bog. Planting of Lodgepole pine.
Drainage on High Bog:	YES	High	Intensive drainage in the northern eastern part of site on high bog where a series of drainage ditches traverse the bog. The drains are functional and circa 1-1.5 m deep with surface water inflow from bog recorded. Excavated surface scraghs and catotelm peat have been spread in adjacent areas.
Functional Drains on High	YES	High	Intensive draining in the northern eastern part of site on

Green Element

Raised Bog Survey 2013 - 2014

Bog:			high bog where a series of drainage ditches traverse the bog. The drains are functional and ca 1-1.5 m deep with surface water ingress recorded. Excavated surface scraghs and catotelm peat spread in adjacent areas. Other functional drainage ditches bound the high bog.
Non-functional Drains on High Bog:	YES	Low	Occasional non functional drainage ditches recorded on the high bog comprises established *Sphagnum* mosses including *Sphagnum capillifolium, S. papillosum, S. magellanicum* with *Eriophorum vaginatum* and *Calluna vulgaris*.
Reduced function Drains on High Bog:	YES	Low	Reduced functional drain recorded in the southern part of the site on high bog containing regenerating *Sphagnum* mosses including *S. cuspidatum, S. capillifolium, S. papillosum* and *S. tenellum*. Other species include *Hypnum jutlandicum*, occasional *Eriophorum vaginatum*.
Burning on High Bog:	NO		Large patches of *Cladonia portentosa* recorded in the central part of the site, indicating lack of recent fires.
Fertilisation on High Bog:	NO		
Dumping on High Bog:	NO		
Grazing on High Bog:	NO		
Paths tracks on High Bog:		Medium	Trampling and compaction of surface vegetation due to machinery accessing the site due to drainage works on site.

General Impacts and Activities Comment:

The main threats that impact on the high bog include peat extraction, drainage, afforestation and the introduction of an alien species.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Windmill **Site Code:** 8

	Present/Absent & Grid Ref	Comment
Cutover Assessment		
Regenerating *Sphagnum* Areas Occur:	Present	Regenerating *Sphagnum* was recorded in an area of cutover on the western and south eastern boundary of the site. Comprises *Sphagnum palustre, S. cuspidatum, S. fallax and S. papillosum, S. capillifolium* and *Sphagnum tenellum* with *Calluna vulgaris* and *Molinia caerulea.* These areas appear to be hand cut.
Active Peat Fields with Bare Peat:	Present	Extensive areas of bare peat in the northern and eastern parts of the site. Highly intensive drainage network developed in these areas of cutover bog.
Cutover with Mix of Wet and Dry Bog Vegetation:		
Cutover Recolonised mainly by Dry Vegetation:	Present	Dry heath occurs in the eastern part of the site dominated by *Eriophorum vaginatum, Calluna vulgaris, Narthecium ossifragum* and grasses.
Cutover Recolonised mainly by Wet Vegetation:	Present	Recolonisation of wet bog vegetation occurs along the western boundary of the cutover / high bog interface and includes *Molinia caerulea, Calluna vulgaris* and *Sphagnum* mosses. This area has regenerated to wet heath.
Cutover with Transition Mire / Fen Vegetation:		
Cutover Reclaimed to Grassland:		
Other Cutover Habitat Occurrence:		

Topography of Cutover Comment:
Flat

Drainage of Cutover Comment:
A series of functional drainage ditches traverse this habitat. Some reduced functional drainage ditches were also recorded.

Comments on Restoration Potential of Cutover:
Potential exists along the western boundary of the site.

Bog Name: Windmill
Bog Code: 8
Plot Code Number: 1
Plot Survey Date: 12/12/2013
Plot Surveyor/s: B. O'Loughlin & B. Kirwan

Ecotope Type Present: Sub Central Ecotope
Community Complex: Complex 10/9

Plot Easting: **Northing:** **Plot Photo. Numbers:** Bol ipad

Ground Firmness: Very Soft
Burning Evidence: No burning
Algae in Hollows %: no
Algae in Pools %: no
Bare Peat %: no
Calluna Height (cm + / - 5 cm): 40
Cladonia Cover %: 3
Macro-topography: Gentle slope
Pools Occurrence: Absent
Pools % Cover: no
Sphagnum % Cover: 45
Narthecium % Cover: 2

Micro-topography:
Low hummocks and lawns.

Tussocks Occurrence: Present
Tussocks *Eriophorum vaginatum*: Yes **% cover** 55
Tussocks *Trichophorum germanicum*: Yes **% cover** 10
Tussocks *Molinia caerulea*: **% cover**
Tussocks Other: **% cover**

Plot Degradation or Regeneration Evidence:
Plot Noteworthy or Rare Species (Flora/Fauna):
Plot General Comments:

Plot Species Recorded:

Present	Domin Cover Value
Andromeda polifolia	2
Calluna vulgaris	5
Cladonia portentosa	3
Erica tetralix	4
Eriophorum angustifolium	3
Eriophorum vaginatum	8
Narthecium ossifragum	3
Sphagnum capillifolium	4

Sphagnum cuspidatum	4
Sphagnum fallax	4
Sphagnum magellanicum	6
Sphagnum papillosum	6
Sphagnum subnitens	3

Green Element

Raised Bog Survey 2013 - 2014

Bog Name:	Windmill	**Site Easting & Northing:**	268403 236984
Bog Code:	8	**Site contains Raised Bog Habitat:**	YES
County:	Kildare	**Active Raised Bog 7110:**	YES
Survey Date:	12/12/2013	**Bog Woodland 91D0:**	NO
Name of Surveyor/s:	B. O'Loughlin & B. Kirwan	**Degraded raised bog 7120:**	YES
		Depressions on peat substrates 7150:	NO

Ecotope	Present/Absent	Comment
Central:	Absent	N/A
Sub-Central:	Present	Sub-central ecotope occurs in the northern part of the site. The area is dominated by *Sphagnum* mosses (>40%) and *Eriophorom vaginatum.* The plot conforms to community complex 10/9. The ground is very soft underfoot. Areas of active peat formation conforms to annex I EU habitat.
Sub-Marginal:	Present	Sub-marginal ecotope is dominant and widespread throughout the high bog. The ecotype on site conforms to community complex 9/7/6, 9/7/4, 7/6, 9/7, 9a.
Marginal:	Present	This ecotope occurs along the outer margins of the high bog and areas of drainage ditches and is dominated by *Calluna vulgaris, Narthecium ossifragum* and *Calluna vulgaris*. The ecotope conforms to community complex 9/7/6 and 7/6.
Facebank:	Present	The facebank occurs throughout high bog boundary and usually comprises dense stands of *Calluna vulgaris* and *Hypnum jutlandicum.*

High Bog area (ha): 66.90 **Area of Active Raised Bog (ha):** 0.1 **% ARB:** 0.15

Site Description:

The site comprises a low dome of remnant high bog. The high bog can be divided into three discrete sections - the northern, central and southern. To west, the bog is surrounded by cutover bog (bog woodland comprising *Pinus sylvestris* and *Betula pubescens)*. Agricultural grassland and active quarries surround this peatland site.

The site is intensively managed for peat extraction to produce compost peat for the horticultural industry. A highly modified drainage network occurs within a large extensive area of cutover bog to the north and east. The high bog has also been drained in recent years to facilitate this commercial practice. Functional drainage ditches circa 1 m to 1.5 m deep traverse the north eastern part of the site with surface water and culverts installed.

Four ecotope types are present (facebank, marginal, sub-marginal and sub-central). The sub-central area occurs in the northern part of the site and is dominated by *Sphagnum* mosses (>40% cover) and *Eriophorum vaginatum*. Ground conditions are soft underfoot with low hummocks and hollows. The ecotope type conforms to community complex 10/9 and the annex I habitat active raised bogs 7110. The sub-marginal ecotope type is widespread throughout the high bog and comprises low hummocks with few hollows recorded. The marginal ecotope occurs on the outer areas of the high bog. Old turf banks are present along the western and southern parts of the high bog. No recent cutting and these areas have regenerated with wet heath and bog woodland.

The main threats to the site include peat extraction, drainage, the introduction of invasive alien species (*Rhododendron ponticum*) and afforestation. The site is of importance for the presence of active raised bog 7110. Its location at the eastern extent of the range of the habitat is also of note.

Landscape setting:
Low dome that adjoins Carbury Bog NHA (1388) to the south and industrially cut bog to the north.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Windmill **Site Code:** 8

	Present/Absent	Comment
Positive Bog Features		
High Bog Features		
Pool system:	Absent	
Good Hummock Hollow topography:	Absent	Occasional hummocks and hollows.
High Bog Flush:	Absent	
High Bog Woodland:	Absent	Occurs in the immediate surroundings in cutover areas.
High Bog Swallow Hole System:	Absent	
Other High Bog Feature:	Absent	
Marginal Features		
Semi-natural Margin:	Absent	
Positive High Bog Species		
Sphagnum fuscum	Absent	
Sphagnum austinii	Absent	
Sphagnum pulchrum	Absent	
Sphagnum cuspidatum		Occurs in hollows in sub-marginal ecotope and reduced functional drainage ditches and subcentral ecotope in the northern part of the site.
Sphagnum denticulatum	Absent	
Cladonia portentosa	Present	*Cladonia portentosa* is widespread throughout the site with different degrees of % cover.

Noteworthy / Rare Species

Presence of active peat sub-central ecotope in northern part of site.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Windmill **Site Code:** 8

	Present/Absent	Impact	Comment
Impact and Activities on High Bog			
Peat Extraction on High Bog Surface:	YES	High	Active commercial peat extraction of high bog. Machinery operating on site. An extensive area of the high bog to the south and east has been largely affected by mechanical large scale peat cutting. A peat harvesting plant occurs on
Marginal Peat Extraction:	YES	High	Marginal peat extraction on the northern and eastern parts of the site by mechanical machinery. Turf cutting along the southern and western parts of the high bog has been abandoned and it appears that this area was hand cut.
Hand Cutting of Peat:	YES	Medium	This traditional practice of peat cutting by hand has been abandoned along the southern and western parts of the site as indicated by old abandoned turf banks. The cutover area is colonised by regenerating cutover bog communities including established bog woodland, wet heath and dense bracken.
Mechanical Removal of Peat:	YES	High	Large scale intensive mechanical removal of peat from the high bog particularly in the northern and eastern parts of the high bog. Machinery including harvesters and diggers observed operating onsite.
Commercial Peat Extraction:	YES	High	The site is managed and highly modified for commercial use managed for compost peat to serve the horticultural industry. A peat extraction processing plant occurs on site. Large peat stockpiles observed on site.
Domestic Peat Extraction:	NO		Unknown
Bog Burst:	NO		
Cracking or Peat Slumping at Edge of High Bog:	YES	Medium	High along the northern and eastern parts of the site where the high bog has been managed for large scale peat extraction activities.
Forestry Planting on High Bog:	YES	Low	Evidence of forestry planting of Lodgepole pine (circa 20 saplings) observed in northern part of site.
Forestry Felling on High Bog:	NO		
Invasive Species on High Bog:	YES	Medium	Potential threat of spread of *Rhododendron ponticum* recorded growing in adjacent area of bog woodland and cutover bog. Planting of Lodgepole pine.
Drainage on High Bog:	YES	High	Intensive drainage in the northern eastern part of site on high bog where a series of drainage ditches traverse the bog. The drains are functional and circa 1-1.5 m deep with surface water inflow from bog recorded. Excavated surface scraghs and catotelm peat have been spread in adjacent areas.
Functional Drains on High	YES	High	Intensive draining in the northern eastern part of site on

Green Element

Raised Bog Survey 2013 - 2014

Bog:			high bog where a series of drainage ditches traverse the bog. The drains are functional and ca 1-1.5 m deep with surface water ingress recorded. Excavated surface scraghs and catotelm peat spread in adjacent areas. Other functional drainage ditches bound the high bog.
Non-functional Drains on High Bog:	YES	Low	Occasional non functional drainage ditches recorded on the high bog comprises established *Sphagnum* mosses including *Sphagnum capillifolium, S. papillosum, S. magellanicum* with *Eriophorum vaginatum* and *Calluna vulgaris*.
Reduced function Drains on High Bog:	YES	Low	Reduced functional drain recorded in the southern part of the site on high bog containing regenerating *Sphagnum* mosses including *S. cuspidatum, S. capillifolium, S. papillosum* and *S. tenellum*. Other species include *Hypnum jutlandicum*, occasional *Eriophorum vaginatum*.
Burning on High Bog:	NO		Large patches of *Cladonia portentosa* recorded in the central part of the site, indicating lack of recent fires.
Fertilisation on High Bog:	NO		
Dumping on High Bog:	NO		
Grazing on High Bog:	NO		
Paths tracks on High Bog:		Medium	Trampling and compaction of surface vegetation due to machinery accessing the site due to drainage works on site.

General Impacts and Activities Comment:

The main threats that impact on the high bog include peat extraction, drainage, afforestation and the introduction of an alien species.

Green Element

Raised Bog Survey 2013 - 2014

Main Site Name: Windmill **Site Code:** 8

	Present/Absent & Grid Ref	Comment
Cutover Assessment		
Regenerating *Sphagnum* Areas Occur:	Present	Regenerating *Sphagnum* was recorded in an area of cutover on the western and south eastern boundary of the site. Comprises *Sphagnum palustre, S. cuspidatum, S. fallax and S. papillosum, S. capillifolium* and *Sphagnum tenellum* with *Calluna vulgaris* and *Molinia caerulea.* These areas appear to be hand cut.
Active Peat Fields with Bare Peat:	Present	Extensive areas of bare peat in the northern and eastern parts of the site. Highly intensive drainage network developed in these areas of cutover bog.
Cutover with Mix of Wet and Dry Bog Vegetation:		
Cutover Recolonised mainly by Dry Vegetation:	Present	Dry heath occurs in the eastern part of the site dominated by *Eriophorum vaginatum, Calluna vulgaris, Narthecium ossifragum* and grasses.
Cutover Recolonised mainly by Wet Vegetation:	Present	Recolonisation of wet bog vegetation occurs along the western boundary of the cutover / high bog interface and includes *Molinia caerulea, Calluna vulgaris* and *Sphagnum* mosses. This area has regenerated to wet heath.
Cutover with Transition Mire / Fen Vegetation:		
Cutover Reclaimed to Grassland:		
Other Cutover Habitat Occurrence:		

Topography of Cutover Comment:
Flat

Drainage of Cutover Comment:
A series of functional drainage ditches traverse this habitat. Some reduced functional drainage ditches were also recorded.

Comments on Restoration Potential of Cutover:
Potential exists along the western boundary of the site.

Bog Name: Windmill
Bog Code: 8
Plot Code Number: 1
Plot Survey Date: 12/12/2013
Plot Surveyor/s: B. O'Loughlin & B. Kirwan

Ecotope Type Present: Sub Central Ecotope
Community Complex: Complex 10/9

Plot Easting: **Northing:** **Plot Photo. Numbers:** Bol ipad

Ground Firmness: Very Soft
Burning Evidence: No burning
Algae in Hollows %: NA
Algae in Pools %: NA
Bare Peat %: NA
Calluna Height (cm + / - 5 cm): 40
Cladonia Cover %: 3
Macro-topography: Gentle slope
Pools Occurrence: Absent
Pools % Cover: NA
Sphagnum % Cover: 45
Narthecium % Cover: 2

Micro-topography:
Low hummocks and lawns.

Tussocks Occurrence: Present
Tussocks *Eriophorum vaginatum*: Yes **% cover** 55
Tussocks *Trichophorum germanicum*: Yes **% cover** 10
Tussocks *Molinia caerulea*: **% cover**
Tussocks Other: **% cover**

Plot Degradation or Regeneration Evidence:
Plot Noteworthy or Rare Species (Flora/Fauna):
Plot General Comments:

Plot Species Recorded:

Present	Domin Cover Value
Andromeda polifolia	2
Calluna vulgaris	5
Cladonia portentosa	3
Erica tetralix	4
Eriophorum angustifolium	3
Eriophorum vaginatum	8
Narthecium ossifragum	3
Sphagnum capillifolium	4

Sphagnum cuspidatum	4
Sphagnum fallax	4
Sphagnum magellanicum	6
Sphagnum papillosum	6
Sphagnum subnitens	3

Appendix F6 –Bat Survey Report

ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MAIGHNE WIND FARM, COUNTIES KILDARE AND MEATH

BAT FAUNA ASSESSMENT

March 2015

elementpower

FEHILY TIMONEY & COMPANY

ABSTRACT

This report details site surveys and assessments undertaken seasonally in 2013 and 2014 of the existing bat fauna at proposed wind development sites in Cos. Kildare and Meath, collectively known as Maighne, where 47 turbines are planned to be erected and survey of structures along the proposed routes of the High Voltage and Medium Voltage cables.

In recent years, as wind turbine developments increased around the world, their impacts on birds and bats became known. Multiple studies on the interaction of bats with turbines have shown that these animals, including species found in Ireland, suffer high mortality as a result of the presence of these structures.

The surveys determined that at least five bat species actively forage on or over the study areas and other species are known from the local area and may occur onsite occasionally.

All but one of the bat species confirmed or expected onsite are low fliers and, as a result, are considered to be at a low risk from the proposed development. Only Leisler's bat is of concern as it is a high flier and hence may come into conflict with turbines. However, there is currently no evidence of Leisler's bat mortality due to wind turbines in Ireland. The average foraging height of the species is approximately 40m above the ground and, although it can hunt at heights in excess of 70m, most activity is below 50m.

To date, there are no published results of bat/turbine interaction at Irish wind turbine sites and those undertaken abroad are mainly of wind farms, with multiple turbines, sited along known bat migration routes which are currently unknown in Ireland.

Mitigation measures are given to reduce the potential risks to bats posed by wind turbines. These include clearing vegetation around 36 turbines for the life of the development. The adjudged worst case scenario is that, during operation, the turbine development may possibly cause injury or death to a few individual specimens of Leisler's bat but the resulting impact of the proposed development on local bat populations, with mitigation measures, is considered to be minor negative with the favourable conservation status (FCS) of bat species being unaffected and all species confirmed or expected on or near the study areas are anticipated to persist.

As little research is undertaken on bats and wind turbines in Ireland, the planned development could provide an opportunity to gain baseline data on bat/turbine interaction.

STATEMENT OF COMPETENCE

Mr. Conor Kelleher: The author of this report has specialised in the study of bats since the mid-1980s and is licensed to catch these animals for educational and scientific purposes. He is a past Bat Warden for *English Nature* (now *Natural England*), the Statutory Nature Conservation Organisation in England, from 1989 to 1999. He has published many articles and papers on these animals and presented papers on bat ecology at international conferences and symposia. He is a part-time lecturer on bat ecology at University College Cork.

The author has also undertaken research on bats including radio-telemetry and detector studies and distribution surveys and tutors courses on field study techniques.

Since 2001, he has been self-employed as an Ecological Consultant undertaking terrestrial mammal surveys, specialising in bats, for Environmental Impact Assessments, pre-construction surveys etc. To date, he has been involved in over 400 ecological surveys for developments such as roads, quarries, landfills, wind turbine and residential and commercial projects.

Mr. Kelleher was Secretary and Trustee of the UK *Bat Conservation Trust* from 1998-2003 and has recently stepped down as Chairman of *Bat Conservation Ireland*. He also recently retired as Chairman of the *Irish Wildlife Trust*. He continues chairing the *Cork County Bat Group*. He has attended oral hearings as an Expert Witness on bat issues and has undertaken research-based projects on bats for the *National Parks and Wildlife Service* and the *Vincent Wildlife Trust*.

In 2006, Mr. Kelleher co-authored the National Roads Authority's *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* and *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*; in 2007, he co-authored the National Parks and Wildlife Service's *Bat Mitigation Guidelines for Ireland* and, in 2012, he co-authored Bat Conservation Ireland's *Wind Turbine/Wind Farm Development Bat Survey Guidelines*. He also recently co-published the interactive DVD: *Knowing, Studying and Conserving the Bats of Ireland – an Interactive Guide on How to Identify, Study, Appreciate and Care for Irish Bats.*

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

1 BAT FAUNA ASSESSMENT

1.1 Introduction

A wind energy development consisting of 47 turbines is proposed to be constructed in the townlands of Ballynakill, Windmill, Drehid, Hortland, Derrybrennan and Cloncumber in County Kildare with the footprint of the Ballynakill site extending into County Meath. The turbines are numbered 1 to 47 as follows:

Ballynakill:	T1 to T10	(10 turbines)
Windmill:	T24 to T26	(3 turbines)
Drehid:	T11 to T23 and T47	(13 turbines)
Hortland:	T40 to T46	(7 turbines)
Derrybrennan:	T27 and T28	(2 turbines)
Cloncumber:	T29 to T39	(11 turbines)

In recent years, as wind turbine developments increased around the world, their impacts on birds and bats became known. Multiple studies on the interaction of bats with turbines have shown that these animals suffer high mortality as a result of the presence of these structures. In Hayes 2013, the published bat fatality information at wind energy facilities in the contiguous United States in 2012 was reviewed to derive estimates of the number of bats killed and concluded that over 600,000 bats may have died as a result of interactions with wind turbines in that year alone. The All-Ireland Species Action Plan: Bats (Anon 2008) states:

> *Wind turbines may have a negative impact on bat populations. Johnson et al., (2000) while studying bird strike, recorded that the number of dead bats found under wind turbines was sometimes greater than the number of dead birds.*

In Europe, twenty bat species have been confirmed as suffering fatal collisions with wind turbines. These include four species that occur in Ireland that may be affected by turbines in different ways. For instance, turbines sited in open landscapes can impact high flying species such as Leisler's bat *Nyctalus leisleri* and migratory species such as Nathusius' pipistrelle *Pipistrellus nathusii* whereas turbines sited close to hedgerows, treelines and woodlands can impact lower flying species such as common *P. pipistrellus* and soprano pipistrelle *P. pygmaeus*.

Although all bat species are given a 'Favourable' conservation status in the Republic of Ireland (*National Parks and Wildlife Service* 2013), all are protected under current European and National legislation (see Appendix 3) and an assessment of impacts, if any, to local bat populations as a result of the planned turbine development was undertaken over two years in 2013 and 2014.

This report presents the results of a desk study into previous records of bat species (from *Bat Conservation Ireland's* National Bat Distribution Database and the *National Parks and Wildlife Service's* National Lesser Horseshoe Bat Roost Database) in the area of the proposed development and that of site visits in spring, summer and autumn 2013 during which the onsite structures and habitats were assessed during daylight hours for their favourability for bats and, from dusk to dawn, bat activity surveys were undertaken using heterodyne, frequency division and time expansion detectors. Also included are the findings of surveys of structures along the proposed routes of the High and Medium Voltage cables. The onsite assessments were undertaken by Mr. Conor Kelleher.

1.2 Methodology

Bats utilise treeline and hedgerow boundaries of agricultural grasslands, sheltered minor roads and lanes, scrub and woodland edge habitats as foraging areas and commuting routes and large-scale development in such areas may adversely affect bats in a number of ways such as vegetation removal for haulage roads or new tracks which may impact bats through the creation of open space barriers that bats may be unwilling to cross. Bat roosts in trees or buildings may be lost if they have to be removed. The removal of hedgerows and treelines and the loss of mature trees, draining of wet areas and provision of artificial lighting all affect the availability of invertebrate prey and feeding areas.

It is essential therefore that a comprehensive study of bat activity at sites of such development be undertaken to identify any conflict zones and hence to avoid or reduce impacts through mitigation to safeguard these animals.

To comprehensively research and so understand the existing behaviour of bats within the study areas the approach detailed in the following guidelines were followed:

- Hundt, L. 2012 in *Bat Surveys: Best Practice Guidelines* (2nd edition). Bat Conservation Trust
- Bat Conservation Ireland 2012 *Wind Turbine/Wind Farm Development Bat Survey Guidelines*, Version 2.8, December 2012 and the
- National Roads Authority 2006 *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes*

These guidelines recommend that the potential impacts of a proposed development on bats are assessed over several seasons in order to take into consideration the affect the planned development may have on the nightly and seasonal behaviour of bats including:

- post hibernation spring re-emergence
- peak summer activity
- autumnal mating behaviour and, where necessary,
- winter hibernation

Each method of surveying bats has its own specific merit in observing and identifying the different species, their occurrence and landscape use (roosts, flight paths, hunting areas). However, each method is selective. The best approach, therefore, is through using a strategic combination of techniques.

Spring – May 2013
- Detector surveys to observe bat feeding, commuting and roosting behaviour

Summer – June 2013
- Detector and bat habitat surveys undertaken to observe bat feeding, commuting and roosting behaviour to establish priority bat habitats
- Onsite structure survey carried out where possible to inspect buildings to ascertain bat use
- Assessment of previously identified roosts within or adjacent to study sites and maternity roosts identified through dawn swarming roost surveys

Autumn – September 2013
- To identify Leisler's bat *Nyctalus leisleri* lekking areas and other bat mating sites

Winter – December 2013
- Assessment of known and identification of hibernation sites and, if required, access potential hibernacula in order to check for bat presence

A desk study of extant bat records in the vicinity of each of the study areas was also undertaken by evaluation of relevant literature and a review of *Bat Conservation Ireland's* National Bat Records Database and the *National Parks and Wildlife Service's* National Lesser Horseshoe Bat Roost Database.

Areas likely to be of interest for bats within the proposed development areas and in the wider landscape were identified and selected from mapping and ortho-photography before being assessed on the ground as the nature and type of habitats present are indicative of the species likely to be present. During site visits, landowners were also questioned in relation to bat observations within their farmyards, dwellings and outbuildings.

Habitats on each site were assessed for their favourability for bats and where possible, structures were surveyed for bat presence either externally via bat detector, internally by visual inspection or by a combination of both. All accessible areas of such structures were inspected for bats and/or their signs using powerful torches.

The presence of bats is often shown by grease staining, droppings, urine marks, corpses, feeding signs such as invertebrate prey remains and/or the presence of bat fly *Nycteribiidae* pupae, although direct observations are also occasionally made. Bat droppings are often identifiable to species-level based on their size, shape and content and those of certain species, for example brown long-eared *Plecotus auritus* and lesser horseshoe *Rhinolophus hipposideros* bats, are very distinctive and unmistakable.

An assessment of potential bat roosts in trees will be undertaken at pre-construction stage when impacted trees are known. A survey of trees to be removed is best undertaken as near as possible to felling as bats are highly mobile animals that can move into affected trees between their survey and their removal if the period is a long one.

The winter 2013/2014 assessment of bat hibernation sites within or adjacent to the study areas found that veteran and mature trees, older buildings, bridges, farm outbuildings and derelict structures have potential for use as winter roosting sites in which bats can hibernate however no such hibernation site is currently known in the local area and none was identified during the assessment. In winter, bats can secrete themselves deep within such structures and so can be present without being visible. The exception is the lesser horseshoe bat which hangs in the open within structures and is easily seen but this species is absent from the midlands. Bats in Ireland as elsewhere, are known to hibernate in natural caves especially in limestone areas but there are no known natural caves in Co. Kildare or Co. Meath (Drew 2004). Apart from natural underground features, manmade prehistoric underground structures - souterrains - are also known to be used by these animals and one potential such prehistoric site is present within the townland of Drehid (ref.: www.archaeology.ie) however the feature is buried and therefore not accessible to bats.

Transects through bat favourable habitats were walked in each of the planned development areas during which bat activity was recorded using heterodyne/frequency division (*BatBox Duet - BatBox Electronics*) and heterodyne/frequency division/time expansion (*Echometer EM3+ - Wildlife Acoustics*) detectors while the wider area of the proposed development was surveyed from a vehicle driven at 20 kph with a detector mounted on the hedge-side of the vehicle. Bats were identified by their ultrasonic calls coupled with behavioural and flight observations and on computer by sound analysis of recorded echolocation and social calls with dedicated software (*Kaleidoscope Viewer - Wildlife Acoustics*).

Nocturnal bat activity is mainly bi-modal taking advantage of increased insect numbers on the wing in the periods after dusk and before dawn, with a lull in activity in the middle of the night. This is particularly true of 'hawking' species – i.e. bats which capture prey in the open air. However, 'gleaning' species remain active throughout the night as prey is available on foliage for longer periods. The prime periods for detecting bat activity especially flight paths and commuting routes, therefore, are two hours after dusk and again for a shorter period before dawn.

Bat activity is governed by the activity of their insect prey and insect abundance is in turn governed by weather conditions and climate. Insects, and therefore bats, are unlikely to be abroad at temperatures below 6° Celsius or during periods of strong winds or heavy rainfall so survey in such conditions is not possible.

All field surveys were undertaken within the active bat seasons and during good weather conditions.

The areas under study and the number and location of turbines changed throughout the study as the planned development evolved. Some areas surveyed in 2013 are now no longer within the scheme.

1.2.1 Survey Constraints

There were no climatic or seasonal constraints to the onsite assessments as each was undertaken during optimal conditions however the prolonged winter of 2012/2013 and very cold spring of 2013 resulted in decreased numbers or indeed an absence of flying insects up to the end of May which affected bat activity. In 2013, the Irish bat fauna experienced a second consecutive winter and spring of exceptionally low temperatures. In 2012, bat activity throughout the country was noticeably affected by the severely cold temperatures with bats remaining in hibernation far longer than usual. Some species remained underground until mid-May (pers. obs.); unlike, in 'normal' years, when bats are usually active from mid-March onwards.

The prolonged and record rainfall in the summer of 2012 which followed the long winter of 2011/2012 noticeably affected a range of animal species including bees, butterflies and moths and resulted in far fewer numbers of these invertebrates being on the wing than in other years. The reduction in prey items affected bat activity and would certainly have lead to malnourised animals entering hibernation.

Any young born late in the summer of 2012 would likely have perished during the following winter having had less time for feeding and, consequently, low fat reserves. The negative impacts of the spring and summer weather were then exacerbated by a second prolonged winter which lasted until the end of May 2013 with night temperatures throughout the month of only 2°C to 6°C which is certain to have resulted in greater mortality of juveniles.

The prolonged winter of 2012/2013 also resulted in staggered and late birth of young, abandonment of pups, roost absence and poor foraging activity in 2013 and to compound matters further, the bats which survived the extended winter and finally emerged from hibernation two months later than usual at the end of May had only four to five hours of darkness in which to feed compared to eight or nine hours of darkness had they emerged from hibernation in mid-March as the nights in May are far shorter.

As a result of the weather conditions during 2012 and early 2013 as outlined above, bat activity and numbers across the country were noticeably lower in the summer and autumn of 2013 than in previous years with activity being especially poor through the month of June until temperatures rose sufficiently and stabilised. There were no seasonal or climatic constraints to survey in 2014.

1.2.2 Relevant Guidance

- Bat Conservation Ireland 2012 *Wind Turbine/Wind Farm Development Bat Survey Guidelines*, Version 2.8. Bat Conservation Ireland, Virginia, Co. Cavan
- Bat Conservation Trust 2012 *Bat Surveys: Best Practice Guidelines* (2nd edition). Bat Conservation Trust, London
- Carlin, C. and Mitchell-Jones, T. 2012 *Bats and Onshore Wind Turbines – Interim Guidance (2nd Edition),* Technical Information Note TIN051. *Natural England*, Peterborough, UK
- National Roads Authority 2006a *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes,* NRA, Dublin
- National Roads Authority 2006b *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*, NRA, Dublin
- Northern Ireland Environment Agency 2011 *Bat survey – specific requirements for wind farm proposals*. Northern Ireland Environment Agency, Department of the Environment, Belfast
- Rodrigues, L., Bach, L., Dubourg-Savage, M-J., Goodwin, J. and Harbusch, C. 2008 *Guidelines for Consideration of Bats in Wind Farm Projects:* EUROBATS Publication Series No. 3. UNEP/EUROBATS Secretariat, Bonn, Germany

1.3 Existing Environment

The study areas are within a lowland landscape, 50m to 90m asl, which largely consists of improved agricultural (GA1) and wet grasslands (GS4) with associated hedgerows (WL1) and treelines (WL2), arable crops (BC1), blanket bog (PB3) and cutaway blanket bog (PB4), coniferous plantations (WD4), deciduous woodland (WD1) and scrub (WS1). Rivers (FW2), small streams and minor drainage channels (FW4) are common. Several classes of public roads (BL3) traverse the area (habitat classifications based on Fossit 2000).

1.3.1 General Description of Area and Habitats

The landscape is characterised by relative tranquillity with the principal agricultural land use in the area being permanent grassland pasture, grazed principally by cattle and horses. Most pastures are of high quality improved grassland but poorer quality wet grasslands are also used for agricultural purposes. Some fields are also in use for tillage. A number of coniferous plantations are present as is some scrub. Deciduous woodlands occur but are uncommon. Areas of blanket bog are widespread. There are three large rivers (Boyne, Blackwater and Slate), two canals (the Royal and the Grand) and many small tributaries and drains in the area. Habitats are described individually over.

1.3.2 Designated Sites of Conservation Interest in the Locality

The development area is within the catchment of the River Boyne and River Blackwater Special Area of Conservation Site Code 002299.

1.3.3 Grassland: Improved (GA1), Wet (GS4); Arable Crops (BC1)

The grasslands are mostly improved pastures of variable quality, predominantly used for grazing and silage but wet grasslands also occur. Field size varies in the area and most field boundaries are of hedgerows of varying quality and treelines but some have been removed and replaced by light fencing or temporary electric fences.

1.3.4 Hedgerows (WL1), Treelines (WL2), Stone Walls (BL1), Earthen Banks (BL2)

The structure of hedgerow boundaries varies in the study areas but is principally of hawthorn *Crataegus monogyna* and with taller emergent trees. Hedgerows also occur with stone walls or earthen banks as boundaries in some areas.

1.3.5 Woodland: Coniferous (WD4), Deciduous (WD1)

Dense stands of semi-mature conifer plantations occur in some areas. These woodlands have limited ground flora. Some stands are edged with deciduous tree species and these are more favourable to bats. Deciduous woodlands exist but they are not extensive or common but, where present, are very favourable bat habitats.

1.3.6 Scrub (WS1)

Scrub is present in some wetter areas and in clear-felled areas of commercial forestry.

1.3.7 Blanket Bog (PB3), Cutaway Blanket Bog (PB4)

Large areas of blanket bog occur but these have been largely cutaway historically. Industrial peat cutting continues in some areas.

1.3.8 Rivers, Canals, Streams (FW2), Drains (FW4)

The proposed development areas are within the catchments of the Boyne, Slate and Blackwater rivers as well as numerous small tributaries including streams and drains.

1.3.9 Built Land, Roads (BL3)

Apart from major and minor roads and lanes, there are also many tracks that serve as access to farms and houses within the survey areas. Bridges and culverts occur throughout and dwellings, farm buildings, disused and derelict structures are also present.

1.4 Desk Study Findings

A review of existing bat records within 30km and 10km of the study areas (sourced from BCIreland's National Bat Records Database) reveals that, currently, eight of the ten known Irish species have been observed within a 30km radius. These include common, soprano and Nathusius' pipistrelles, Leisler's, brown long-eared, Daubenton's *Myotis daubentonii,* whiskered *M. mystacinus* and Natterer's *M. nattereri* bats as shown in Tables 1 to 12 below. Roosts of several of these species, as shown in the tables, have also been identified within these radii but none are within or immediately adjacent to any of the study areas.

The two remaining Irish species; lesser horseshoe and Brandt's *M. brandtii* bats have not been recorded in the local area to date. Of these, the lesser horseshoe bat is not known to occur in either county as the species' distribution range is confined to the west of Ireland and only a single confirmed specimen of Brandt's bat has been found in Ireland (Mullen 2007). Further information on the Irish bat species is given in Appendix 1 and 2.

Tables 1 to 12 below outline the adjudged status of each bat species within a 30km and a 10km radius of each of the respective study areas.

Table 1: Adjudged status of Irish bat species within a 30km radius of the Ballynakill study area

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	12 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	22 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		12 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	10 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	23 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	3 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	1 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			18 known	BCIreland

Table 2: Adjudged status of Irish bat species within a 10km radius of the Ballynakill study area

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	1 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	2 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		3 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	4 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	4 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Potential	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Potential	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland

Table 3: Adjudged status of Irish bat species within a 30km radius of the Windmill study area

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	10 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	17 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		10 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	8 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	25 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	4 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			17 known	BCIreland

Table 4: Adjudged status of Irish bat species within a 10km radius of the Windmill study area

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	10 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	17 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		10 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	3 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	3 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			2 known	BCIreland

Table 5: Adjudged status of Irish bat species within a 30km radius of the Drehid study area

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	14 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	20 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		20 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	12 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	32 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	3 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	3 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	2 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			20 known	BCIreland

Table 6: Adjudged status of Irish bat species within a 10km radius of the Drehid study area

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	1 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	1 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		3 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	2 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	3 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Potential	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Potential	0 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland

Table 7: Adjudged status of Irish bat species within a 30km radius of the Hortland study area

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	18 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	18 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrelle* spp.		18 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	27 known	BCIreland/Pers. Obs.

Common name	Scientific name	30km radius	Known roosts	Source
Brown long-eared bat	*Plecotus auritus*	Present	35 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	4 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	4 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	2 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			21 known	BCIreland

Table 8: Adjudged status of Irish bat species within a 10km radius of the Hortland study area

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	2 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	3 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		2 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	2 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	2 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Potential	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Potential	0 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			1 known	BCIreland

Table 9: Adjudged status of Irish bat species within a 30km radius of the Derrybrennan study area

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	1 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	23 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrelle* spp.		11 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	11 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	26 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	3 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			19 known	BCIreland

Table 10: Adjudged status of Irish bat species within a 10km radius of the Derrybrennan study area

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	1 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	0 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		1 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	3 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	5 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Potential	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			1 known	BCIreland

Table 11: Adjudged status of Irish bat species within a 30km radius of the Cloncumber study area

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	17 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	24 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		1 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	3 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	32 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	2 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	4 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	3 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			21 known	BCIreland

Table 12: Adjudged status of Irish bat species within a 10km radius of the Cloncumber study area

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	0 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	0 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	0 known	BCIreland/Pers. Obs.

Common name	Scientific name	10km radius	Known roosts	Source
Brown long-eared bat	*Plecotus auritus*	Present	3 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Potential	0 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			2 known	BCIreland

1.5 Field Study Findings

In 2013, onsite bat activity surveys were undertaken during the spring, summer and autumn seasons in May, June and September. A total of 21 nights of onsite survey were undertaken which identified five bat species; common and soprano pipistrelle, Leisler's, brown long-eared and Daubenton's bat.

1.5.1 Bat Activity Survey Findings

The key locations of importance for bats in the local area include water bodies, watercourses, woodlands, treelines and hedgerows. Additional habitats include scrub and scattered trees. The bat fauna present onsite is typical of the habitats present, with the predominantly pasture grassland landscape providing a limited range of habitats. Faunal diversity is greater in areas dominated by semi-natural vegetation.

Common and soprano pipistrelles were the most commonly recorded species onsite and were ubiquitous along hedgerows, treelines and the edges of forests throughout the area.

Brown long-eared bat was encountered in several areas but this species may be present without being detected as it is a very quiet species and sometimes hunts without echolocating.

Leisler's bat, which forages over agricultural landscapes, scrub and woodland as well as urban areas, was widespread across the area.

Daubenton's bat, which forages over open water, was observed on the Grand Canal at Cloncumber and one the larger rivers in the area. This species travels over considerable distances along watercourses and is also found on smaller water bodies such as ponds and pools. It often roosts beneath stone masonry bridges, taking advantage of cracks and crevices. In such locations, roosts are vulnerable through infilling of fissures during maintenance works, impacts of lighting etc.

The bat observations recorded at the proposed locations of each turbine are shown in Table 3 below.

Table 13: Bat observations at proposed turbine locations

Turbine number	Habitat Code	Bat species	Comments
1	GA1, WL1	Common pipistrelle	Low activity
2	GA1, WL1	Common pipistrelle	Low activity
3	GA1, WL1	Common pipistrelle Soprano pipistrelle Brown long-eared	Low activity

Turbine number	Habitat Code	Bat species	Comments
4	GA1, WL1	Common pipistrelle Soprano pipistrelle Brown long-eared Leisler's	Low activity
5	GA1, WL1	Common pipistrelle Leisler's	Low activity
6	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
7	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
8	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
9	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
10	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
11	WD4	Common pipistrelle Soprano pipistrelle	High activity
12	WD4	Common pipistrelle Soprano pipistrelle Leisler's	High activity
13	WS1	Common pipistrelle Soprano pipistrelle	Low activity
14	WS1	Soprano pipistrelle Leisler's	Low activity
15	WS1	Common pipistrelle Soprano pipistrelle	Low activity
16	WS4, WL1	Common pipistrelle Soprano pipistrelle	Low activity
17	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
18	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
19	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
20	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
21	GA1, WL1	Common pipistrelle	Low activity
22	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
23	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity

Turbine number	Habitat Code	Bat species	Comments
24	PB4	Common pipistrelle Soprano pipistrelle	Low activity
25	PB4	Common pipistrelle Soprano pipistrelle	Low activity
26	PB4	Common pipistrelle Leisler's	Low activity
27	GA1	Common pipistrelle Leisler's	Low activity
28	WD4	Common pipistrelle	Low activity
29	WD4	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
30	WD4	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
31	WD4	Common pipistrelle Soprano pipistrelle	Low activity
32	WD4	Common pipistrelle Leisler's	Low activity
33	GA1	Common pipistrelle Soprano pipistrelle	Low activity
34	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	High activity
35	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
36	GA1	Common pipistrelle Soprano pipistrelle	Low activity
37	GA1	Common pipistrelle Soprano pipistrelle Leisler's bat	Low activity
38	GA1	Soprano pipistrelle	Low activity
39	GA1	Common pipistrelle Soprano pipistrelle	Low activity
40	WD4	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
41	GA1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
42	WD4	Common pipistrelle Soprano pipistrelle Leisler's	High activity
43	WD4	Common pipistrelle Soprano pipistrelle Leisler's	High activity

Turbine number	Habitat Code	Bat species	Comments
44	WD4	Common pipistrelle Soprano pipistrelle	Low activity
45	WD4	Common pipistrelle	Low activity
46	GA1	Common pipistrelle	Low activity
47	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity

1.5.2 Roost Survey Findings

During survey, a soprano pipistrelle roost was identified in a waste water treatment plant to the west of Longwood village but this is outside the study areas.

1.5.3 High and Medium Voltage Cable Routes Structure Survey Findings

Several structures along the proposed High (HV) and Medium Voltage (MV) cable routes were inspected for their potential to harbour bat roosts. These included 23 culverts and 9 bridges as shown in Table 14 below with their adjudged potential to be used by bats.

The structures varied in their favourability for use by bats. Some have been completely sealed by concrete which prevents bat use while others have crevices between stonework in which bats can secrete themselves.

Three culverts and seven bridges have uncluttered access for bats, are high enough to off-set the risks of predation and complete inundation and have crevices that are favourable for bat use.

Table 14: Bat roost potential within impacted structures along the HV and MV cable routes

Structure	Bat potential	Location	Comments
Bridge	Nil	N705 215	Low, prone to predation and flooding
Bridge	Nil	N703 216	Sealed – no available crevices for bat-use
Culvert	Nil	N711 233	Low, prone to predation and flooding
Culvert	Nil	N708 242	Low, prone to predation and flooding
Culvert	Nil	N704 255	Low, prone to predation and flooding
Culvert	Nil	N706 266	Low, prone to predation and flooding
Bridge	**Potential**	**N710 287**	**Some crevices present**
Bridge	**Potential**	**N716 293**	**Some crevices present**
Bridge	**Low**	**N719 293**	**Low, prone to predation and flooding**
Culvert	**Low**	**N715 305**	**Low, prone to predation and flooding**
Culvert	**Low**	**N715 313**	**Low, prone to predation and flooding**
Culvert	Nil	N736 336	Low, prone to predation and flooding
Culvert	Nil	N770 322	Low, prone to predation and flooding
Culvert	Nil	N778 333	Low, prone to predation and flooding
Culvert	Nil	N717 348	Low, vegetated, prone to predation and flooding
Culvert	Nil	N710 362	Low, prone to predation and flooding
Bridge	**Potential**	**N921 342**	**Some crevices present**

Structure	Bat potential	Location	Comments
Culvert	Nil	N895 342	Low, prone to predation and flooding
Culvert	Nil	N885 340	Low, prone to predation and flooding
Culvert	Nil	N877 337	Low, prone to predation and flooding
Culvert	Nil	N851 332	Low, prone to predation and flooding
Culvert	**Limited**	**N827 342**	**Low, prone to predation and flooding**
Culvert	Nil	N824 348	Low, prone to predation and flooding
Culvert	Nil	N816 357	Low, prone to predation and flooding
Bridge	**Potential**	**N807 374**	**Some crevices present**
Culvert	Nil	N795 379	Low, prone to predation and flooding
Culvert	Nil	N839 384	Low, prone to predation and flooding
Bridge	**Potential**	**N876 404**	**Some crevices present**
Bridge	**Potential**	**N881 405**	**Some crevices present**
Culvert	Nil	N939 452	Low, prone to predation and flooding
Culvert	Nil	N946 463	Low, prone to predation and flooding
Culvert	Nil	N949 467	Low, prone to predation and flooding

There are no known bat hibernation sites within the study areas. Minor hibernation sites certainly occur but these are of single specimens or small numbers of bats that find winter refugia in older stone structures, trees and unheated modern buildings where they over-winter beneath slates, lead flashing and ridge tiles or within cavity walls etc. No hibernation site was identified during the present assessments.

1.6 Overall Assessment of Scientific Interest of Area for Bats

The habitats in the area of the proposed scheme may be considered in terms of extent, diversity, naturalness, rarity, fragility, typicalness, recorded history, position, potential value and intrinsic appeal (Regini, 2000). The potential of these habitats for bat fauna is considered in this framework also.

The area may be considered in terms of the principal habitats or land use zones present and the principal areas of ecological interest in relation to bats present on or near the study areas include:

1. Deciduous woodlands, treelines, hedgerows and scrub provide potential roosting, foraging and commuting opportunities for bats. Considered as of high local value.

2. Coniferous woodlands, although non-native, provide shelter belts for foraging and commuting bats and are considered to have low local value.

3. The Boyne, Slate and Blackwater rivers and their tributaries provide foraging habitat and commuting routes across the area for bats. Such watercourses are considered as of high local or national value.

1.6.1 Agricultural Areas and Associated Hedgerows and Treelines

Most of the agricultural areas may be considered as of low or negligible interest from a bat perspective. The habitats onsite are low-grade and widespread. However, many of the onsite hedgerows are relatively diverse and therefore of moderate local value being used for both commuting and foraging.

1.6.2 Woodland and Scrub

Deciduous woodland and scrub habitats provide areas where insect prey can accumulate for bat foraging and are considered as of high local value in relation to bats. Coniferous woodland is much poorer being non-native and mono-cultural and so is considered as of moderate value.

1.6.3 Blanket Bog

Being an open habitat, blanket bog is poor for bats unless taller scrub is present in places to act as shelter for insect swarms. These are considered as of low value in relation to bats.

1.6.4 Rivers, Canals, Streams and Drains

Rivers and streams and their associated riparian habitat provide important wildlife corridors for a number of mammalian (including bats), avian and invertebrate species of conservation interest and their quality should be maintained.

1.7 Assessment of Proposed Development

The field study findings indicate that a diverse range of bat species use the landscape in the study areas and the key potential impacts on these animals arise through potential roost loss, loss of feeding areas and disruption of commuting routes.

A variety of habitats occur in the area which vary in their importance for bats. The loss of areas of improved agricultural grassland will have negligible or minor impact on bats. Watercourses should not be significantly impacted by the proposed development and thus bats are likely to continue using them. The main impact on bats arises through the potential loss of woodland, mature deciduous trees and hedgerows which are widely used by these animals.

As the study areas include open fields amid tall vegetation that provide sheltered areas in which insects can swarm, it is favourable for foraging bats and the field surveys have confirmed the presence of five bat species and others may be expected to occur on occasion. Apart from one, each of the bat species confirmed or expected onsite are normally low fliers e.g. <10m above ground level and thus are considered to be at a low risk from turbine impacts. The exception is Leisler's bat which is a high-flying species and as such is of most concern.

Leisler's bat is classified as a *high risk* species in relation to wind turbines as it is a high flier (Carlin and Mitchell-Jones 2012) which travels considerable distances (up to 13.4km has been recorded in Ireland, Shiel *et al.* 1999) between roosts and foraging areas. The species has evolved for fast flight in excess of 40km/h (Dietz *et al.* 2007) and is less manoeuvrable as a consequence. It therefore avoids cluttered environments by keeping above the tree canopy normally flying between 10m and 70m above the ground (Russ 1999) but which has been known to reach heights of 500m (Bruderer and Popa-Lisseanu 2005). Flying at such heights brings it into direct conflict with wind turbines.

Wind turbines are a known risk to bats (Arnett *et al.* 2008, Baerwald *et al.* 2008, Cryan and Brown 2007, Johnson *et al.* 2003, Johnson and Strickland 2004, Zagmajster *et al.* 2007) and the *EUROBATS Secretariat* has published guidelines on bats and wind farm projects (Rodrigues *et al.* 2008) to ensure bats are considered as part of development proposals. The Irish Government has yet to produce national guidelines as has been done in the UK and Northern Ireland but, following discussions with the *Irish Wind Energy Association, Bord Gáis Energy, Forestry Service, BirdWatch Ireland* and other interested parties, *Bat Conservation Ireland* published wind turbine/wind farm development bat survey guidelines in December 2012 (Version 2.8).

Although further worldwide research on bat/turbine interactions needs to be undertaken, studies to date in Europe and the U.S.A. (Kunz *et al.* 2007, Arnett *et al.* 2008, Horn *et al.* 2008, Rydell *et al.* 2010), have shown that bat mortality due to wind turbines is a serious issue.

To add to the dangers to bats of collision with a rotating turbine, a study in 2008 by Baerwald *et al.* showed that bats do not have to make contact with the turbine to be killed as the change in atmospheric pressure resulting from the rotating rotor causes bats' lungs to haemorrhage leading to the animal's death however the findings of this study have since been questioned (Rollins *et al.* 2012). While such foreign findings cannot be ignored, to date, there is no published research or survey evidence that the same scenarios apply in Ireland and there is no evidence of Leisler's bat mortality due to wind turbines in this country as, to date, no studies have been undertaken.

1.8 Potential Impacts

Bat species within the study areas will be affected by both the construction phase and subsequent existence of the wind development in the landscape. Apart from Leisler's bat which is a high flying species so will not be impacted unduly by the removal of vegetation along cable or haul routes, loss of foraging sites and commuting habitat may displace other bat species.

1.8.1 Potential Impacts during Construction

The construction of the planned wind development will involve offsite widening of existing road carriageways to allow unimpeded haulage of the large turbine sections. This road widening will involve tree and hedgerow removal which may affect bats. Existing bridges and culverts which may be in use by bats may also require strengthening to cope with increased loads during turbine delivery or works to facilitate cable placement. New onsite haul roads will also need to be constructed resulting in the loss of vegetation which may be in use as flight path features by bats. Onsite human construction activity may also cause disturbance to these animals. The foreseen potential impacts are as follows.

1.8.1.1 Potential Direct Impacts

- Loss of commuting and foraging habitats
- Loss of roosts in trees
- Loss of roosts in bridges/culverts

1.8.1.2 Potential Indirect Impacts

- Disturbance due to increased human activity

1.8.1.3 Potential Cumulative Impacts

- Displacement of populations
- Abandonment of young
- Mortality

1.8.2 Potential Impacts during Operation

Bat mortality due to collisions with wind turbines is well known and studies have further shown that bats may be killed without physically contacting turbine blades. The death of bats due to the presence of the operating turbines may reduce local bat populations especially if a turbine is sited near a roost. The planned turbine development is also to be sited within an area which is over-flown by Leisler's bat and whose hedgerow, treeline and forest edge habitats are currently in use by at least four other bat species. Although, as yet, there are no published results of a study of bat mortality from Irish wind turbines, considering recent research from mainland Europe and North America, there is an increasing amount of detailed published evidence that wind turbines cause bat fatalities. However, many of these overseas turbine/bat mortality studies are at wind farms, with significantly large numbers of turbines, sited along known bat migration routes where many hundreds or even thousands of bats commute seasonally resulting in numerous deaths and injuries. There is currently no evidence that mortality of bats on the same scale occurs here.

Also, although it is known that Nathusius' pipistrelle migrates from Scandinavia to Scotland and to the north of Ireland and back again (Russ *et al.* 2001), apart from this species, there is currently no evidence that internal or external bat migration routes of other bat species exist elsewhere in Ireland as no research has been undertaken. Nevertheless, risks to bats from wind turbines have to be acknowledged and it is possible that some bat mortality may occur due to the operation of the planned development therefore mitigation measures are recommended to reduce the likelihood of such fatalities. The foreseen potential impacts during operation are as follows.

1.8.2.1 Potential Direct Impacts

- Death through collision with turbine blades
- Death through barotrauma

1.8.2.2 Potential Indirect Impacts

- No indirect impacts envisaged

1.8.2.3 Potential Cumulative Impacts

- Mortality
- Reduction of local populations

1.8.3 Potential Impacts during Decommissioning

The possible impacts on bats during the decommissioning phase of the wind development are the same as those given for the construction phase of the project as similar activities which may affect bats will again be undertaken both on and offsite resulting in the potential

- loss of commuting and foraging habitats
- loss of roosts in trees
- loss of roosts in bridges/culverts and
- disturbance due to increased human activity.

1.9 Mitigation Measures

Standard mitigation measures, as would apply to any large-scale development, shall be adopted in the site clearance and construction of the turbines. These shall include limiting season of disturbance to trees and other vegetation so as to reduce impacts on breeding bird species and to implement measures to avoid and/or control pollution and sedimentation into watercourses. The following specific measures will be required to protect bats onsite.

The following mitigation measures are in line with the NRA guidelines on provisions for the conservation of bats during the planning and construction of roads (2006). Reference is made to the NRA Guidelines (*Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* and the *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*).

Each of the proposed locations of the 47 turbines was surveyed and the bat activity findings recorded have identified specific areas of conflict that are listed in Table 15 over along with recommended mitigation measures to prevent or reduce the potential negative impacts in these areas.

Table 15: Assessment of potential turbine / bat conflict zones

Turbine number	Nearest vegetation	Bat activity	Recommended mitigation measures and general comments
1	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey veteran ash tree with bat roost potential
2	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
3	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
4	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey mature beech and horse chestnut trees with bat roost potential
5	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
6	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey mature beech trees with bat roost potential
7	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
8	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
9	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
10	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey mature beech trees with bat roost potential
11	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
12	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
13	Scrub	Low	Remove vegetation within 60m of the turbine shaft
14	Scrub	Low	Remove vegetation within 60m of the turbine shaft
15	Scrub	Low	Remove vegetation within 60m of the turbine shaft
16	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
17	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
18	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
19	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
20	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
21	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
22	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
23	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
24	N/A	Low	No mitigation required
25	N/A	Low	No mitigation required
26	N/A	Low	No mitigation required
27	N/A	Low	No mitigation required
28	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
29	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
30	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
31	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
32	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
33	N/A	Low	No mitigation required
34	Hedgerow	High	Remove hedgerow vegetation within 60m of the turbine shaft
35	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
36	N/A	Low	No mitigation required

Turbine number	Nearest vegetation	Bat activity	Recommended mitigation measures and general comments
37	N/A	Low	No mitigation required
38	N/A	Low	No mitigation required
39	N/A	Low	No mitigation required
40	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
41	N/A	Low	No mitigation required
42	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
43	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
44	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
45	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
46	N/A	Low	No mitigation required
47	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft

As shown in the previous table, apart from four sites needing pre-construction tree surveys, mitigation measures to protect bats are required at 22 of the 47 proposed turbine locations. In all cases it is recommended that existing vegetation is cleared to provide a vegetation-free buffer zone around the turbine. This includes turbines T31 and T32 at Cloncumber which are within a *Coillte*-owned, set-aside biodiversity area. This area mainly consists of non-native coniferous woodland and removing such within a 60m radius of both turbines will not impact on the biodiversity value of the site as tree clearance should encourage the growth of ground-cover native bog flora.

1.9.1 Mitigation Measures during Construction

1.9.1.1 Buffer zones

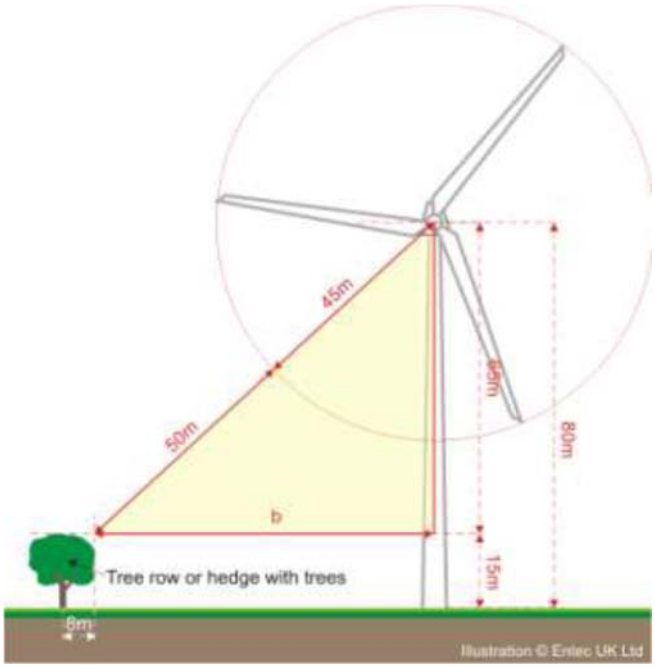
Bats commuting and foraging along onsite forest edge, treelines and hedgerows should be safeguarded by providing a 50m minimum distance buffer zone between the rotors of the planned turbines and the nearest vegetation to reduce the risk of collision and/or barotrauma. This is in line with present best practice guidelines (Carlin and Mitchell-Jones 2012) and should prevent impacts to bats that mainly fly low along such linear features e.g. the pipistrelles. Such a buffer zone can be provided by either siting the turbines so that rotors are a minimum of 50m away from existing vegetation or by felling any trees within 50m of rotors. Such cleared vegetation should be managed and maintained during the operational life of the development

From Carlin and Mitchell-Jones 2012: *It is incorrect to measure 50m from the turbine base to habitat feature at ground level as this would bring the blade tips very close to the canopy of a tall hedgerow tree and potentially put bat populations at risk. Instead, it is necessary to calculate the distance between the edge of the feature and the centre of the tower (b) using the formula:*

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

where, (in metres):

bl = blade length
hh = hub height
fh = feature height



For the example above, b = 69.3m

1.9.1.2 Removal of deciduous trees

Any mature broadleaved trees that are to be removed, should first be surveyed for bat presence by a suitably experienced specialist. If bats are found, an application for a derogation licence should be made to the *National Parks and Wildlife Service* to allow its legal removal. Such trees should ideally be felled in the period late August to late October, or early November, in order to avoid disturbance of any roosting bats as per *National Roads Authority* guidelines (NRA 2006a and 2006b) and also to avoid the bird breeding seasons. Tree felling should be completed by Mid-November at the latest as bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Trees with ivy *Hedera helix* cover, once felled, should be left intact onsite for 24 hours prior to disposal to allow any bats beneath foliage to escape overnight.

Landowners should be advised that the timber from felled trees will remain for their use. This should prevent trees being felled prematurely.

1.9.1.3 Retention of trees

Several species of bats roost in trees. Where possible, treelines and mature trees that are located immediately adjacent to the line of proposed haul roads or are not directly impacted should be avoided and retained intact. Overall impacts on these sites should be reduced through modified design and sensitivity during construction. Any trees and treelines along approach roads and planned site access tracks should be retained where possible. Retained trees should be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees should be fenced off by adequate temporary fencing prior to other works commencing.

1.9.1.4 HV and MV cable routes – other structures

Should any further structures be impacted by changes to the current proposed HV and MV cable routes then these should be assessed for their potential to harbour bats prior to works and the findings reported. If bat use is confirmed, appropriate mitigation measures should be taken to ensure no animals are harmed.

1.9.1.5 Compensation for loss of commuting routes

Linear features such as hedgerows and treelines serve as commuting corridors for bats (and other wildlife). Mitigation measures are recommended to compensate for the loss of these features that are used by bats as commuting routes. These measures will also compensate for habitat loss and provide continuity in the landscape.

Severed linear features such as hedgerows and treelines should, where possible, be reconnected using semi-mature trees under-planted with hedgerow species to compensate for the loss of treelines and hedgerows that are currently used by bats. The exact locations of such planting will be designed at detailed landscaping stage. Native species should be used as they support more insect life than non-native varieties.

All planting shall preferably, be completed during the pre-construction phase to provide hedgerow/tree growth prior to completion of the development. This would ensure that bats commuting in the area have prior knowledge of newly planted landscape features as well as ensuring the newly planted hedgerows/treelines are well established prior to completion of the wind farm.

1.9.1.6 Habitat retention, replacement and landscaping

Habitat replacement and landscaping could compensate for or add to the wildlife value of the area and also provide areas of aesthetic as well as wildlife interest. Further pro-active habitat restoration measures are considered below.

In general, best practice design should aim to retain the quality of the landscape where possible and ensure its protection within the landscaping programme. Existing hedgerows and treelines, semi-natural scrub or semi-natural grasslands should be retained where possible and incorporated into the landscaping programme.

The overall design of the project should also include habitat replacement or enhancement of existing onsite woodland, hedgerow, treeline and scrub habitats and it is recommended that the planting of native broadleaved trees is also considered. Native species should be chosen in all landscaping schemes. Planting schemes should attempt to link in with existing wildlife corridors (hedgerows and treelines) to provide continuity of wildlife corridors.

1.9.1.7 Bridges and culverts on HV and MV cables/turbine delivery routes

If any of the structures listed in Table 5 that showed potential for use by bats or any other local bridge or culvert is to be strengthened prior to use for haulage of construction materials for this development, it should first be surveyed/re-surveyed for bat presence prior to any upgrading or maintenance works. Bats, especially Daubenton's, regularly use bridges for roosting and are vulnerable within such structures due to infilling of crevices during which they may be entombed. If bats are found then some crevices beneath the bridge should be retained for their continued use according to best practice bat mitigation measures for bridge works (see *Billington and Norman 1997, Highways Agency 2001, Joint Nature Conservation Committee 2004, National Roads Authority 2006a/2006b* and *Shiel 1999*). Any re-pointing or pressure grouting of bridges should only proceed after an inspection of the structure for bats and, should bats be found, an application for a derogation licence to legally allow works on or near a bat roost, which is a notifiable action under current legislation (see Appendix 4), should be made to the *National Parks and Wildlife Service*.

1.9.1.8 Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) should be used to prevent overspill. This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

1.9.2 Mitigation Measures during Operation

1.9.2.1 Buffer zones

The vegetation-free buffer zones around the identified 38 turbines should be managed and maintained during the operational life of the development.

1.9.2.2 Changes to cut-in speeds

Due to mitigation by design, as each turbine is to be sited a suitable separation distance to hedgerows and/or trees or such vegetation is to be removed to ensure a vegetation-free buffer zone, no operational curtailment of any turbine as a mitigation measure is required however, should any turbine be relocated so that its blade tip is less than 50m from any hedgerow or treeline, the recommended mitigation measure is to increase the turbine's cut-in speed during the active bat period from April to September, inclusive. Increasing the cut-in speed to 5.5m/s from 30 minutes prior to dusk to 30 minutes after dawn has been shown to protect bats (Arnett *et al.* 2010). This measure should be actioned during optimal bat hunting conditions when wind speeds are less than 5.5m/s and air temperature is greater than 7ºC as measured onsite.

1.9.2.3 Bat fatality monitoring

As no research currently exists on bats and wind farms in Ireland, the planned development could provide an opportunity to gain baseline data on bat/turbine interaction and it is recommended that the scheme be monitored for bat fatalities for the first three years of operation. A comprehensive onsite avian fatality monitoring programme is to be undertaken following published best practice. This fatality monitoring programme should be extended and duplicated for bat fauna. The primary components of the bird mortality programme are outlined below and an assessment of bat mortality would essentially follow the same methodology.

a. Carcass removal trials to establish levels of predator removal of possible fatalities. This should be done following best recommended practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. No turbines which are used for carcass removal trials should be used for subsequent fatality monitoring.

b. Turbine searches for fatalities should be undertaken following best practice in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above.

c. The large scale and clustered nature of the proposed wind farm provides an opportunity for a standardised approach with a possible control group of one cluster and/or variation in search techniques such as straight line transects/randomly selected spiral transects/dog searches as a means of robustly estimating the post construction impact in terms of fatality.

d. Recorded fatalities should be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

1.9.2.4 Monitoring of mitigation measures

The success of the implemented mitigation measures for bats on the project should be monitored for a period of three years after construction and appropriate measures taken to enhance these if and where required. A recommended schedule for such monitoring is given in Table 16 over.

Table 16: Monitoring schedule recommended for bat mitigation measures

Mitigation measure	Monitoring required	Description	Duration
Newly planted hedgerows and treelines	Ensure viable growth of planting	Planted material shall be checked periodically over the growing season to remove dead material. Any dead material shall be replaced within the same season with viable stock according to age/height restrictions already specified in mitigation.	From time of planting to 1 year post construction
Bat boxes and tubes	Monitor bat use	Bat boxes and tubes shall be examined by a licensed bat specialist following or pursuant to NPWS guidance. Records should be submitted to *Bat Conservation Ireland* for inclusion in their bat distribution database. Re-site if necessary. Annual cleaning required if well used by bats or if used by birds. Replacement if damaged/lost.	From mounting to 3 years post construction.
Mortality study	Fatality monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation to three years post commissioning.

1.9.3 Mitigation Measures during Decommissioning

Mitigation measures implemented during decommissioning should be the same as those recommended for implementation during construction.

1.10 Residual Impacts

Some of the planned turbines are to be located within or close to existing vegetation but providing a vegetation-free buffer zone around these turbines or increasing cut-in speeds should reduce the risk of collision and/or barotrauma to foraging and/or commuting species such as pipistrelles.

The adjudged worst case scenario is that, during operation, the turbines may possibly cause injury or death to a few individual specimens of Leisler's bat as it is a high flying species (10m to 70m+). However, the amount of time spent hunting at the upper height limit cannot be assessed accurately due to the maximum distance (60m to 80m) of detection of this species by ultrasound detectors (Rodrigues *et al.* 2008) but most activity and time can be expected to occur in the mid-region of the species hunting altitude i.e. 40m. The resulting impact of the proposed development on local bat populations, with implemented mitigation measures, is considered to be minor negative with the favourable conservation status (FCS) of bat species being unaffected and all species confirmed or expected on or near the study areas are anticipated to persist.

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2 APPENDICES

2.1 Appendix 1: Bat Ecology

Introduction

The bat is the only mammal that is capable of true flight using modified hands and arms which are covered by a supple membrane of skin. This ability has allowed bats to exploit aerial insect prey and avoid predation. As the largest mammalian group after the rodents (to which they are not related), bats are very successful and have diversified into over 1,200 species worldwide, representing almost a quarter of all mammal species. Within such diversification, they have evolved a range of hunting strategies, means of reproduction, roosting behaviours and social interactions (Kunz 1982). They are found throughout the world and in every continent apart from Antarctica.

Bats are classified within the Order Chiroptera (meaning 'Hand-wing') and this is further divided into two Superfamilies: the Megachiroptera and Microchiroptera. The former are mainly fruit-eaters while the latter are predominantly insectivorous. Of these, 52 bat species are currently known in Europe.

Irish bat species

In Ireland, nine species of bat are currently known to be resident while others may yet be confirmed. These are classified into two Families: the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats). The lesser horseshoe bat *Rhinolophus hipposideros* is the only representative of the former Family in Ireland. All the other Irish bat species are of the latter Family and these include three pipistrelle species: common *Pipistrellus*, soprano *P. pygmaeus* and Nathusius' *P. nathusii*, four *Myotids*: Natterer's *Myotis nattereri*, Daubenton's *M. daubentonii*, whiskered *M. mystacinus*, Brandt's *M. brandtii*, the brown long-eared *Plecotus auritus* and Leisler's *Nyctalus leisleri* bats.

Individual species accounts with distribution maps of bats recorded or expected to occur onsite are given in Appendix 2 below.

Hunting with sound

The microbats are unique as they use a type of sonar, called echolocation, by which they hunt their prey. This is a stream of sound produced at high frequencies which allows the animal to build-up a complete 'sound picture' of their surroundings. These sounds are produced well beyond the range of human hearing. Using these sounds, the bats are able to detect the clutter of nearby leaves, hear an insect, know how fast it is travelling, how fast its wings are beating, whether it is hard or soft bodied etc. before closing in for the catch. Although bats use this method to find their way around, they also use their eyes to see in low light levels.

All the European bat species feed exclusively on insects and/or spiders and a pipistrelle, weighing only 4 to 8 grams, will eat up to 3,500 insects every night. This allows the bat to increase its body weight by 50% each night but this is immediately burned off through calorie consumption while flying. Such feeding ensures a build-up of fat in the form of brown adipose tissue between the shoulder blades of the bat which acts as a winter fuel store to keep the animal alive while in hibernation.

Roosting behaviour

Bats naturally roost in caves and trees but some species have recently adapted to using man-made structures for roosting. Being social animals, these roosts can reach substantial numbers in the peak period of bat activity in mid-summer and especially if the roost has been selected as a maternity site. These nursery roosts are mainly composed of breeding females but often they include some non-breeding females and males that may be the previous season's young still with their mother. Males are more solitary and form smaller roosts apart from the females.

For summer roosts, bats seek warm temperatures but, for hibernation in winter, they require constant temperatures of only 5° or 6°C and humid surroundings to keep from dehydrating. In mild winters, bats will emerge from such sites to hunt should insects be on the wing.

Breeding and longevity
In autumn, male bats attract females by song flights and form harems with up to 20 females being defended by a male. After mating, the males take no further part in the rearing of the young.

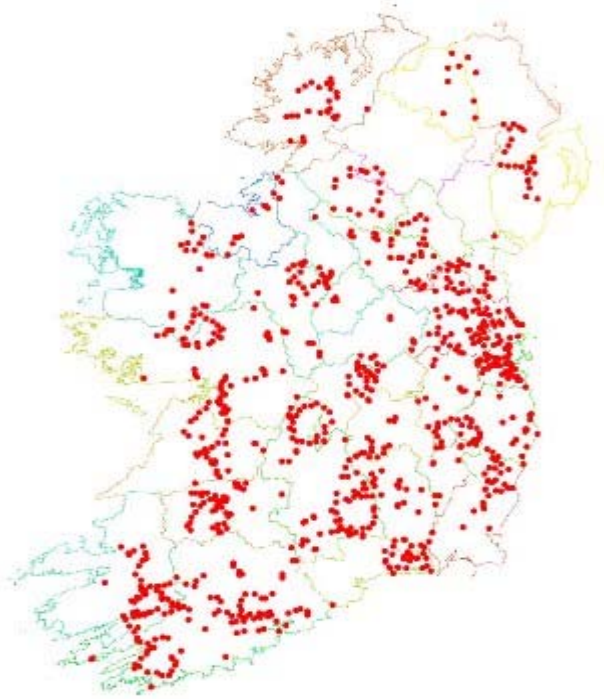
Irish bats can produce one young per year but, more usually, only one young is born in spring every two years (Boyd and Stebbings 1989). There is no fixed pregnancy period and gestation is governed by ambient temperature. The slow rate of reproduction by bats inhibits repopulation in areas of rapid decline. Although bats have been known to live for twenty or more years, this is rare as most die in their first and the average lifespan, in the wild, is four years. The survival of the young is closely linked to climate and poor weather in spring and summer can result in high infant mortality.

Threats
All bat species are in decline as they face many threats to their highly developed and specialised lifestyles. Many bats succumb to poisons used as woodworm treatments within their roosting sites (Racey and Swift 1986). Agricultural intensification, with the loss of hedgerows, treelines, woodlands and species-rich grasslands have impacted bat species also. Habitual roosting or hibernation sites in caves, mines, trees and disused buildings are also often lost to development. Summer roosts are prone to disturbance from vandals. Agricultural pesticides accumulate in their prey, reaching lethal doses (Jefferies 1972). Chemical treatments in cattle production sterilise dung thus ensuring that no insects can breed within it to be fed upon by bats. Likewise, river pollution, from agricultural runoff, reduces the abundance of aquatic insects. Road building, with the resultant loss of foraging and roosting sites is a significant cause in the reduction of bat populations across Europe.

Extinction
As recently as 1992, the greater mouse-eared bat *Myotis* became the first mammal to become extinct in Britain since the wolf in the 18th century.

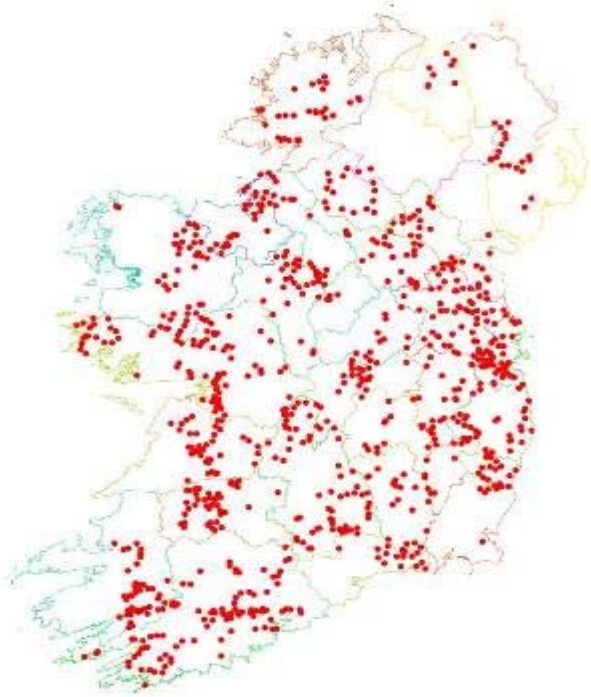
2.2 Appendix 2: Description of the Irish bat species

Brief species accounts and current known distribution (maps from *Bat Conservation Ireland*)



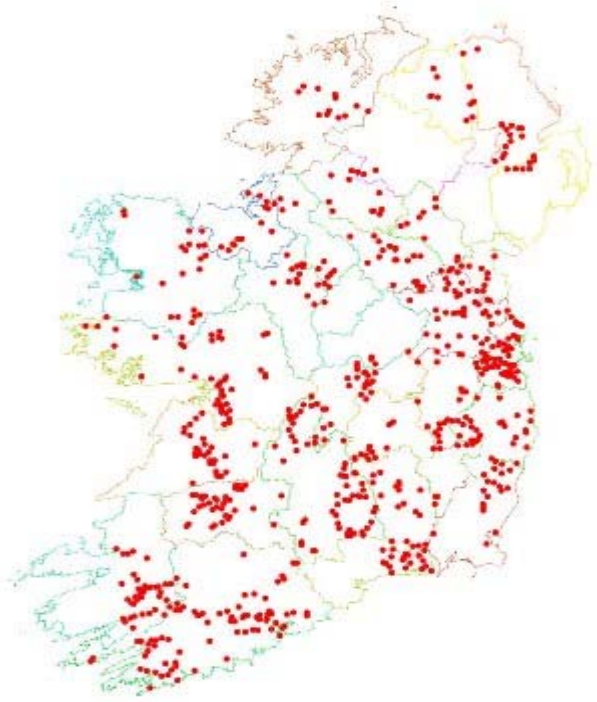
Common pipistrelle *Pipistrellus*

This species was only recently separated from its sibling, the soprano or brown pipistrelle *Pipistrellus pygmaeus*, which is detailed below (Barratt *et al.* 1997). The common pipistrelle's echolocation calls peak at 45 kHz. The species forages along linear landscape features such as hedgerows and treelines as well as within woodland.



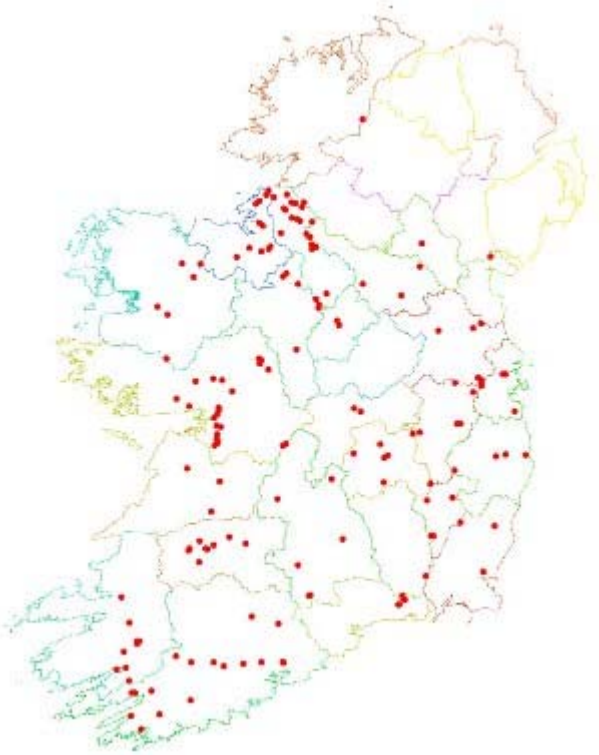
Soprano pipistrelle *Pipistrellus pygmaeus*

The soprano pipistrelle's echolocation calls peak at 55 kHz, which distinguishes it readily from the common pipistrelle. The pipistrelles are the smallest and most often seen of our bats, flying at head height and taking small prey such as midges and small moths. Summer roost sites are usually in buildings but tree holes and heavy ivy are also used. Roost numbers can exceed 1500 animals in mid-summer.



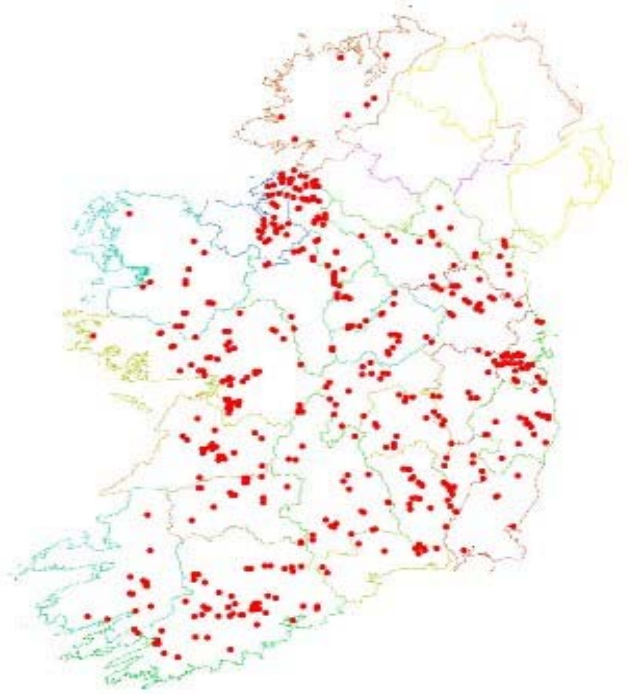
Leisler's bat *Nyctalus leisleri*

This species is Ireland's largest bat, with a wingspan of up to 320mm; it is also the third most common bat, preferring to roost in buildings, although it is sometimes found in trees and bat boxes. It is the earliest bat to emerge in the evening, flying fast and high with occasional steep dives to ground level, feeding on moths, caddis-flies, and beetles. The echolocation calls are sometimes audible to the human ear being around 15 kHz at their lowest. The audible chatter from their roost on hot summer days is sometimes an aid to location. This species is uncommon in Europe and Ireland holds the largest national population. The species is considered as *Internationally Important*.



Natterer's bat *Myotis nattereri*

This species has a slow to medium flight, usually over trees but sometimes over water. They follow hedges and treelines to their feeding sites, consuming flies, moths and caddis-flies. Natterer's bats are frequently recorded in hibernation sites in winter but there are few records of summer roosts. Those that are known are usually in old stone buildings but they have been found in trees and bat boxes. The status of the Natterer's bat has not been determined but it is classed as *Threatened* and is listed in the *Irish Red Data Book* (Whilde 1993).

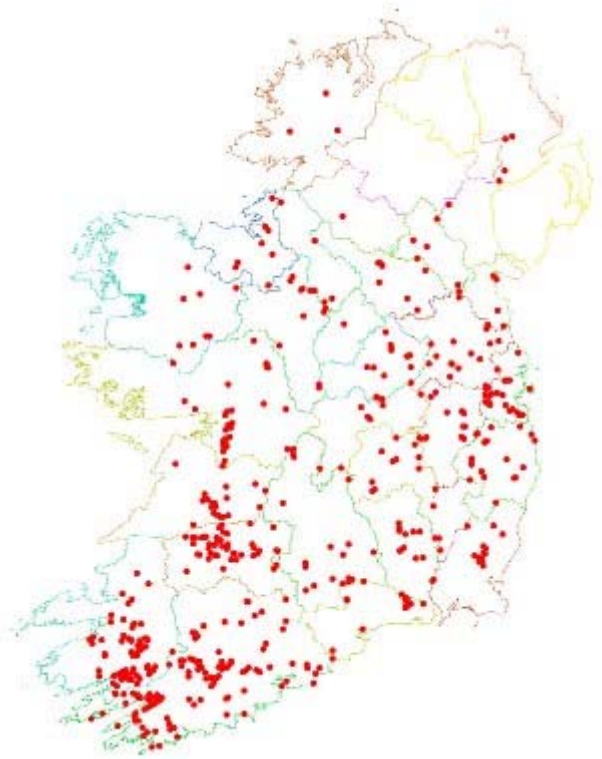


Daubenton's bat *Myotis daubentonii*

This bat species feeds close to the surface of water, either over rivers, canals, ponds, lakes or reservoirs, but can also be found foraging in woodlands. Flying at 15 kilometres per hour, it gaffs insects with its over-sized feet as they emerge from the surface of the water - feeding on caddis flies, moths, mosquitoes, midges etc. It is often found roosting beneath bridges or in tunnels and also makes use of hollows in trees.

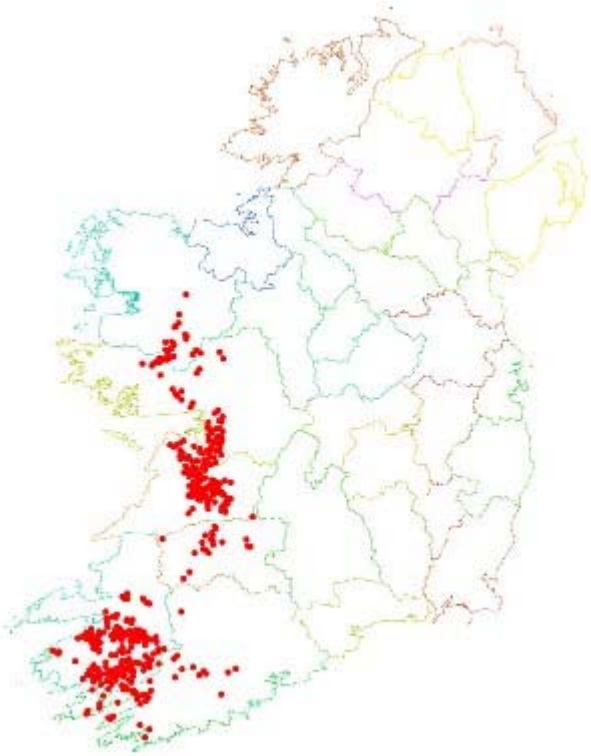
Whiskered bat *Myotis mystacinus*

This species, although widely distributed, has been rarely recorded in Ireland. It is often found in woodland, frequently near water. Flying high, near the canopy, it maintains a steady beat and sometimes glides as it hunts. It also gleans spiders from the foliage of trees. Whiskered bats prefer to roost in buildings, under slates, lead flashing or exposed beneath the ridge beam within attics. However, they also use cracks and holes in trees and sometimes bat boxes. The status of the species has not been determined but it is classed as *Threatened* and is listed in the *Irish Red Data Book* (Whilde 1993).



Brown long-eared bat *Plecotus auritus*

This species of bat is a 'gleaner', hunting amongst the foliage of trees and shrubs, and hovering briefly to pick a moth or spider off a leaf, which it then takes to a sheltered perch to consume. They often land on the ground to capture their prey. Using its nose to emit its echolocation, the long-eared bat 'whispers' its calls so that the insects, upon which it preys, cannot hear its approach (and hence, it needs oversize ears to hear the returning echoes). As this is a whispering species, it is extremely difficult to monitor in the field as it is seldom heard on a bat detector. Furthermore, keeping within the foliage, as it does, it is easily overlooked.



Lesser horseshoe bat *Rhinolophus hipposideros*

This species is the only representative of the Rhinolophidae family in Ireland. It differs from our other species in both habits and looks, having a unique nose leaf with which it projects its echolocation calls. It is also quite small and, at rest, wraps its wings around its body. Lesser horseshoe bats feed close to the ground, gleaning their prey from branches and stones. They often carry their prey to a perch to consume, leaving the remains beneath as an indication of their presence. The echolocation call of this species is of constant frequency and, on a bat detector, sounds like a melodious warble. Its distribution is restricted to the western Atlantic seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork (Kelleher 2004). However, single specimens have recently been discovered in Lough Key, near Boyle, Co. Roscommon in 2004 (B. Keeley, pers. comm.) and in Tubbercurry, Co. Sligo in 2008 (Kelleher, pers. obs.), two counties where their low numbers may have caused their presence to be overlooked in the past. This species is considered as *Internationally Important* and it is an Annex II species under the *EC Habitats Directive 1992*.

Nathusius' pipistrelle *Pipistrellus nathusii*

Nathusius' pipistrelle is a recent addition to the Irish fauna and, so far, has mainly been recorded from the north of the island in Cos. Antrim, Down and Longford (Richardson 2000) but is assumed to be spreading as single specimens have been recorded in Kerry and Cork (Kelleher 2006a) and elsewhere and the known resident population is enhanced in the autumn months by an influx of animals from Scandinavian countries. There is a likelihood, therefore, that this species may occur in the area as a vagrant especially in the autumn months. The status of the species has not been determined.

Brandt's bat *Myotis brandtii* (No map)

This sibling species to the whiskered bat is known from four specimens found to date in Cos. Wicklow (Mullen 2007), Cavan, Clare (B. Keeley, pers. comm.) and Tipperary (Kelleher 2006b). A fifth specimen was identified in Killarney National Park, Co. Kerry in August 2005 (Kelleher 2005 and 2006a). Its status is unknown.

2.3 Appendix 3: Legislation relating to bats

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is a notifiable action and a derogation licence has to be obtained from the *National Parks and Wildlife Service* before works can commence.

The current status and legal protection of the known bat species occurring in Ireland is given in the table below.

Common and scientific name	Wildlife Act 1976 & Wildlife (Amendment) Acts 2000 & 2010	Irish Red List status	Habitats Directive	Bern & Bonn Conventions
Common pipistrelle *Pipistrellus*	Yes	Least Concern	Annex IV	Appendix II
Soprano pipistrelle *P. pygmaeus*	Yes	Least Concern	Annex IV	Appendix II
Nathusius' pipistrelle *P. nathusii*	Yes	Not referenced	Annex IV	Appendix II
Leisler's bat *Nyctalus leisleri*	Yes	Near Threatened	Annex IV	Appendix II
Brown long-eared bat *Plecotus auritus*	Yes	Least Concern	Annex IV	Appendix II
Lesser horseshoe bat *Rhinolophus hipposideros*	Yes	Least Concern	Annex II Annex IV	Appendix II
Daubenton's bat *Myotis daubentonii*	Yes	Least Concern	Annex IV	Appendix II
Natterer's bat *M. nattereri*	Yes	Least Concern	Annex IV	Appendix II
Whiskered bat *M. mystacinus*	Yes	Least Concern	Annex IV	Appendix II
Brandt's bat *M. brandtii*	Yes	Data Deficient	Annex IV	Appendix II

It should also be noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997 and Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law), issued by NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007 – reproduced in Appendix 4.

Furthermore, on 21st September 2011, the Irish Government published the European Communities (Birds and Natural Habitats) Regulations 2011 which include the protection of the Irish bat fauna and further outline derogation licensing requirements re: European Protected Species.

2.4 Appendix 4: NPWS Circular Letter 2/07

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Circular Letter NPWS 2/07

16 May, 2007

Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species/ applications for derogation licences.

A chara,

I am directed by the Minister for the Environment, Heritage and Local Government to refer to the EU Habitats Directive, to the Habitats Regulations 1997-2005 which transpose that directive into Irish law,[1] and to Ireland's obligations under that Directive.

The Directive, and the implementing Regulations, require that certain species listed in Annex IV of the Habitats Directive are strictly protected. A list of these species is appended.

These species are not necessarily associated with areas subject to a specific nature designation: in the case of bat species and otters they may be found anywhere throughout the country.

Under Regulation 23 of the Habitats Regulations 1997, any person who, in regard to the animal species listed in Annex IV of the Habitats Directive-

"(a) deliberately captures or kills any specimen of these species in the wild,
(b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,
(c) deliberately takes or destroys the eggs from the wild, or
(d) damages or destroys a breeding site or resting place of such an animal,

shall be guilty of an offence."

[1] Council Directive 92/43/EEC of 21 May 1992, on the conservation of natural habitats and of wild flora and fauna, the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997), the European Communities (Natural Habitats) (Amendment) Regulations, 1998, (S.I. No. 233 of 1998), and the European Communities (Natural Habitats) (Amendment) Regulations, 2005, (S.I. No. 378 of 2005),

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Regulation 21 provides corresponding protection for Annex IV plant species.

The carrying out of any work that has the potential to disturb these species, and for which a derogation licence has not been granted, may constitute an offence under Regulation 21 or 23 of the Habitats Regulations.

It should be noted that in the case of Regulation 23 (d), it is not necessary that the action should be deliberate for an offence to occur. This places an onus of due diligence on anyone proposing to carry out an action or project that might result in such damage or destruction.

A particular concern arises regarding works carried out by or on behalf of local authorities themselves, including works of maintenance or repair.

Examples of cases that are likely to require assessment are the removal of trees and other habitat during the construction of roads or other infrastructure, the modification of the courses of rivers, drainage and discharge of water, and even the re-pointing or replacement of masonry in bridges, walls and other structures where bats are likely to roost, etc.

Procedure to be followed
Local authorities must ensure that they, their staff and their agents comply fully with the requirements of the Directive and the Regulations as follows:

1. In advance of any works, an appropriate initial assessment should be carried out by a person competent to identify where a risk of damage or disturbance to an Annex IV species may exist (e.g. by an appropriately qualified ecologist). The fact that such an assessment has been carried out should be recorded and kept with the papers associated with the project.

2. Projects where a risk is identified should be subject to an appropriate scientific assessment. It will be necessary to identify alternatives or modifications that will avoid that risk.

3. Where it is not possible to identify a means of avoiding the risk completely, the question of seeking a derogation licence from the Minister under Regulation 23 of the Habitats Regulations should be considered if it is desired, notwithstanding, to proceed with the action or project.

4. The Minister is empowered, within strict parameters, to grant a license for derogation from complying with the requirements of the provisions of section 21 of the Wildlife Act 1976 and Regulations 23 and 24 of the Habitats Regulations. The scope of the Minister's powers to grant derogation licences is set out in Regulation 23, as follows:

Where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range, the Minister may, in respect of those species, grant a licence to one or more persons permitting a

derogation from complying with the requirements of the provisions of section 21 of the Principal Act and Regulations 23 and 24 where it is—

(a) in the interests of protecting wild fauna and flora and conserving natural habitats, or

(b) to prevent serious damage, in particular to crops, livestock, forests, fisheries and water and other types of property, or

(c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment, or

(d) for the purpose of research and education, of repopulating and re-introducing these species and for the breeding operations necessary for these purposes, including the artificial propagation of plants,

(e) to allow, under strictly supervised conditions, on a selective basis and to a limited extent, the taking or keeping of certain specimens of the species to the extent (if any) specified therein, which are set out in the First Schedule.

6. Any application for a derogation licence (to be submitted to Mr Jamie Mulleady of this Department at: Species and Regulations Unit, National Parks and Wildlife Service, 7 Ely Place, Dublin 2 email: Jamie.mulleady@environ.ie) should address the criteria referred to in the above paragraph as well as proposed scientifically-based mitigation measures to address any potential impact on the identified Annex IV species. A decision on an application will be made on the basis of the information and proposals submitted and best scientific knowledge.

7. An application for such a derogation licence should be made in advance of seeking approval under Part 8 or 10 of the Planning and Development Regulations, 2001, as amended, or seeking planning permission for works. This will ensure that full consideration can be given to the impacts of the proposed project on the species and to avoid the possibility of delay to the proposed project or of a refusal of a derogation licence which would prevent the works being carried out as planned.

8. The obligation to obtain a derogation licence is additional to the requirement to notify the Minister of a proposed development which may have an impact on nature conservation to the Minister under article 82(3)(n) and others of the Planning and Development Regulations, 2001 (as amended). Local authorities should notify the Minister (Development Applications Unit) in any case where it appears that a proposed development may pose a risk to Annex IV species.

9. Should a problem be identified regarding Annex IV species in the course of works, this should be reported immediately to the National Parks and Wildlife Service. No further work that might impact on such species should take place unless a derogation licence has been obtained.

Applications for planning permission
Issues concerning damage or disturbance to Annex IV species also arise in the context of applications for planning permission for proposed development, e.g. proposals to renovate older houses. The responsibility of avoiding disturbance or damage to Annex IV species, or of obtaining an appropriate derogation licence, rests with the developer.

However, planning authorities should note that in any case where it appears that a proposal may pose a risk to Annex IV species, the planning application should be referred to the Minister under article 27(1)(n) of the Planning and Development Regulations 2001 (as amended). This referral should be done in the appropriate manner for applications having impacts on nature conservation sites. Planning authorities could also take the opportunity afforded by any pre-application discussions to alert prospective applicants to the requirements in relation to Annex IV species.

Further information
Species Action Plans, which set out specific measures for the monitoring and protection of these species, have been or are being prepared. They are published on www.npsw.ie or can be obtained from Species Unit (Tel: 01 888 3212). Guidelines in regard to bats are available at www.npsw.ie.

General questions in relation to the protection of Annex IV species or require any further information on an application for a derogation licence should be referred to Species Unit (01 8883214). Specific queries regarding a proposed project, location or species should be referred to the appropriate National Parks and Wildlife Service Divisional Ecologist or to the Regional Manager (contact details http://www.npws.ie/media/Media,4976,en.pdf).

If you have any questions in relation to the referral of a planning application, please contact Development Applications Unit (Tel: 01 8883181)

Is mise le meas,

Peter Carvill,
Assistant Principal Officer.

To: all County and City Managers, Directors of Services for Planning, Town Clerks

Appendix F7 – Aquatic Ecology Report

MAIGHNE AQUATIC REPORT

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

LIST OF PLATES

Page

1 AQUATIC ECOLOGY

1.1 Introduction

This chapter addresses the potential impact of the proposed Maighne wind farm project on aquatic ecology. The proposed Maighne Wind farm is divided into five separate clusters: 'Ballynakill', 'Windmill', 'Cloncumber', 'Drehid-Hortland' and 'Derrybrennan'. This document provides an assessment of the impact of the proposed development on aquatic habitats, aquatic ecological communities, and individual aquatic species. The aims of the aquatic ecology assessment are:

- To carry out a desktop study in order to determine the surface water features affected by the proposed development and surrounding area;
- To carry out a baseline fisheries and aquatic ecological survey of the affected aquatic areas;
- To predict the potential direct, indirect and cumulative impacts of the proposed development on aquatic species and habitats.
- To propose mitigation measures in the construction and operation of the wind farm so as to minimise potential impacts on fisheries and aquatic ecology receptors.

Field survey work to inform current assessment was undertaken during the period August to October 2013. Figure 1 gives the location of the five components of the proposed Maighne wind farm and with respect to water regions (Hydrometric Area and catchment). This report has been prepared by ECOFACT Environmental Consultants on behalf of Fehily Timoney & Company.

1.2 Methodology

1.2.1 Relevant Guidance

The current assessment has been prepared taking account of relevant guidance published by the Environmental Protection Agency (EPA) including '*Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2002) and '*Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements)'* (EPA, 2003). In addition the impact assessment also takes account of the '*Guidelines for Ecological Impact Assessment*' (Institute of Ecology and Environmental Management, 2006). 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), 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 2008a) and '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (NRA 2008b).

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 and Wildlife (Amendment) Act, 2000; which includes the Flora Protection Order (1999). The Habitats Directive 1992 has been transposed into Irish legislation as the European Union (Natural Habitats) Regulations SI 94/1997 and amended in 1998 and 2005. The Habitat Regulations have been updated in 2011 as the European Communities (Birds and Natural Habitats) Regulations (2011) to bring the Irish transposition of these regulations into line with the requirements of the EU Habitats Directive (1992).

Under the Fisheries (Consolidation) Act, 1959, it is an offence to disturb the bed of a river; therefore 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 development. 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.

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.

1.2.3 Selection of watercourses for assessment

All watercourses / water bodies which could be affected directly (i.e. within the site) or indirectly (i.e. lie within 500 m of the site boundary) were considered as part of the current appraisal. Some of the sites assessed are located greater than 500 m from the site boundary. Generally only streams and other watercourses shown on the 1:50,000 Discovery Series Maps were examined, as watercourses smaller than this are not normally of fisheries or aquatic ecological significance.

A total of 10 sites were selected for detailed assessment. The sites selected for assessment are given in Table 1 and the location of these sites is shown in Figure 2.

The surveys completed at each site were at a level required to make an evaluation of biological water quality, fisheries value, aquatic habitat value, and presence of rare/protected/notable aquatic species at each site. Due to land access restrictions sampling could only be undertaken at sites within the land option areas. However, watercourses downslope of the proposed development were observed from public roads and this allowed such watercourses to be adequately evaluated for the purpose of the current appraisal.

1.2.4 Aquatic habitat assessments

Habitat assessment was carried out at the rivers/streams on, and in the vicinity of, the site using 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 the affected watercourses were assessed in terms of:

- Stream width and depth and other physical characteristics;
- Substrate type, listing substrate fractions in order of dominance, i.e. large rocks, cobble, gravel, sand, mud etc;
- Flow type, listing percentage of riffle, glide and pool in the sampling area;
- Instream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside;
- Estimated cover by bankside vegetation, giving percentage shade of the sampling site.

The results of the physical habitat study were used in conjunction with the leaflet '*The Evaluation of habitat for Salmon and Trout*' (DANI Advisory leaflet No. 1) to assess habitat suitability for salmonids. Stream order is described using the classification system given in Strahler (1957) which defines stream size based on a hierarchy of tributaries (with 1st order streams being the smallest).

The Water Framework Directive status of waterbodies in the study area was estimated with reference to the manual *'European waters — assessment of status and pressures'* by the European Environmental Agency (2012).

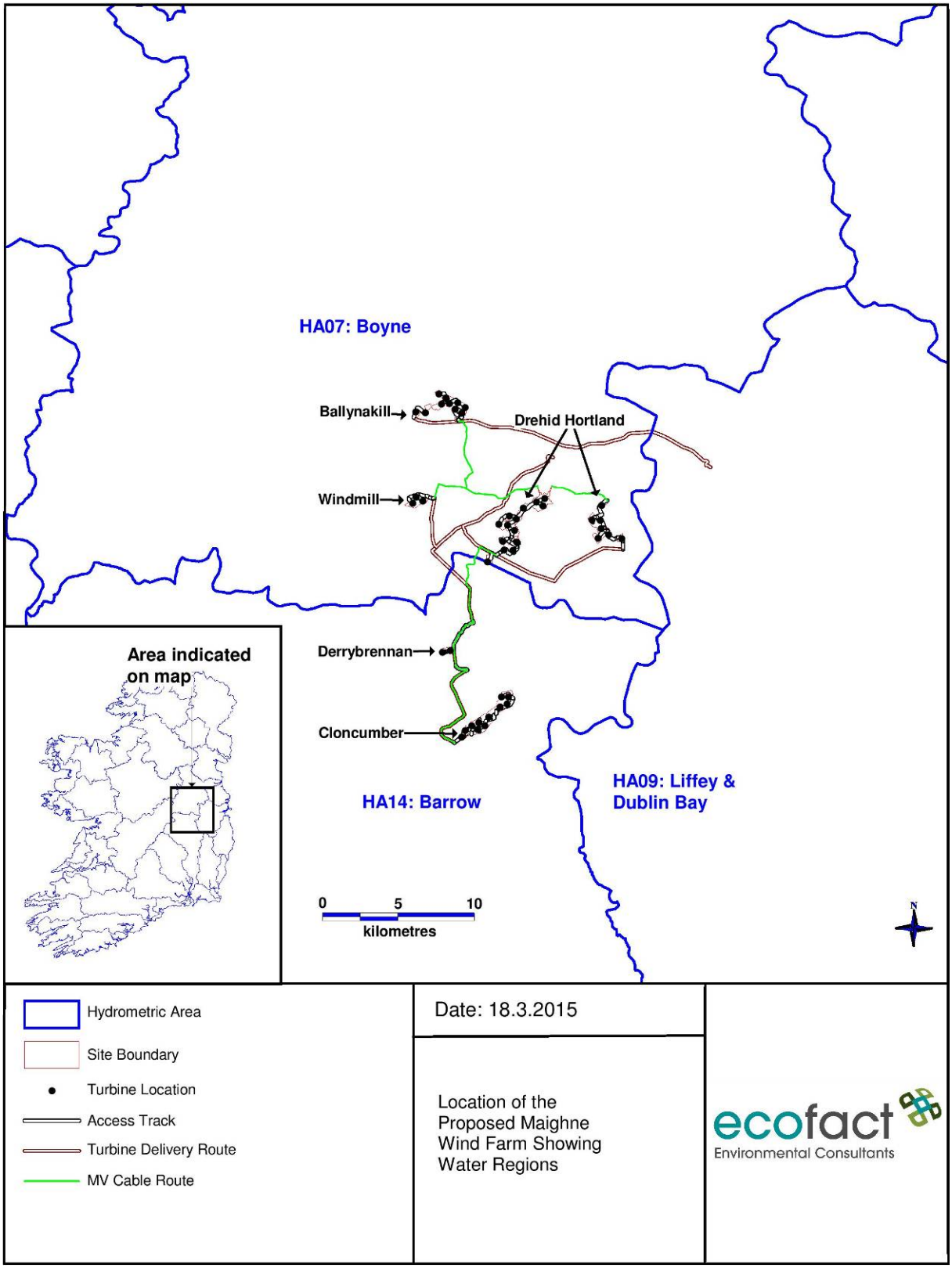

Figure 1: Location of the five components of the proposed Maighne Wind Farm showing Water Regions

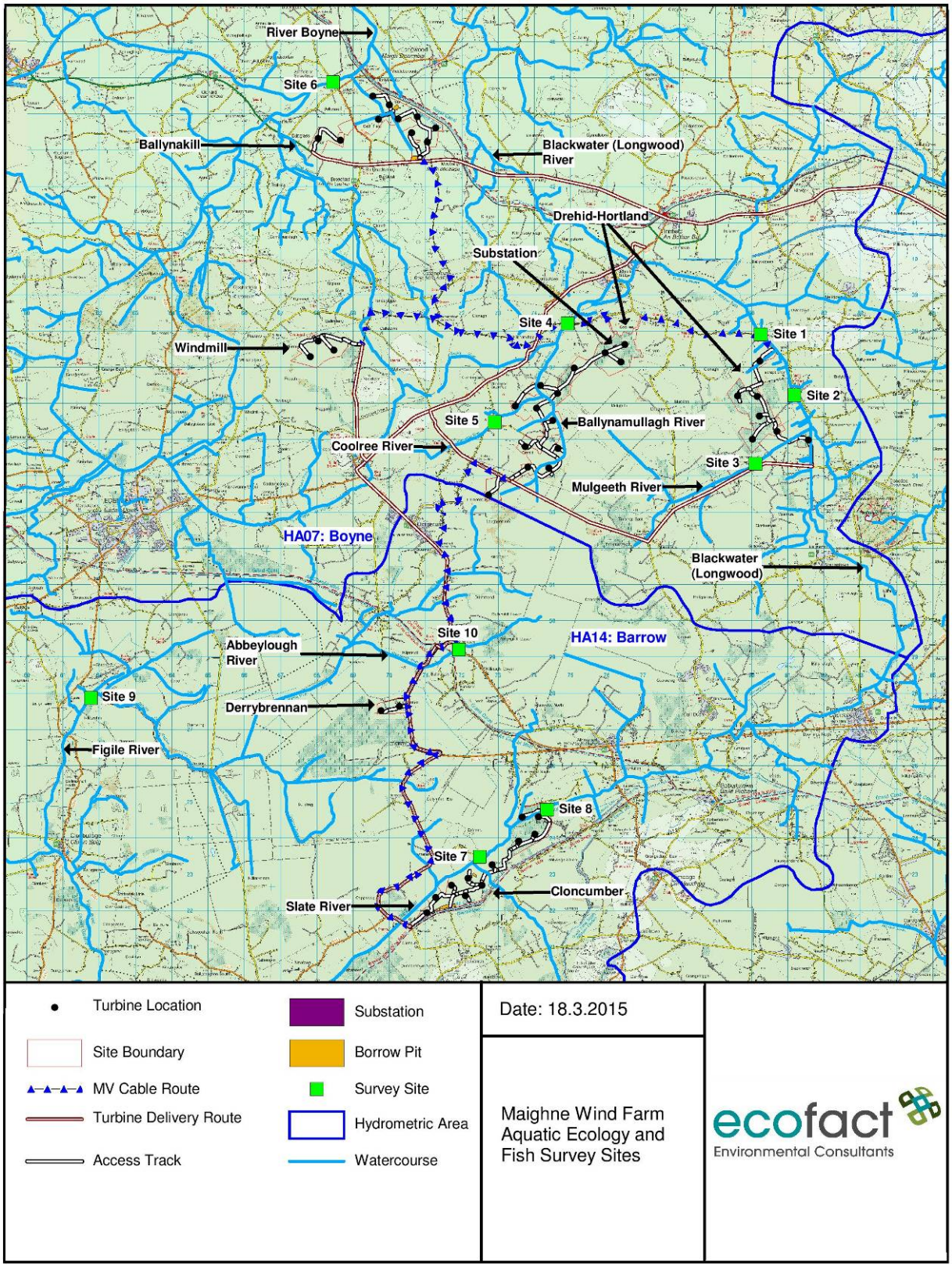

Figure 2: Maighne aquatic ecology and fisheries survey sites

Table 1: Location of the aquatic ecology and fisheries survey sites assessed for the proposed Maighne wind farm site during the August/October 2013 survey

Site No.	Catchment	Relevant component of wind farm	Sub-catchment	River	Tributary	Watercourse Name	Segment code	EPA code
1	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)		Blackwater (Longwood)	07_925	07B02
2	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)		Blackwater (Longwood)	07_1043	07H03
3	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Mulgeeth	Mulgeeth	07_1720	07M54
4	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Coolree 07	Coolree 07	07_1848	07C23
5	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Coolree 07	Coolree 07	07_1230	07C23
6	Boyne	Ballynakill, Windmill	Boyne	Boyne		Boyne	07_951	07B04
7	Barrow	Cloncumber	Figile	Slate		Slate	14_1574	14S01
8	Barrow	Cloncumber	Figile	Slate		Slate	14_235	14S01
9	Barrow	Derrybrennan	Figile	Figile		Figile	14_553	14F01
10	Barrow	Derrybrennan	Figile	Figile	Abbeylough	Abbeylough	14_1678	14A01

1.2.5 Aquatic macroinvertebrate surveys

1.2.5.1 Kick sampling

Qualitative sampling of benthic (or bottom dwelling) macroinvertebrates was undertaken at selected (index) sites using kick-sampling (Toner *et al.*, 2005). This procedure involved the use of a 'D' shaped hand net (mesh size 0.5 mm; 350 mm diameter) which was submerged on the river bed with its mouth directed upstream. The substrate upstream of the net was then kicked for one minute in order to dislodge invertebrates, which were subsequently caught in the net. This procedure was undertaken at three points along/across the watercourse. Stone washings and vegetation sweeps were also undertaken to ensure a representative sample of the fauna present at each site was collected.

All samples of invertebrates were combined for each site and live sorted on the river bank and indentified to the level required to assign a Q-rating or SSRS score. Samples were also collected and fixed in ethanol for subsequent laboratory identification.

1.2.5.2 Biological water quality

The Quality Rating (Q) System (Toner *et al*, 2005) and the Small Stream Risk Score (SSRS) (Walsh, 2005) were used to obtain a water quality rating / risk assessment for each site.

The Quality Rating System (Q-Value) is based on the well-established sensitivities, abundance and diversity of macroinvertebrates and their relation to water quality. The changes brought about by organic pollution in the bottom dwelling (benthic) macroinvertebrate community in rivers are particularly well documented. These changes are due to the varying sensitivities of the different components of the community to the stresses caused by pollution. It is well documented that community diversity declines in the presence of pollution and that more tolerant forms progressively replace sensitive species as the level of pollution increases. The same basic Quality Rating System (Q-Value) has been used to assess the water quality of Irish rivers since 1971. It has provided the primary basis for mapping long-term trends of water quality in Irish rivers by the EPA. For the purposes of the Irish assessment procedure, benthic macroinvertebrates are divided into five indicator groups ranging from the most disturbance sensitive taxa to the most insensitive taxa as follows:

- Group A, the sensitive forms,
- Group B, the less sensitive forms,
- Group C, the tolerant forms,
- Group D, the very tolerant forms and
- Group E, the most tolerant forms.

The Q-Value assigned to a site depends on inter alia, the degree of departure of the river fauna's taxonomic composition, diversity and abundance from its reference condition at close to natural, undisturbed conditions. A Q-Value of Q5 indicates that conditions are close to reference conditions whereas a Q-Value of Q1 indicates the presence of serious pollution. The Q-Value employs the ratio of disturbance sensitive to insensitive taxa to indicate the degree or extent of change from the natural reference conditions at a site.

The Quality Rating System (Q-Value) has been intercalibrated at European level in both the Northern Geographical Intercalibration Group (NGIG) and the Central/Baltic Geographical Intercalibration Group (CBGIG). The relationship between Q-Value and Ecological Status for macroinvertebrates is as shown in Table 2.

Table 2: Relationship between Q-Value and Ecological Status for macroinvertebrates.

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

** These values are based primarily on the relative proportions of pollution sensitive to tolerant macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site.*
*** "Condition" refers to the likelihood of interference with beneficial or potential beneficial uses*

1.2.5.3 Protected aquatic invertebrates

An assessment of the occurrence of rare protected species (e.g. white-clawed crayfish, freshwater pearl mussels) at sampling sites was assessed by underwater visual observation using bathyscopes.

1.2.6 Fisheries assessments

1.2.6.1 Visual surveys

Many of the streams on the proposed wind farm site were small first order streams or field drains that could be assessed visually and categorised as watercourses of insignificant fisheries importance that contained no fish. Other areas where access could not be provided (i.e. outside the option lands areas) were also assessed visually from publically accessible areas.

1.2.6.2 Dip netting surveys

Qualitative netting with a 'D' shaped dip net (35cm diameter, 2mm mesh) was carried out at selected sites to check for the presence / absence of small fish. This method was generally employed in drains and very small watercourses. The net was used in a circular motion to intercept small fish sheltering in instream vegetation stands and under the bank vegetation overhang.

1.2.6.3 Electrofishing survey

An electrical fishing assessment was carried out at Site 9 on the Figile River under authorisation from the Department of Communication, Energy and Natural Resources under Section 14 of the Fisheries Act (1980). The purpose of this survey was to provide information on the presence of Annex II listed fish species (i.e. lampreys and salmon) and other fish (i.e. Brown Trout and Eels).

This survey was carried out following the methodology outlined in the CFB guidance "*Methods for the Water Framework Directive - Electric fishing in wadable reaches*".

A portable electrical fishing unit (Smith Root-LR 24 backpack or Marine Electrics Safari Researcher 660D) was used during the assessment. Fishing was carried out continuously for 5 minutes and captured fish were collected into a container of river water. Captured fish were then anaesthetised using a solution of 2-phenoxyethanol and measured to the nearest mm using a measuring board. Subsequent to this the fish were allowed to recover in a container of river water. All fish were released alive and spread evenly over the sampling area. Following completion of the fishing the dimensions and physical habitat characteristics of the site were recorded.

1.2.7 Evaluation Criteria

The evaluation criteria used in the current assessment follows the '*Guidelines for the Assessment of Ecological Impacts of National Realignments – Revision 2*' (NRA, 2009). The evaluation of impact significance is a combined function of the value of the affected feature (its ecological importance), the type of impact and the magnitude of the impact. It is therefore necessary to identify the value of ecological features within the study area in order to evaluate the significance and magnitude of possible impacts.

Following the guidance set out by the NRA (2009) the study area for the *Proposed Development* has been evaluated based on an identified zone of influence with regard to the potential for pathways for impacts affecting ecological features of interest (habitats, flora and fauna).

Ecological features are assessed on a scale ranging from international-national-county-local. The local scale is taken as corresponding to the zone of influence of the development and extending to a parish area. The evaluation criteria are presented below. Watercourses, evaluated following the NRA (2009) criteria were evaluated on the basis of a number of characteristics and features defined as follows:

- Aquatic habitat refers to the in-water conditions of any watercourse; including substrate and stream structure (i.e. proportion of riffles, runs and pools).
- The fisheries value of a watercourse refers to its suitability for fish, primarily salmonids (salmon and trout), and to the associated value for recreational angling purposes.
- Annex II species are those that are listed under the EU Habitats Directive (92/43/EEC).
- Annex I habitats are those that are listed under the EU Habitats Directive, including Priority Habitats.
- The evaluation of water quality uses a five-point biotic index (Q-value) based on the presence and relative abundance of various invertebrates using the Environmental Protection Agency's (EPA) standard technique.

Table 3: Criteria used to determine the value of ecological resources (NRA 2009)

Importance	Criteria
International Importance	'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. Site 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 Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. 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. Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl

Importance	Criteria
	Habitat 1971). World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). 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). Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). Biogenetic Reserve under the Council of Europe. European Diploma Site under the Council of Europe. Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance	Site designated or proposed as a Natural Heritage Area (NHA). Statutory Nature Reserve. Refuge for Fauna and Flora protected under the Wildlife Acts. National Park. 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. 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.
County Importance	Area of Special Amenity. Area subject to a Tree Preservation Order. Area of High Amenity, or equivalent, designated under the County Development Plan. 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. 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. 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. 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. Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (higher value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; 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;

Importance	Criteria
	Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. 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; 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.
Local Importance (lower value)	Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; Sites or features containing non-native species that are of some importance in maintaining habitat links.

*SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area.

1.3 Existing Environment

The study area is described below in terms of affected catchments, designated sites with aquatic dependant key conservation interests, waterbody types in the study area, protected aquatic flora and fauna, fish communities and fisheries, aquatic macroinvertebrates and biological water quality, and aquatic plant communities. Each of the above are discussed in relation to the Drehid-Hortland, Ballynakill, Windmill, Cloncumber and Derrybrennan components of the proposed Maighne wind farm.

1.3.1 Affected catchments

For the purposes of hydrological activities and by agreement between the various hydrological agencies in Northern Ireland and the Republic of Ireland, Ireland was divided into 40 hydrometric areas. Each Hydrometric Area comprises a single large river basin, or a group of smaller ones, and neighbouring coastal areas. Each area was assigned a number from 01 to 40 beginning at the Foyle Catchment and proceeding in a clockwise direction (an exception to this general scheme is the catchment of the River Shannon and its tributaries which, because of its size, was divided into two hydrometric areas, 25 (Lower Shannon) and 26 (Upper Shannon)). A brief overview of the two Hydrometric Areas (or part of) affected by the proposed development is given below.

1.3.1.1 Hydrometric Area 07 Boyne

Hydrometric Area 07 consists of the River Boyne catchment. The River Boyne main channel rises near Edenderry on the borders of Counties Offaly and Kildare and flows in a north-easterly direction for 112 km before entering the Irish Sea at Drogheda. Together with its tributaries, it drains a catchment of approximately 2,500 km^2. The River Boyne corridor together with its tributary the Kells Blackwater River are designated as a Special Area of Conservation (SAC) (SAC Code 002299). In addition, the River Boyne main channel is also a designated salmonid river under the EU Freshwater Fish Directive (78/659/EEC).

The Boyne has eleven major tributary sub-catchments. The watercourses in the Boyne catchment affected by the proposed development are the Boyne River and Glash River (Ballynakill), the Balrinnet and Glash Rivers (Windmill), and the Coolree, Ballynamullagh, Mulgeeth and Longwood Blackwater Rivers (Drehid-Hortland), where the names in parenthesis are components of the proposed development in the various sub-catchments.

Most of the Boyne catchment is underlain by limestone-based glacial till (O'Grady 1998). The Boyne catchment drains a mainly lowland area, and consequently all sub-catchments are fed by percolating ground water to a greater extent rather than by runoff. Farming practices in the catchment include dairy, beef production and tillage. There are many large towns in the catchment, including Slane, Navan, Kells, Trim, Athboy and Ballivor.

O'Grady (1998) reported that three major ecological impacts on the Boyne catchment have occurred in 'recent' times. These are (1) excavation of peat lands in the headwater area of the catchment to fuel power stations, (2) the 1980's arterial drainage scheme which affected virtually the entire catchment, and (3) the onset of serious eutrophication problems on Lough Ramor in the Kells Blackwater sub catchment.

The excavation of the peat bogs in headwater areas led to a runoff of fine peat silt particles causing siltation of the headwater tributaries and excessive growth of reeds on these lateral silt beds. This led to a narrowing and deepening of the stream channels; particularly in the catchment area above Trim (O'Grady 1998). The second major event to impinge on the system was the implementation of an arterial drainage programme throughout the catchment. This programme commenced in 1969 and continued until 1985 (O'Grady 1998). The only major section of this catchment which was not drained was the lower reaches of the main Boyne channel - from Navan downstream, and a section of the Kells Blackwater.

The Ballynakill, Drehid-Hortland and Windmill components of the proposed Maighne wind farm are within the Boyne catchment and watercourses draining these areas are discussed below.

1.3.1.1.1 Drehid-Hortland

The Drehid-Hortland component of the proposed development is drained by the Blackwater (Longwood) River (EPA code 07B02). The western extent of the Drehid-Hortland site is drained by the Coolree River (EPA code 07C23). This river rises to the east of the site and flows into the 4th order Blackwater (Longwood) from the south as a 3rd order watercourse. The 3rd order Ballynamullagh River rises within the Drehid-Hortland site and flows into the Coolree River from the south. The Mulgeeth River (EPA code 07M54) rises within the southern extent of the Drehid-Hortland component of the proposed development. It has a channel length of ca. 8km and flows east into the Blackwater (Longwood) River a 2nd order watercourse.

1.3.1.1.2 Ballynakill

The Ballynakill section of the proposed development is located to the southwest of Longwood and comprises 10 turbines. The proposed development at Ballynakill is drained by the River Boyne (EPA code 07B04, segment code 07_951) to the north, the Boolykeagh River (EPA code 07B44) and the Glash River (EPA code 07G02) to the west. The River Boyne within the study area is a large drained 5th order river with little physical variation. The Boolykeagh River is a 2nd order watercourse that is formed by the joining of two 1st order streams that are within the Ballynakill site. These streams join and the Boolykeagh River flows north for approximately 2km before flowing into the River Boyne. The Glash River is a 4th order watercourse that is formed by numerous tributaries to the south west of the site. A 1st order stream of ca. 1.5km long (Mulphedder Stream, EPA code 07M18) within the Glash River sub-catchment flows approximately 0.5km to the west of the site. The Ashfield Stream (EPA code 07A14) drains the north eastern portion of the site. This 1st order watercourse has a channel length of ca. 2km and flows into the River Boyne approximately 1km downstream of the Royal Canal crossing.

1.3.1.1.3 Windmill

The Windmill portion of the proposed development is located in the Glash River sub-catchment where the lands are drained by the 2nd order Balrinnet River (EPA code 07B26). The Balrinnet River is formed by two 1st order streams that rise approximately 1km north and 1.5km south-east of the proposed development site (Glash Stream to the south east). The Balrinnet River flows into the Kilrainy River (EPA code 07K22) to form the Glash River which flows into the River Boyne. The headwaters of the Glash Stream flow within 0.2km from the site. The overland hydrological distance from the proposed Windmill site to the River Boyne is approximately 8.5km.

1.3.1.2 Hydrometric Area 14 Barrow

Hydrometric Area 14 is the Barrow catchment, which is one of the largest river catchments in Ireland. The River Barrow itself is 192 kilometres long and drains a catchment of 2,983km^2. It rises on sandstones in the Slieve Bloom Mountains at an elevation of 580 m to flow south to confluence with the River Suir estuary at Waterford Harbour. The River Barrow corridor (together with the adjacent River Nore) is a designated Special Area of Conservation (SAC) (SAC Code 002162).

Being a very large catchment there is variation in the underlying geology and soil types across this large catchment. The highlands of the Slieve Blooms consist of blanket peat and peaty gleys of sandstone origin. These give way to gleys of limestone origin or to river alluvium in the catchment downstream to Monasterevin. The extensive area drained by the Slate and Figile systems has soils of basin peat and of podzolics of limestone origin. From Monasterevin to Goresbridge, the principal soil association is one of grey brown podzolics, all of limestone origin. In the area between Athy and Goresbridge a narrow ribbon of soils is composed of morainic gravels and sands and these materials are extensively quarried in surface excavations. As with the geological changes at Goresbridge, so the soils also change and have their origins in granitic or Silurian glacial till or shales.

The Barrow has eleven major tributary sub-catchments. The main tributaries, on the left bank, are the Cushina, Figile and Slate, all of which form one tributary at Monasterevin, the Greese, Lerr, Burren, Mountain and Pollmounty; those on the right bank are the Owenass, Triogue, Stradbally, Douglas, Fushoge, Gowran, Powerstown and Duiske. The current proposed development affects the Cushina, Figile, Slate, Stadbally and Triogue River sub-catchments. A number of other minor sub-catchments draining directly into the main channel of the River Barrow are also affected.

The River Barrow has been the subject of an arterial drainage scheme (1926 – 1934) with 210 km of main rivers and tributaries and 175 km of smaller drains deepened and widened, to improve conveyance, in the course of the works programme. The extent of the drainage programme was largely confined to the catchment upstream of Athy and included the extensive Figile-Slate systems.

There are extensive areas of peat in the catchment, bogland having an area in excess of 159 km^2 in the catchment. The Cushina – Philipstown – Figile – Slate system in particular drains extensive areas of flat land with large-scale commercial peat workings present. The Cloncumber, Derrybrennan, Drehid-Timahoe components of the current proposed development are located in this sub-catchment where these areas are drained by the Slate and Abbeylough Rivers.

To accommodate navigation, as well as providing hydropower to a number of industrial units, the River Barrow was regulated by a number of major weirs, creating a series of very low gradient reaches between each weir. Navigation at each weir was accommodated through a network of 23 lock gates. Downstream of Athy, the Grand Canal – Barrow Line navigation switches from being an exclusively canal-like channel to one where navigation takes place within the riverine channel.

The Cloncumber and Derrybrennan components of the proposed Maighne wind farm are within the Barrow catchment and watercourses draining these areas are discussed below.

1.3.1.2.1 Cloncumber

The Cloncumber component of the proposed development is located in the Slate River (EPA code 14S01) sub-catchment within the Barrow catchment. Much of the northern boundary of the proposed Cloncumber component of the proposed development, a stretch of approximately 4km is defined by the stretch of the 3rd order Slate River upstream of Agar Bridge. An external road is proposed to access the proposed Cloncumber development site from the north which would involve a crossing of the Slate River. The Cloncumber Stream (EPA code 14C17) flows north through the proposed Cloncumber component of the proposed development to meet the Slate River from the south. The Cloncumber Stream is a highly modified low gradient 2nd order channel. The 3rd order Slate River joins the 4th order Figile River approximately 12km downstream of the Cloncumber site. Approximately 1km downstream, the Figile River is fed from the west by the 3rd order Cushina River (EPA code 13C04). A further 7km or so downstream the Figile River flows into the River Barrow (EPA code 14B01).

1.3.1.2.2 Derrybrennan

The Figile River (EPA code 14F01) drains the Derrybrennan component of the proposed development. The Abbeylough River (EPA code 14A01) is a 1st order watercourse of approximately 6km long. This watercourse flows in an easterly direction and to within 1.2km north of the proposed Derrybrennan site. It flows into the 2nd order Figile River approximately 2km north west of the proposed development site. The 3rd order Slate River joins the 4th order Figile River.

1.3.2 Designated sites

1.3.2.1 SACs designated for aquatic interests

There are two Natura 2000 river systems in the study area. These are the River Barrow and River Nore cSAC (Site Code 002162) and the River Boyne and River Blackwater cSAC (Site Code 002299). These two Natura 2000 are discussed hereunder with reference to the Drehid-Hortland, Ballynakill and Windmill components of the proposed Maighne wind farm in Hydrometric Area 04 and with reference to the Cloncumber and Derrybrennan components of the site in Hydrometric Area 14.

Rye water valley / Carton cSAC (001398) is also within 15km of the proposed development where the Drehid-Hortland component of the Maighne wind farm is located approximately 14.5km to the west. Rye water valley / Carton cSAC is a river valley site which includes at its western end a large area of estate woodland and an artificial lake. The eastern section of the site includes a section of railway, canal and aqueduct; it continues as far as Leixlip town. The site is underlain by carboniferous limestone over which has been laid a layer of glacial drift.
Rye water valley / Carton cSAC is within Hydrometric Area 09 (Liffey and Dublin Bay) so is hydrologically disconnected from any component of the proposed Maighne wind farm i.e. the proposed Maighne development is located in Hydrometric Areas 07 (Boyne) and 14 (Barrow).

Ballynafagh Lake is located within the Barrow catchment and lies approximately 5km to the north east of the Cloncumber component of the proposed development. Ballynafagh Lake comprises a former reservoir (generally called Ballynafagh Lake) and an associated canal feeder (Blackwood feeder), the latter now disused and mostly dry. The lake is shallow and is now very overgrown with various wetland vegetation types with only a small area of open water remaining. Fen is the predominant habitat, with reed-swamp, wet grassland and some bog or heath also occurring. A strip of deciduous woodland occurs on some drier ground. The main habitats along the canal feeder are dry grassland (partly improved), wet grassland, swamp vegetation and scrub. The site supports a population of *Euphydryas aurinia* and contains a number of other rare invertebrate species, some of which are good wetland indicator species, including the mollusc *Pisidium pseudosphaerium*.

Ballynafagh Lake is located in the upper Figile catchment in the north-eastern most part of the River Barrow basin. Assuming there is a hydrological link with the proposed development, it is located approximately 7km upstream of the Cloncumber site via the River Slate and other surface waters. There are no overland pathways between Ballynafagh Lake and other components of the proposed development.

1.3.2.1.1 River Boyne and the River Blackwater cSAC

The River Boyne and the River Blackwater SAC comprises the freshwater element of the River Boyne as far as the Boyne Aqueduct, the Kells Blackwater as far as Lough Ramor and the Boyne tributaries including the Deel, Stoneyford and Tremblestown Rivers. This site is a candidate SAC selected for Alkaline fens [7230] and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0], both listed on Annex I of the E.U. Habitats Directive. The site is also listed for the following Annex II species; River lamprey (*Lampetra fluviatilis*) [1099], Atlantic salmon (*Salmo salar*) [1106] and Otter (*Lutra lutra*) [1355].

1.3.2.1.1.1 Drehid-Hortland

The Drehid-Hortland component of the proposed development is within the Blackwater (Longwood) River sub-basin and approximately 10km to the southeast at its closest. The Blackwater (Longwood) River flows into River Boyne and the River Blackwater SAC. The shortest pathway between the Drehid-Hortland component of the proposed development and the River Boyne and the River Blackwater SAC is approximately 18.9km where the overland hydrological distance from the eastern portion of the Drehid-Hortland site and the River Boyne and the River Blackwater SAC is approximately 18.9km via the Blackwater (Longwood) River.

The distance from the western portion of the proposed development site to the River Boyne within the cSAC is approximately 19km where the Coolree River drains the western extent of the site and flows into the Blackwater (Longwood) River before discharging to the River Boyne.

1.3.2.1.1.2 Ballynakill

The upper limit of the River Boyne and River Blackwater cSAC on the main channel of the River Boyne is approximately 2km west of Longwood where the royal Canal crosses the River Boyne. The Ballynakill component of the proposed development lies approximately 1km due south of this part of the River Boyne and River Blackwater cSAC. This part of the cSAC is a receptor for Ballynakill component of the proposed development as the Boolykeagh River flows from the Ballynakill site into the River Boyne. The western extent of the Ballynakill site also drains into the River Boyne and River Blackwater cSAC via the Glash River.

1.3.2.1.1.2 Windmill

The Windmill portion of the proposed development is located in the Glash River sub-catchment which discharges to the River Boyne approximately 1.5km upstream of the designation. The closest watercourse to the Windmill component of the proposed development is a 1st order tributary of the Balrinnet River which flows approximately 0.2km to the east of the proposed development site. This stream would be crossed by the proposed MV cable. The distance from this location to the River Boyne and River Blackwater cSAC is approximately 11km via the Balrinnet River which flows into the Glash River before meeting the River Boyne.

1.3.2.1.2 River Barrow and the River Nore cSAC

The River Barrow and River Nore cSAC is a very large site that consists of the freshwater stretches of the Barrow/Nore River catchments as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site is a candidate SAC selected for a number of habitats listed on Annex I of the E.U. Habitats Directive, including Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] which is a fully aquatic habitat. The site is also selected for the following species listed on Annex II of the same directive; *Vertigo moulinsiana* [1016], Freshwater pearl mussel (*Margaritifera margaritifera*) [1029], Nore pearl mussel (*Margaritifera durrovensis*) [1990] White-clawed crayfish (*Austropotamobius pallipes*) [1092], Sea lamprey (*Petromyzon marinus*) [1095], Brook lamprey (*Lampetra planeri)* [1096], River lamprey (*Lampetra fluviatilis*) [1099], Allis shad (*Alosa alosa*) [1102], Twaite shad (*Alosa fallax fallax*) [1103], Otter (*Lutra lutra*) [1355] and Salmon (*Salmo salar*) [1106].

1.3.2.2.1 Cloncumber

The Cloncumber component of the proposed development is in the Slate River catchment so the River Barrow within the River Barrow and River Nore cSAC is receiving water for this part of the proposed Maighne wind farm. The Cloncumber site is located approximately 18km to the north west of the River Barrow cSAC where the main channel of the Rive Barrow is within the designation. The closest part of the proposed Cloncumber component of the proposed development to the River Barrow and River Nore cSAC hydrologically is where the MV cable route crosses the Slate River. This crossing location is approximately 18km upstream of the River Barrow and River Nore cSAC where the lower reach of the Figile River is part of the designation.

1.3.2.2.2 Derrybrennan

The Derrybrennan component of the proposed development is within the Figile River sub-catchment. At its closest, the Derrybrennan component of the proposed development is located 17.5km to the north east of the River Barrow and River Nore cSAC. The proposed MV cable would cross the Abbeylough River and the Lullymore East Stream, these stream crossings located approximately 34km via watercourse pathways.

1.3.2.2 Designated salmonid waters

1.3.2.2.1 Boyne catchment

The River Boyne main channel is a designated Salmonid Water under the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293/1988).

1.3.2.2.1.2 Ballynakill

The River Boyne is located approximately 1km north of the proposed Ballynakill component of the proposed development. The Boolykeagh River flows from the northern boundary of the proposed development site to the River Boyne. The Glash River system to the west of the proposed development which drains part of the site also flows into the main channel of the River Boyne.

1.3.2.2.1.3 Windmill

The Windmill portion of the proposed development is located in the Glash River sub-catchment and is located approximately 9.5km upstream of the main channel of the River Boyne.

1.3.2.2.1.1 Drehid-Hortland

The Drehid-Hortland component of the proposed development is drained by the Blackwater (Longwood) River. The Blackwater (Longwood) River flows into River Boyne approximately 18.9km downstream of the Drehid-Hortland site.

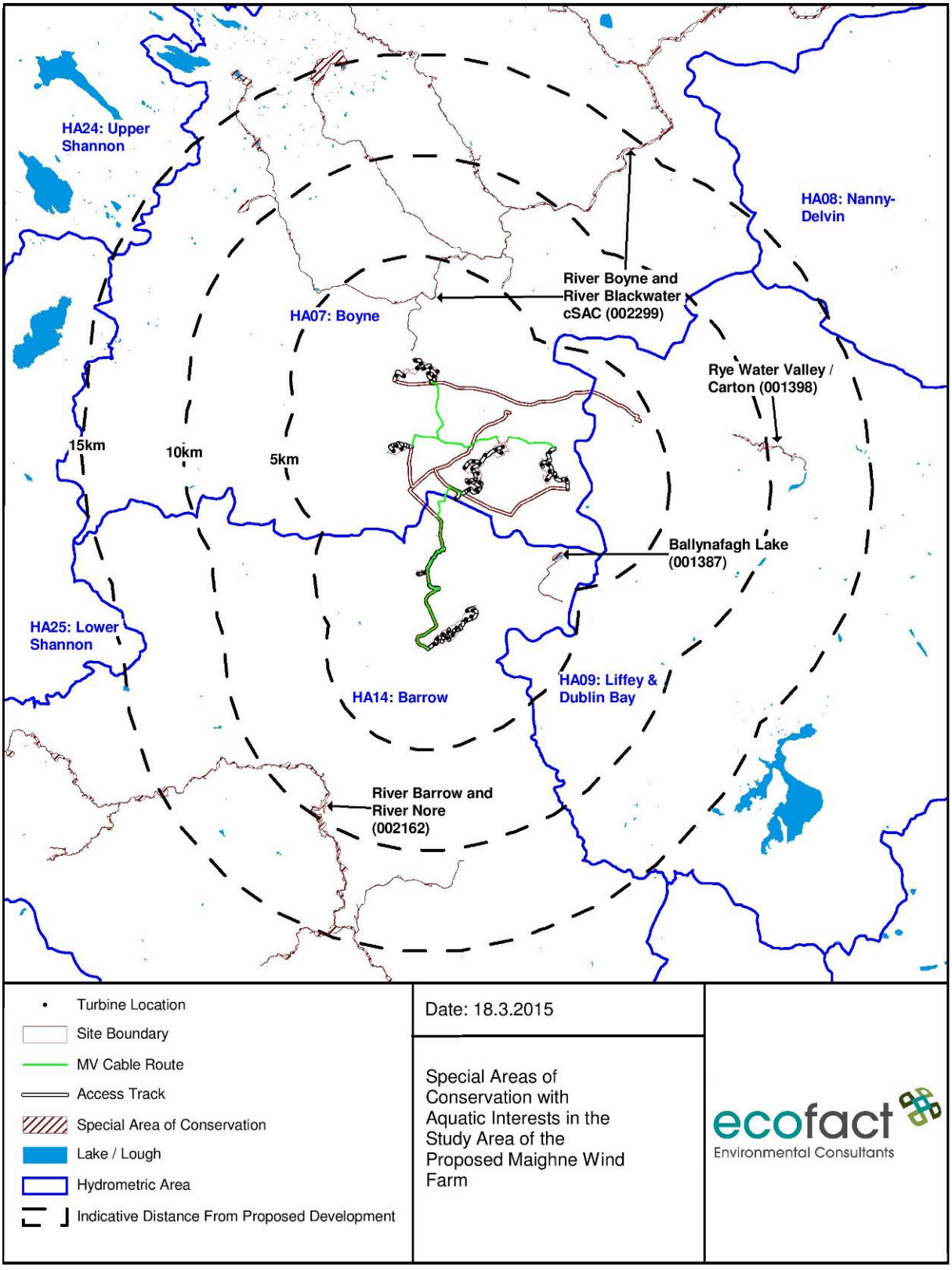

Figure 3: Proposed wind farm in relation to Natura 2000 river sites and Special Areas of Conservation with aquatic interests. The River Boyne and River Blackwater candidate Special Areas of Conservation are the principal designations within 15km of the proposed development.

1.3.2.2.1 Barrow catchment

There are no designated Salmonid Waters in the Barrow catchment.

1.3.3 Waterbody types

Figure 2 shows the principal watercourses in the study area. These water features correspond with rivers and streams shown on the EPA map viewer where spatial data such as watercourse locations can be downloaded from the EPA geoportal website. These watercourses are also indicated on the 1:50,0000 scale Discovery Series maps. Watercourses in the study area are discussed below under drains (FW4) and depositing/lowland rivers (FW2). These are the only habitat types in the study area following the classifications given in Fossitt (2000). A significant proportion of 1st order watercourses in the region correspond to the habitat drainage ditch owing to the low gradient topography of the study area. Indeed, there is no clear delineation between Hydrometric Area 7 (Barrow) and Hydrometric Area 14 (Barrow) with respect to surface water features, some 1st order streams crossing from one of these water regions to another. For example, the Clonkeen Stream (EPA code 07C36) rises within the Barrow catchment and flows north into the River Boyne approximately 2km east of Edenderry.

1.3.3.1 Drains (FW2)

There are a number of highly modified waterbodies in the study area corresponding to the habitat 'Drainage ditch (FW4)'. These waterbodies include drainage ditches, field drains and channelised streams. The drainage ditch and depositing lowland river habitats in the study areas of the Drehid-Hortland, Ballynakill and Windmill components of the proposed Maighne wind farm within the Boyne catchment, and the Cloncumber and Derrybrennan sites within the Barrow catchment are discussed below.

Typical characteristics of waterbodies classified as drains are evidence of significant, and modification including deepening and straightening, absence of any visible flow, dominance of mud or silt substrate, and choking by aquatic vegetation. This category of waterbody is highly modified and generally not of any significant aquatic ecological importance, and rarely of any fisheries importance. These watercourses usually contain populations of three-spined stickleback (*Gasterosteous aculeatus)* however. This fish species can be expected to occur in most of the watercourses in the study area. The land drainage network in the study area has many drainage ditches that are not indicated by the EPA i.e. watercourses smaller than 1st order.

Drainage ditches in the study area are evaluated as being of Local Importance (lower value). It is noted that these waterbodies can be of importance to amphibians (i.e. frogs and newts) and the presence of frogs and/or newts would raise their overall ecological value. It is also possible that whorl snails (*Vertigo moulinsiana*) could use these habitats in some limited areas. Small drains can also occasionally be used by white-clayed crayfish (*Austropotamobius* pallipes); however this species was not found in the current study. However, most of the drains assessed during the current study were physically degraded and organically enriched.

1.3.3.1.1 Drehid-Hortland

The Mulgeeth River at southern extent of the Drehid-Hortland component of the proposed development is a sluggish watercourse of trapezoidal cross section. It flows into the Blackwater (Longwood) River.

1.3.3.1.2 Ballynakill

Two 1st order watercourses within the Ballynakill site are channelised and deepened and classified as a drainage ditches.

1.3.3.1.3 Windmill

Two 1st order streams that rise approximately 1km north and 1.5km south-east of the proposed Windmill development site and join to form the Balrinnet River are classified as drainage ditches. These linear watercourses drain predominantly peaty soils and are slowing flowing.

1.3.3.1.4 Cloncumber

There are three minor 1st order tributaries within / adjoining the proposed Cloncumber component of the Maighne wind farm that flows into the Slate River from the north of the Slate River and fall into the habitat category 'drainage ditch. The longest of these has a channel length of ca. 4km.

1.3.3.1.5 Derrybrennan

The Abbeylough River which drains the Derrybrennan component of the proposed development and the Lullymore Stream to the south are classified as drainage ditches, being artificial / deeply drained linear channels.

1.3.3.2 Depositing/lowland rivers (FW2)

Larger watercourses in the study area are low gradient with deposits of fine sediments on the river bed with slow water flow. All watercourses in the study area have been modified to one degree or another, with many channels subjected to severe modifications in part as a result of the OPW arterial drainage schemes. Such reaches of these watercourses would typically hold populations of small fish such as Minnow, Stone loach, Pike, perch and brown trout. Atlantic salmon *Salmo salar*, Brook lamprey *Lampetra planeri* and White-clawed crayfish could also potentially be present in these stretches. The lowland depositing rivers in the study area are evaluated as being of Local Importance (higher value).

1.3.3.2.1 Drehid-Hortland

The Drehid-Hortland component of the proposed development is drained by the Blackwater (Longwood) River which corresponds to the habitat lowland/depositing river. This watercourse has a trapezoidal cross section and banks of up to 2m high.

1.3.3.2.2 Ballynakill

The Boolykeagh and Glash Rivers downstream of the proposed Ballynakill component of the Maighne wind farm site are lowland / depositing rivers, having been drained / highly modified in the past.

1.3.3.2.3 Windmill

The Balrinnet, Boolykeagh and Glash Rivers downstream of the proposed Ballynakill component of the Maighne wind farm site are lowland / depositing rivers that have been drained / highly modified in the past.

1.3.3.2.4 Cloncumber

The Slate River and the Cloncumber Stream correspond to the habitat lowland/depositing river. The Slate River has encroaching marginal vegetation and large stands of instream club rush. The Cloncumber Stream is artificially deepened and widened and has a large proportion of instream emergent vegetation.

1.3.3.2.5 Derrybrennan

The Figile River which is the receiving water for the Derrybrennan component of the proposed development corresponds to the habitat lowland/depositing river.

1.3.4 Protected aquatic flora and fauna

The study area is within the 10km Grid squares N62, N63, N64, N72, N73 and N83. Every six years, Member States of the European Union are required to report on the conservation status of all habitats and species listed on the annexes of the Habitats Directive as required under Article 17 of the Directive.

Following a period of public consultation Ireland submitted these status assessments to the European Commission in June 2013. Table 4 shows the current distribution of protected aquatic fauna in the 10km grid squares relevant to the Drehid-Hortland, Ballynakill, Windmill, Cloncumber and Derrybrennan components of the proposed Maighne wind farm based on the 2013 Article 17 Assessments (NPWS, 2013).

Table 4: Distribution of protected aquatic species in the 10km grid squares relevant to the proposed Maighne wind farm. Based on NPWS (2013) Article 17 Assessments

	Component of windfarm and Relevant 10km grid square(s)				
	Drehid-Hortland (N73, N83)	**Ballynakill (N64, N74)**	**Windmill (N63)**	**Cloncumber (N72)**	**Derrybrennan (N62, N72)**
Atlantic salmon (1106)	✓	✓	✓	✓	✓
Freshwater pearl mussel (1029)	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded
White-clawed crayfish (1092)	✓*	✓	✓	✓	✓
Brook lamprey	✓ (N83 only)	✓ (N74 only)	✓	Not recorded	Not recorded
River lamprey	✓ (N83 only)	✓ (N74 only)	✓	Not recorded	Not recorded
Sea lamprey	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded

*Indicated as occurring by NBDC.

1.3.4.1 Atlantic salmon

The Atlantic salmon is listed under Annexes II and V of the EU Habitats Directive and Appendix III of the Bern Convention. It is an economically important species and salmon recreational and commercial fisheries occur throughout Ireland. Atlantic salmon are present in the main river channels and tributaries of the Boyne and Barrow catchments. Atlantic salmon are an anadromous species, meaning they are spawned in freshwater habitats and then migrate to the sea. Salmon habitats are usually fast flowing riffle and glide habitats with cobble or gravel substrates. Salmon angling areas are usually located on main river channels or small rivers in deep glides of 1.5m depth or more.

Crisp (2000) notes that salmon spawning site selection is governed by a complex of environmental factors including intra-gravel flow, gravel size, water depth as well as stream velocity and cover, which are all essential for successful spawning, egg survival and hatching. One of the most important factors for salmon egg survival is oxygen supply, which is dependent upon dissolved oxygen concentration and inter-gravel flow. High concentrations of suspended solids in the river are undesirable as they are likely to result in infilling of the gravel pores with fine material (Cowx and Fraser, 2003). Watercourses in the study area including the Boyne, Blackwater (Longwood), Slate and Figile Rivers are unsuitable/suboptimal with regard to salmonid spawning considering the lack of gravel substrates, poor aeration due to sluggish flows and degree of siltation. It is noted that many of these watercourses drain the Bog of Allen and that the substrate in many watercourses in the study area have artificially high levels of suspended solids during flood events and peaty deposits on the river beds. These conditions do not coincide with the habitat requirements of salmon spawning.

McGinnity *et al.* (2003) give the distribution of salmon in watercourses in Ireland and indicate that the species is present in all rivers of equal or greater than 2nd order in both the Boyne and Barrow catchments (with the exception of the upper reaches of the Owenass River in the upper Barrow catchment). Within the study area these waters include the Blackwood (Longwood), and the lower reaches of the Glash, Coolree and Mulgeeth Rivers in the Boyne catchment and the in the Barrow catchment. The Figile, Abbeylough, Lullymore and Slate Rivers and Cloncumber Stream area within the Barrow catchment are also indicated as supporting salmon.

Atlantic salmon populations in Ireland have been recently assessed as being 'unfavourable - inadequate' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013).

1.3.4.1.1 Boyne catchment

Atlantic salmon are widely distributed in the Boyne catchment and main tributaries, and the Boyne is subject to famous folklore stories about the great warrior Fionn mac Cumhaill and the mythical "*salmon of Knowledge*" that was caught on the River Boyne. Unfortunately as it is put in the book '*A celebration of salmon rivers'* published by NASF (2007) "*the salmon is no longer an image associated with the Boyne, nor is wisdom a quality to be associated with the management of this natural resource*".

The main problem currently facing salmon in the Boyne catchment is water quality. The catchment was also significantly affected in the past by a major extended OPW arterial drainage scheme that involved deepening and channelisation works affecting almost every channel in the catchment above Navan. O'Grady (1998) argued that this drainage scheme may have inadvertently improved salmonid production in the catchment. He concluded that this was due to (a) the restoration of a natural river form in the middle reaches of the main channel as a result of the removal of a series of large weirs and (b) the post-drainage fishery enhancement programmes. However, few anglers in the Boyne catchment would agree with this hypothesis, and it is clear that the scheme had a devastating effect on the physical ecological diversity of the river corridors in this catchment. The lower reaches of the main Boyne channel, from Navan to Drogheda, was not subject to arterial drainage and this coupled with the lengthy nature (17 years) of the drainage scheme was also probably advantageous in terms of maintaining salmonid production (O'Grady 1998). However, the delay in this scheme was apparently due to budgetary constraints rather than a mitigation measure and does not take into account other ecological impacts. O'Grady (1998) reported that spawning sites for both salmon (and trout) in the Boyne catchment are confined principally to the tributaries as there are very limited gravel deposits in the main channel. He also noted that sub-tributaries in the catchment are generally not of importance in fisheries terms; probably a legacy of the arterial drainage scheme. O'Grady (1998) states that the tributaries function as nursery areas for salmonids and the larger of these channels, and the main Boyne channel, support substantial populations of salmon parr (and adult brown trout). According to Inland Fisheries Ireland the River Boyne catchment contains 5.93% of the accessible juvenile salmon habitat in Ireland, comprising 6.69 million m^2 of suitable juvenile salmon habitat. Salmon angling areas in the River Boyne are largely limited to the main Boyne downstream of Navan and the lower reaches of the Kells Blackwater. Adult salmon seldom move upstream of this point in the channel until late in the year, after the angling season (O'Grady 1998; O'Reilly 2002).

1.3.4.1.2 Barrow catchment

The Barrow is a highly modified river with the lower and middle reaches of the river canalised for navigation. The river still has a good run of salmon which spawn downstream of the weirs on the main channel, and also run into the tributaries. Most of the tributaries have been subjected to arterial drainage schemes and water quality is a significant pressure in the catchment. It is a river that has had recurring serious water pollution problems in recent times, and fish kills have occurred. Despite this salmon stocks are improving according to Inland Fisheries Ireland. A catchment wide electrofishing survey of juvenile salmon abundance was undertaken on the River Barrow during summer 2011 by Inland Fisheries Ireland. The mean catch in 2011 at 79 sites was 24.75 salmon fry per 5 minute fishing which is considered a high abundance level. The mean catch over the four years sampled was 15.35 salmon fry per five minute fishing. It is clear that all the 2^{nd} order and larger streams in the study area of the proposed wind farm developments have salmon populations. According to Inland Fisheries Ireland the River Barrow catchment contains 5.75% of the accessible juvenile salmon habitat in Ireland, comprising 6.49 million m^2 of suitable juvenile salmon habitat. The salmon fishing in the River Barrow is generally regarded as poor, and what fish are taken are mostly grilse, taken either during the summer or late in the season. The salmon fisheries on the River Barrow are located well downstream of the study area.

1.3.4.2 Freshwater Pearl Mussel

The freshwater pearl mussel (*Margaritifera margaritifera* (L.)) does not occur in the study area or in downstream areas. The Freshwater Pearl Mussel is a large bivalve species found in oligotrophic, soft to neutral waters of rivers and, occasionally, in lakes. In Ireland, the species is concentrated along the western sea-board, but also occurs in the south and east where geology allows.

The biology and ecology of the species are particularly notable in that individuals can grow to very large sizes relative to other freshwater molluscs, building up thick calcareous valves, in rivers with relatively soft water and low levels of calcium. Their shell building is consequently very slow, and individuals in natural conditions live to over a hundred years of age.

In Ireland, a total of 27 populations have been designated within 19 SAC areas for *Margaritifera margaritifera.* NPWS (2013) note that the freshwater pearl mussel (FPM) is found in 162 rivers in 104 catchments / sub-catchments across 14 counties (Carlow, Cavan, Clare, Cork, Donegal, Galway, Kerry, Limerick, Mayo, Sligo, Tipperary, Waterford, Wexford and Wicklow). The Freshwater Pearl Mussel does not occur in the study area or in downstream areas. Freshwater Pearl Mussel populations in Ireland have been recently assessed as being 'unfavourable - bad' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013).

1.3.4.2.1 Boyne catchment

The Drehid-Hortland, Ballynakill and Windmill components of the proposed development are located within the Boyne catchment. The Drehid-Hortland and Windmill components are located in Co. Kildare as is the bulk of the Ballynakill site. A small portion of the northern extent of the Ballynakill site is located in Co. Meath. There are no records of FPM in these counties and the species does not occur in the study area. The Article 17 report (NPWS, 2013) which shows the current distribution of FPM shows the Boyne catchment to be outside the known distribution of FPM in Ireland.

1.3.4.2.2 Barrow catchment

The Cloncumber and Derrybrennan components of the proposed development are located within the Barrow catchment in Co. Kildare. Co. Kildare is not listed in NPWS (2013) as an area where FPM is found and the study area is not indicated within the current distribution of FPM.

Lucey (1993) gives the distribution of *Margaritifera margaritifera* in southern Irish rivers and streams. This study area encompassed Hydrometric Areas 11 to 24. The distribution of FPM given in Lucey (1993) for the River Barrow is within the distribution given in NPWS (2013). Again, the proposed development is outside of this distribution range.

Tributaries of the Barrow, Nore and Suir River were examined for freshwater pearl mussels *Margaritifera margaritifera* and *M. m. Durrovensis* from June to August 1991 (Moorkens *et al.,* 1992). Rivers surveyed included the Figile, Cushina, Lerr and Greese in the upper Barrow catchment. Of the 79 rivers surveyed, only four were found to have living freshwater pearl mussels. Two of these rivers were in the Barrow catchment: the Mountain River and the Ballymurphy River. In the 1991 study (Moorkens *et al.,* 1992), mussels were found in sandy gravel towards the river banks, and under overhanging trees. It is noted in Moorkens *et al.* (1992) that alteration in a river's flow regime, such as that caused by drainage for forestry or agriculture, may result in summer flows being insufficient to support Freshwater Pearl Mussel. The same can be said of drainage carried out for harvesting of peat. A large proportion of rivers in the study area have soft substrates deemed unsuitable for FPM, beds of these rivers thought to be influenced by peat runoff from peat harvesting, suspended solids from ploughed lands and diffuse enrichment from agricultural activities, all known pressures on FPM (Moorkens, 1999).

There are three *Margaritifera margaritifera* populations in the Barrow catchment within the River Barrow and River Nore cSAC (002162). These mussels are present in the Mountain, Ballymurphy and Aughavaud Rivers and are in excess of 65km to the south of the Cloncumber component of the proposed Maighne wind farm.

1.3.4.3 White-clawed crayfish

The white-clawed crayfish is the only freshwater crayfish recorded in Ireland. Populations of the species in the rest of Europe have declined dramatically and Ireland is seen as a unique stronghold for this species in a European context (Reynolds 1998). The white-clawed crayfish is protected under both European and Irish legislation. It is protected by the Wildlife Act, 1976 and has been classified as endangered in the IUCN Red List. It is also listed under Appendix III of the Bern Convention and Annexes II and V of the EU Habitats Directive (1992).

The white-clawed crayfish is Ireland's only crayfish species. Ireland is understood to hold some of the best European stocks of this species, under least threat from external factors. Irish stocks are therefore of substantial conservation importance (Reynolds, 1998). Throughout its natural range across Western Europe, the distribution and abundance of white-clawed crayfish has been dramatically reduced in the last 150 years due to human disturbances such as overfishing, habitat destruction, pollution and the introduction of foreign crayfish species (Reynolds, 1998). In Britain, the North American signal crayfish (*Pacifastacus leniusculus*) was introduced for aquaculture and subsequently escaped into the wild, where it has had a devastating effect on white-clawed crayfish populations. While this species has not been recorded in Ireland, there is a real threat that this alien crayfish species will reach this country. The crayfish plague, which was transmitted by introduced crayfish species and is caused by the fungus *Aphanomyces astaci*, has been found in Ireland since the late 1980s.

White-clawed crayfish is widespread in areas which are underlain by Carboniferous limestone, or its derivative - glacial drift (Reynolds, 1998). Demers *et al.* (2005) reported that white-clawed crayfish are still widespread in the rivers of the Irish midlands, where the geology is predominantly limestone. However, these authors also report that the distribution of white-clawed crayfish in rivers has been restricted since the mid-1980s. This was attributed in part to an outbreak of the crayfish plague. Recent data from the EPA suggests a decline in crayfish populations in the north midlands (Reynolds, 2006). According to Reynolds (1998), the main threats to the white-clawed crayfish in Ireland are stream drainage, pollution and the introduction of predators, competitors or diseases. Ongoing drainage maintenance on arterially drained rivers in Ireland has also been identified as having a significant adverse effect of this species (O'Connor & McDonnell, 2008). The overall Article 17 assessment for white-clawed crayfish is Unfavourable-Inadequate (NPWS, 2013).

1.3.4.3.1 Boyne catchment

White-clawed crayfish is generally considered to be widespread in lowland rivers such as the River Boyne and tributaries (e.g. Lucey and McGarrigle, 1987). Demers *et al*. (2005) also reported that crayfish populations in the lakes and rivers of the Boyne catchment were likely to have been affected by crayfish plague, but are currently recuperating, according to Reynolds (2007). However, this effect is geographically isolated (Gallagher *et al*., 2006). All components of the proposed development within the Boyne catchment are located within 10km grid squares within the current distribution of White-clawed crayfish (as in Table 4). This species can be expected to occur in the watercourses draining the Drehid-Hortland, Ballynakill and Windmill components of the proposed development.

1.3.4.3.2 Barrow catchment

All components of the proposed development within the Barrow catchment are located within 10km grid squares within the current distribution of White-clawed crayfish (see Table 4). This species can be expected to occur in the watercourses draining the Cloncumber and Derrybrennan components of the proposed development.

1.3.4.4 Brook lamprey

The brook lamprey is the smallest of the three lampreys native to Ireland and it is the only one of the three species that is non-parasitic and spends all its life in freshwater (Maitland & Campbell 1992). Brook lamprey is listed in Annex II of the EU Habitats Directive (92:43:EEC) and in Appendix III of the Bern Convention. Brook lampreys are the most common and widespread of the three Irish lamprey species (Kurtz & Costello, 1999). They are found in most 2nd order and larger streams and rivers throughout the study area. Brook lampreys live for up to five years burrowed into silt deposits in rivers. They metamorphose into adults and spawn in the early spring in fast flowing streams with gravel substrates. Unlike the other two Irish lamprey species they are not parasitic as adults, and undertake only localised migrations. Lampreys show a preference for gravel-dominated substratum for spawning, and mainly silt and sand-dominated substratum for nursery habitat (Harvey & Cowx, 2003). The spawning season of brook lampreys starts when the water temperatures reach 10–11ºC (Maitland, 2003). This usually occurs in March/April.

Although still common in Ireland they are under significant threat from drainage and navigation maintenance works and also from water quality deterioration. Brook lampreys are also doing less well across the rest of European Union.

In this regard Irish populations of Brook lampreys are of International Importance. Ireland has failed to protect lampreys with a close season for instream works during their spawning season so they are vulnerable due to the lack of this type of protection. Responsibility for protecting lampreys in Ireland falls within the remit of Inland Fisheries Ireland; although there are none and never have been any fisheries for this species in Ireland. Brook lamprey populations in Ireland have been recently assessed as being 'favourable' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013).

1.3.4.4.1 Boyne catchment

During a survey of juvenile lamprey populations in the Boyne Catchment (O'Connor, 2006), brook lampreys were found to be widely distributed in the catchment. Lampreys were present at 70 out of the 91 sites investigated (77%). Mean minimum densities of river/brook juveniles recorded was 5.16 ± 2.43 juvenile lampreys per m^2, which was considered high in the context of Irish rivers. These were considered to be primarily brook lampreys, although river lampreys were also likely to be represented in samples taken from the lower reaches of the Boyne main channel.

1.3.4.4.1.1 Drehid-Hortland

During the O'Connor (2006) survey of juvenile lampreys in the River Boyne catchment, juvenile lampreys were recorded in the Blackwater (Longwood) River. This species can be expected to occur in the Mulgeeth and Coolree Rivers which drain the Drehid-Hortland component of the proposed development.

1.3.4.4.1.2 Ballynakill

Juvenile lampreys occurred in the main channel of the Boyne upstream and downstream of the Boolykeagh River confluence when surveyed in 2005 (O'Connor, 2006).

1.3.4.4.1.3 Windmill

The main channel of the River Boyne was found to have suitable habitat for lampreys at surveyed locations both upstream and downstream of the Glash River confluence, the watercourse draining the Windmill site. This species can be expected to occur in the Glash River also.

1.3.4.4.2 Barrow catchment

King (2006) gives the distribution of the three species of lampreys in the River Barrow cSAC and found brook lampreys to be widely distributed in the main channel of the River Barrow. Taking into account the spawning requirements of the brook lamprey, this species can be expected to occur in only low densities within the study area, the lack of suitable spawning areas considered a limiting factor. Drained rivers such as those in the study area have a much reduced lateral heterogeneity and a lower availability of flow refugia and backwater habitats than un-drained rivers and this can be expected to restrict lamprey production.

1.3.4.4.2.1 Cloncumber

The Abbeylough, Cloncumber and Slate Rivers are likely to support brook lamprey in low densities. These watercourses are regarded as suboptimal for this species however with consideration for the spawning requirements.

1.3.4.4.2.2 Derrybrennan

The Figile and Lullymore Rivers may support small populations of brook lampreys. These watercourses are regarded as suboptimal for this species however with regard to the spawning requirements of the species. These watercourses generally have soft substrates and little gravelly substrates, the latter essential for successful spawning.

1.3.4.5 River lamprey

The river lamprey is larger in size than the brook lamprey and exhibits an anadromous life cycle. River lamprey is listed in Annex II and IV of the Habitats Directive (92:43:EEC), and also in Appendix III of the Bern Convention. River lampreys are poor swimmers and climbers and are confined to the lower reaches of the Boyne catchment - well downstream of the study area of the currently proposed wind energy development. King (2006) notes the presence of river / brook lampreys in the Barrow upstream of Portarlington. It is considered that these lampreys were most likely brook lampreys, taking account of the distance from the tide and the number of weirs on the river.

River lamprey populations in Ireland have been recently assessed as being 'favourable' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013). However, this has been based on the fact that they have been grouped together with Brook lamprey populations due to identification difficulties.

1.3.4.6 Sea lamprey

The sea lamprey is the largest of the Irish lampreys species and again has an anadromous life cycle. They are also listed in Annex II of the Habitats Directive and Appendix III of the Bern Convention. In the NPWS Irish Wildlife Manuals No. 21 (King, 2006), the sea lamprey is indicated as occurring as far upstream as Carlow on the main channel of the River Barrow. Although more capable than river lampreys, sea lampreys are again poor swimmers and climbers would be confined to the lower reaches of the Boyne and Barrow Rivers, if present - well downstream of the study area of the currently proposed wind energy development. Indeed, NPWS (2013) notes that in several sea lamprey rivers, (e.g. the Mulkear, the Feale, the Fergus, the Barrow) severe barriers to passage occur at the upstream end of the tidal freshwater and that this does not represent a favourable situation. Sea lamprey populations in Ireland have been recently assessed as being 'unfavourable' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013).

1.3.4.7 Floating river vegetation

The plants characteristic of this habitat include a number of *Ranunculus* species and all *Callitriche* species, including other submerged aquatic plants. The community Callitricho–Batrachion includes species of the *Ranunculus* subgenus *Batrachium* and two species of *Callitriche*, *C. hamulata* and *C. platycarpa* as diagnostic species. There are few published records for descriptions of this habitat in Ireland and no comprehensive island-wide descriptions. According to NPWS (2013) the EU definition of this habitat is very broad, especially when the presence of aquatic mosses is taken into account. Using this broad definition the habitat will be found in most watercourses in Ireland. There is to date no satisfactory definition of the habitat and its sub-types or their distribution in Ireland. Consequently there is a lack of relevant monitoring data concerning the habitat. What is clear is that the habitat can occur over a wide range of physical conditions, from acid, oligotrophic, flashy upland streams dominated by bryophytes to more eutrophic, slow flowing streams dominated by Ranunculus and Callitriche species. While the former will be sensitive to diffuse pollution the latter, especially in shallow streams, will be relatively more resistant. Flora associated with the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' (3260) includes *Ranunculus saniculifolius, Ranunculus trichophyllus, Ranunculus fluitans, Ranunculus penicillatus ssp. penicillatus, Ranunculus penicillatus* ssp. *Pseudofluitantis, Ranunculus aquatilis, Myriophyllum* spp., Callitriche spp., *Sium erectum* (or *Berula erecta*), *Zannichellia palustris, Potamogeton* spp., and the moss *Fontinalis antipyretica*. *Groenlandia densa* (Opposite leaved pondweed) is also included in the list. The flowering rush *Butomus umbellatus* may be present as part of the bank flora where floating river vegetation has been identified. The habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' in Ireland has been recently assessed as being 'inadequate' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013).

1.3.5 Fish communities and fisheries

Table 5 presents the results of the physical habitat assessments at the aquatic ecology and fisheries survey sites, Table 6 presents the results of the River Habitat Survey (RHS) assessments, Table 7 presents the results of the fisheries habitat assessments and Table 8 presents the biological water quality and WFD status at the aquatic ecology and fisheries survey sites. The results of the aquatic ecology and fisheries survey are also presented on Figure 4.

1.3.5.1 Boyne catchment

A single site was surveyed in the River Boyne catchment within the Eastern River Basin District as part of Water Framework Directive fish surveillance monitoring in 2010 (Kelly *et al, 2011*). This site was located close to the river's source, approximately 1.5km north of Edenderry. This location is approximately 18km upstream of the Fear English River confluence with the River Boyne, the Fear English River draining the Drehid-Hortland component of the proposed development. A total wetted area of 936m^2 was surveyed at Boyne Bridge by IFI in 2010 (117m m long channel of wetted width 8m). Emergent macrophyte vegetation was abundant throughout this stretch, while submerged and floating species were also present. Three fish species were recorded in the River Boyne at Boyne Bridge: brown trout (0.05/m^2), three-spined stickleback (0.004/m^2) and minnow (0.002/m^2). It is noted that the stretch of the River Boyne surveyed during 2010 (Kelley *et al*, 2010) was drained, corresponding to channel characteristics of some watercourses in the current survey area.

1.3.5.2 Barrow catchment

During the current assessment, electrical fishing was carried out at Site 9 on the Figile River. A total of three fish species were recorded at this location: brown trout, European eel and pike.

A site on the main channel of the River Barrow was surveyed in the River Barrow catchment within the Eastern River Basin District as part of Water Framework Directive fish surveillance monitoring in 2009 (Kelly *et al., 2010*), so data from this site was also considered in the current assessment. This site was located at Pass Bridge in Monasterevin, Co. Kildare, approximately 10km downstream of the Figile-Slate confluence, or approximately 22km downstream of Cloncumber, the nearest component of the proposed wind farm (Cloncumber). One electric-fishing pass was conducted using four boat-based electric-fishing units on the 6th of July 2009 along a 426m length of channel. The mean wetted width of the surveyed stretch was 25.6m and the mean depth was 96.0cm. Riffle and glide dominated the habitat, while the substrate was a mixture of cobble, gravel and sand. Macrophyte vegetation consisted mostly of riparian grasses but some submerged species were also present. A total wetted area of 10906m^2 was surveyed. A total of eleven fish species were recorded in the River Barrow (Pass Bridge) site (as well as roach x bream hybrids). Gudgeon *Gobio gobio* was the most abundant species (0.0037/m^2), followed by roach *Rutilus rutilus*(0.0031/m^2), salmon *Salmo salar* (0.0031/m^2), perch *Perca fluviatilis* (0.0026/m^2), pike *Esox lucius* (0.0024/m^2), minnow *Phoxinus phoxinus* (0.0013/m^2), brown trout *Salmo trutta* (0.0009/m^2), stone loach *Barbatula barbatula* (0.0007/m^2), European eel *Anguilla anguilla* (0.0006/m^2), dace *Leuciscus leuciscus* (0.0006/m^2), roach x bream hybrids *Rutilus rutilus* x *Abramis brama* (0.0004/m^2) and bream *A. Brama* (0.0001/m^2).

Gudgeon ranged in length from 8.2cm to 12.0cm (Fig. 4.12). Roach ranged in length from 5.5cm to 25.0cm. Four age classes (2+, 3+, 4+ and 5+) were present, accounting for approximately 14.7%, 35.3%, 29.4% and 17.6% of the total roach catch respectively. Salmon ranged in length from 9.0cm to 14.0cm. All individuals were aged 1+. Perch ranged in length from 10.6cm to 36.0cm. Six age classes (1+, 2+, 3+, 4+, 5+ and 8+) were present. Pike ranged in length from 17.5cm to 59.0cm. Three age classes (1+, 2+ and 3+) were present, accounting for approximately 77%, 8% and 15% of the total pike catch respectively. Brown trout ranged in length from 12.0cm to 38.5cm. Three age classes (1+, 2+ and 3+) were present, accounting for approximately 20%, 70% and 10% of the total brown trout catch respectively. Mean brown trout L1, L2 and L3 were 10.6cm, 18.3cm and 19.4cm respectively, indicating a fast rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971). Eels ranged in length from 46.0cm to 58.0cm.

1.3.5.3 Salmonid habitats and fisheries

Atlantic salmon are discussed in detail in Section 1.3.4.1. As well as salmon, brown trout also occur in the study area. Arterial drainage programmes dating from the 19th and first half of the 20th century impacted on many catchments throughout Ireland. Brown trout occur in virtually every catchment in Ireland with suitable water quality and spawning grounds, and are one of the most common and recognisable fish species in Ireland. Indeed, they have less protection in Ireland from anglers than non-native invasive cyprinid fish species such as the dace and roach, presumably due to their abundance. Brown trout occur as resident 'brown trout' and also as an anadromous form, the 'sea trout'. In many catchments throughout Ireland trout make extensive migrations between spawning grounds in streams and feeding grounds in lakes or larger rivers.

The Boyne catchment was severely affected by these schemes which degraded habitats for species such as trout. In many cases trout populations were more affected than salmon, with the removal of features such as undercut banks, large woody debris etc. from these channels. The larger river channels in the study area are still considered to be important trout fisheries, i.e. the Boyne, Blackwater (Longwood), Slate and Figile are all still noted for the quality and size of brown trout that they produce (O'Reilly, 2004).

1.3.5.4 Coarse fish habitats and fisheries

Coarse fish are essentially any freshwater fish other than salmon and trout and generally include members of the cyprinidae family (i.e. roach, dace, rudd, bream, tench), pike and perch. The term coarse fishing originated in the United Kingdom in the early 19th century. Prior to that time, recreational fishing was a sport of the gentry, who angled for salmon and trout which they called game fish. Other fish were disdained as coarse fish.

Almost all coarse fish in Ireland are considered to be non-native species. However, there is recent evidence that pike may be native to Ireland (Pedreschi *et al*, 2013). Coarse fish in Ireland are afforded a higher level of protection in Ireland than native brown trout, with strict limits on the number and sizes of these fish that can be killed by anglers. Coarse fisheries are of significant economic value in Ireland, particularly for tourist anglers. Coarse fisheries and coarse fish spawning areas are generally located in large lowland rivers and lakes. The main channel of Moynalty is important in this regard.

1.3.5.5 Eel habitats

The European eel *Anguilla anguilla* is a native fish of significant ecological importance. In recent decades, this species has undergone a dramatic decline throughout its range. In response to the decline in European eel populations European Council Regulation 1100/2007 “Establishing measures for the recovery of the stock of European eel” has now been adopted in member states. European eel is listed as ‘Critically endangered’ and is now ‘Red Listed’ according to the recently published ‘Red List No. 5: Amphibians, Reptiles & Freshwater Fish’ (King *et al*., 2011).

Eels are considered present throughout the study area, but are generally only found in larger watercourses, rivers and lakes. Eels have a catadromous life cycle, which means they spawn in the sea and migrate into freshwater to feed and grow. This is opposite of the life cycle of the salmon, for example. The upstream migration of eels in rivers is restricted by weirs and their obstacles. However unlike lampreys they are able to climb over weirs. Despite the international decline in this species, they are still common in the main rivers in the study area.

1.3.5.6 Lamprey habitats

Lampreys are discussed above in Sections 1.3.4.4, 1.3.4.5, and 1.3.4.6. The most common lamprey species in the study area is Brook lamprey and they are generally common and widespread in the study area in 2nd order and larger streams and rivers.

1.3.5.7 Others

The majority of the watercourses within the proposed wind farm site are small fish populations dominated by species such as the three-spined stickleback, nine-spined stickleback, minnow and stone loach. These small fish communities are not of significant ecological or economic importance. These small fish populations, and particularly ones dominated by sticklebacks, can be present in even small drains that have permanent water.

1.3.6 Aquatic macroinvertebrates

1.3.6.1 Macroinvertebrate communities

The aquatic macroinvertebrate community in Ireland is impoverished due to glaciation with many species not reaching Ireland following the retreat of the ice and sea level changes.

Macroinvertebrate assemblages were recorded from Site 2 on the Longwood Blackwater in the Boyne catchment, and Site 8 on the Slate River and Site 9 on the Figile River in the Barrow catchment. The macronivertebrates recorded at these locations are provided in Table 9.

The macroinvertebrate communities in the study area were typically associated with slow flowing watercourses. Pollution tolerant macroinvertebrates were found to dominate the macroinvertebrate assemblage at these sites. Watercourse morphology including physical characteristics such as depth and wetted width, as well as gradient, substrate conditions and instream/emergent vegetation coupled with water quality all dictate the macroinvertebrate families and relative abundance at the sites surveyed. The macroinvertebrate community assemblages recorded on the Longwood Blackwater, Slate River and Figile River are considered to be representative of the watercourses in the study area at large. Owing to their large size, these sites probably support the richest aquatic macroinvertebrate communities in the study area, as the smaller watercourses (drainage ditches) in the study area are prone to fluctuations and have less diverse structural diversity. The only protected macroinvertebrate in the study area is white clawed crayfish (see Section 1.3.4.3). This species was not recorded during the current assessment but is likely to occur.

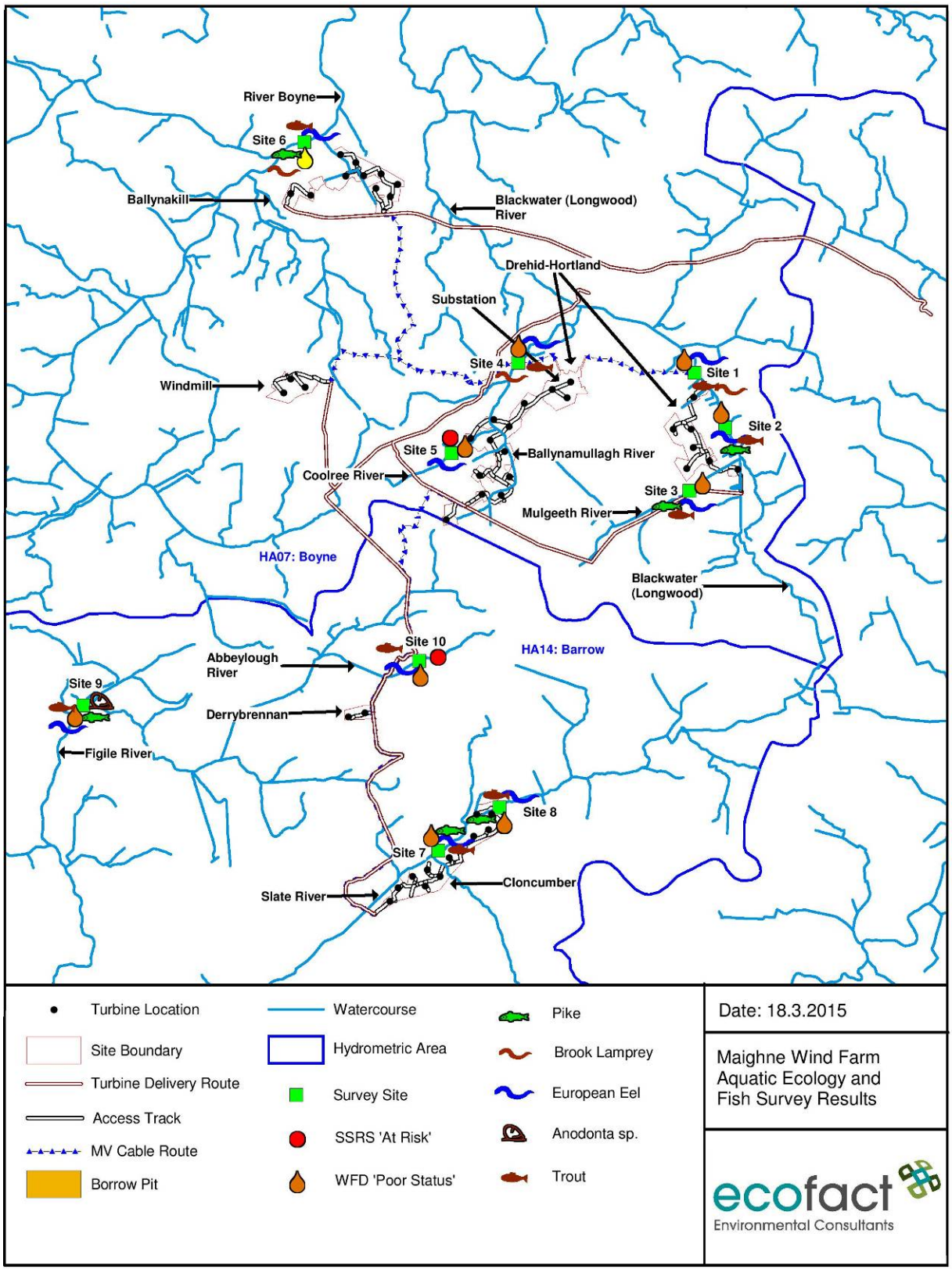

Figure 4: Maighne proposed wind farm site; aquatic ecology and fisheries survey sites and results

1.3.6.1.1 Boyne catchment

1.3.6.1.1.1 Drehid-Hortland

Site 2 was located on the Blackwater (Longwood) River in the Boyne catchment to the east of the proposed Drehid-Hortland component of the proposed Maighne wind farm. A macroinvertebrate family diversity of eight was recorded at this site. The pollution tolerant crustaceans *Gammarus deubeni* and *Asellus aquaticus*, as well as the snail *Bithynia tentaculata* were common. The snai *Lymnaea peregra* and beetles *Potamonectes depressus elegans* and *Stictotarsus duodecimpustulatus* were also recorded. The only Trichopteran recorded was *Hydropsyche sp.* (common).

1.3.6.1.2 Barrow catchment

1.3.6.1.2.1 Cloncumber

Site 8 was located on the Slate River at the eastern estent of the proposed Cloncumber component of the proposed Maighne wind farm. Macroinvertebrates in 10 families were recorded here. The only Ephemeropteran recorded was larval *Baetis rhodani*, a pollution tolernat indicator. Fair numbers and small numbers of *A. Aquaticus* and *Gammarus duebeni* were recorded respectively. The non-native snail *Potamopyrgus jenkinsi* was numerous. The leeches *Glossiphonia complanata* and the fish parasite *Piscicola geometra* as well as Aquatic worm (Lumbriculidae) were present at this site.

1.3.6.1.2 Derrybrennan

Site 9 was located on the Figile River downstream of the Derrybrennan component of the proposed Maighne wind farm. The macroinvertebrate family diveristy at this location was 16. Trivhopterans were well represented with cased larvae of Group (less sensitive) *Phryganea sp.* (scarce) and caseless larvae of *Hydropsyche sp.* (fair numbers) and *Polycentropus* sp. (scarce). Larvae of the banded jewelwing damselfly *Agrion splendens* the true fly *Dicranota* sp. were recorded in small numbers. Molluscs were the most diverse group with the following recorded: *Planorbis carinatus, P. Jenkinsi, Lymnaea stagnalis* and freshwater duck mussel *Anodonta anatina.*

A. anatina has been previously recorded from the Figile River (based on distribution maps in Byrne *et al,* 2009). Its habitat in Ireland is lowland lake, slow moving rivers and canals. Microhabitat for this species in Ireland comprises muddy or silty beds in areas of still or slow flow. The Slate River is also considered to support this species. There are a total of 31 Irish non-marine molluscan species that either have a threat status or with important Irish populations (Moorkens, 2006), including Duck Mussel. The IUCN status of *A. anatina* is 'Vulnerable' (Byrne *et al,* 2009) and its threat status is 'Vulnerable' (Moorkens, 2006).

1.3.7 Biological water quality

Water quality has been monitored in the River Boyne and Barrow main stem and in selected tributaries by the Environmental Protection Agency (EPA) and its predecessors since 1971. As part of its rollover monitoring programme, biological sampling is carried out periodically by the EPA. Below is an account of biological water quality in the study area based on EPA data. Table 10 gives the biological water quality ratings of watercourses assessed in August / September 2013. Figure 5 gives the most EPA Biological Water Quality Results for Watercourses Draining the Proposed Maighne Wind Farm.

1.3.7.1 Hydrometric Area 07 (Boyne)

1.3.7.1.1 Drehid Hortland

The Drehid-Hortland component of the proposed development is drained by the Blackwater (Longwood) River and was most recently monitored by the EPA in 2012. The uppermost EPA biologicla surey location on this river in 2012 is at the bridge south of Hortland (07B02 60), to the east of the proposed development. Biological water quality at this locatioon was rated Q3 at this time, equivalent to WFD poor status. Biological water quality at the bridge at Johnstown was rated Q3-4 in 2012, equivalent to WFD moderate status.

The following is the most recent EPA assessment of the Blackwater (Longwood) River based on the 2012 results: *the dominance of pollution tolerant and paucity of pollution sensitive macroinvertebrate taxa indicated unsatisfactory ecological conditions at all sites surveyed on the Blackwater (Longwood) River in September 2012. Enriched conditions were evident with enhanced macrophyte growth noted downstream of Johnstown at Longwood (0300) and in the lower reaches (0600).*

1.3.7.1.2 Ballynakill

A stretch of the River Boyne between the EPA biological monitoring station at Ashfield Bridge (07B04 600) and Inchamore Bridge (07B04 800) lies approximately 1km north of the Ballynakill component of the proposed development site. At the upstream location (Ashfield Bridge), biological water quality was rated Q3-4 in 2012, corresponding to WFD moderate status. At the downstream location (Inchamore Bridge), biological water quality was rated Q4 in 2012, corresponding to WFD good status. The following is the most recent EPA assessment of the Blackwater (Longwood) River based on the 2012 results: *the majority of the fifteen stations surveyed on the Boyne River remain in an unsatisfactory ecological condition in 2012. The macroinvertebrate fauna indicated satisfactory ecological conditions at six of the stations examined. An unwelcome decline in ecological status was noted at three stations. The macroinvertebrate fauna indicated a decline from good to moderate ecological conditions in the upper reaches at Boyne Bridge (0200) and at Scarriff Bridge (0900) and a decline from high to good ecological conditions at Inchamore Bridge (0800). A welcome improvement from moderate to good ecological conditions was noted downstream of Broadboyne Bridge (2010). Unsatisfactory ecological conditions continue downstream of Edenderry (0300), at Ashfield Bridge downstream of the Glash River confluence (0600), downstream of the Blackwater (Longwood) confluence (0900), at Trim and downstream (1200, 1400), at Bective Bridge downstream of the Knightsbrook and Boycetown confluences (1500), Kilcarn Old Bridge, downstream of the Clady and Skane river confluences (1700) and at Obelisk Bridge, upstream of Drogheda (2200)*.

The Mulphedder Stream drains the western extent of the proposed development site and flows in to the Glash River upstream of Bunglass Bridge (07G02 600). Biological water quality at this site was rated Q3-4 in 2012, corresponding to WFD moderate status.

1.3.7.1.3 Windmill

The Windmill component of the proposed development is drained by the Glash River system River which most recently monitored by the EPA in 2012. Biological monitoring is carried out at four locations within this sub-basin. The uppermost location is at the bridge NW of Calfstown (07G02 200) which is ca. 1km to the northeast of the proposed development site. Biological water quality at all locations surveyed by the EPA in 2012 were rated Q3, equivalent to WFD poor status.

The following is the most recent EPA assessment of the Glash River based on the 2012 results: *the dominance of pollution tolerant macroinvertebrate taxa, complete lack of pollution sensitive taxa and excessive instream siltation continues to indicate unsatisfactory poor ecological conditions at all stations surveyed on the Glash River in 2012. Excessive peat siltation of the instream substratum was noted in particular near Calfstown (0200) and at Clonuff Bridge (0400).*

1.3.7.2 Hydrometric Area 14 Barrow

1.3.1.2.1 Cloncumber

The Cloncumber component of the proposed development is drained by the Slate River and the Cloncumber Stream and these watercourses were most recently monitored by the EPA in 2011.

The Slate River is monitored at Ford Bridge (14S01 50) upstream of the proposed development and at Agar Bridge (14S01 100) downstream. Biological water quality at both of these locations were rated Q3-4 in 2011, equivalent to WFD moderate status.

The following is the most recent EPA assessment of the Slate River based on the 2011 results: *Only one of the six stations surveyed on the Slate River was in a satisfactory ecological condition in 2011. Poor ecological conditions persist downstream of Prosperous (0020) and Allenwood (0050).*

A slight improvement from poor to moderate ecological conditions was noted at Agar Bridge (0100) and downstream of Rathangan (0210). The increased diversity of sensitive macroinvertebrate fauna indicated a welcome improvement in the lower reaches (0300) however signs of enrichment (heavy siltation, enhanced instream algal growth, elevated dissolved oxygen and pH readings) were still evident.

Only a single site is monitored on the Cloncumber Stream, at Old River Bridge (14C17 0200), ca. 3km upstream of the proposed development site. Biological water quality at this site was rated Q3-4 in 2011, equivalent to WFD moderate status. The following is the most recent EPA assessment of the Cloncumber Stream based on the 2011 results: *the macroinvertebrate fauna continues to indicate unsatisfactory moderate ecological conditions on the Cloncumber Stream at Old River Bridge (0200) when surveyed in May 2011.*

1.3.7.2.2 Derrybrennan

The Derrybrennan component of the proposed development is drained by the Figile River and was most recently monitored by the EPA in 2011. The Slate River is assessed by the EPA both upstream and downstream of the proposed development: at Ticknevin Bridge (14F01 200) and Cushaling Bridge (14F01 100) respectively. In 2011, biological water quality was rated Q, equivalent to WFD poor status at Ticknevin Bridge, and Q3-4, equivalent to WFD moderate status at Cushaling Bridge.

The following is the most recent EPA assessment of the Figile River based on the 2011 results: *The dominance of pollution tolerant macroinvertebrate species, enhanced instream plant and algal growth and excessive siltation indicated continued unsatisfactory ecological conditions in the upper reaches (0050, 0100, 0200) of the Figile River in May 2011. The increased diversity and abundance of sensitive macroinvertebrate species indicated good ecological conditions at Clonbulloge (0300), Derrygarran (0400) and Andra Bridge (0500) although the enhanced macrophyte and algal growth continues to indicate some enrichment.*

1.3.8 Aquatic plant communities

Plants recorded during the current surveys consisted of *Sparganium erectum*, *Apium nodiflorum*, *Rorippa nasturtium-aquaticum*, *Glyceria maxima*, *Phalaris arundinacea, Mentha aquatica*, *Myosotis scorpioides, Iris pseudacorus, Schloenoplectus lacustris, Nuphar lutea, Callitriche* spp., *Lemna* spp. and *Potamegeton* sp. The moss *Fontinalis antipyretica* is widespread the Boyne catchment while the filamentous green algae *Cladophora glomerata* is common in both the Boyne and Barrow catchments, especially in the enriched lower reaches of rivers and some tributaries within the study area.

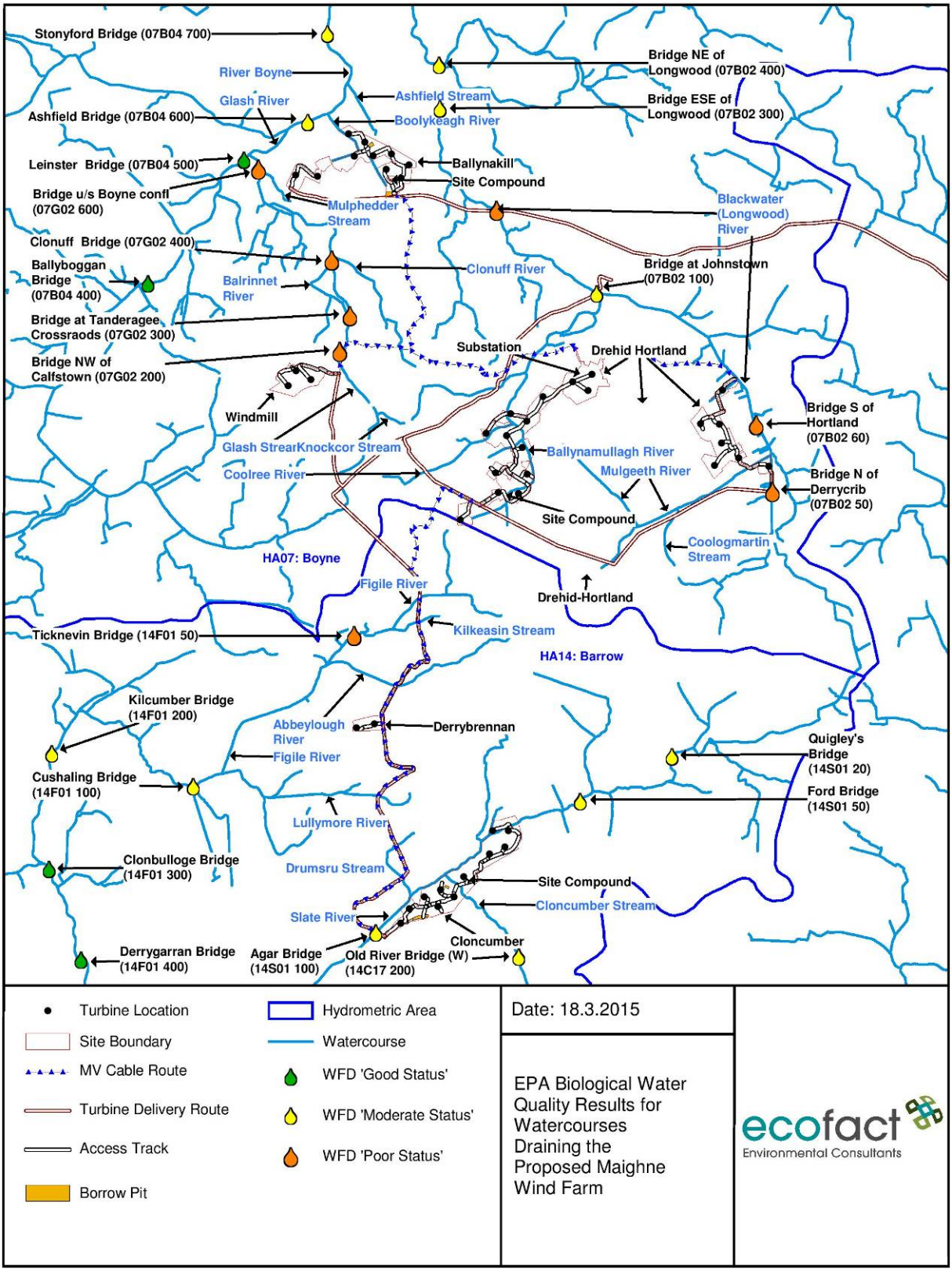

Figure 5: Most EPA Biological Water Quality Results for Watercourses Draining the Proposed Maighne Wind Farm.

Table 5: Results of the physical habitat assessments* of the aquatic ecology and fisheries survey sites at proposed Maighne wind farm site

Site	Watercourse Name	Wetted width (m)	Mean Depth (cm)	Max Depth (cm)	Instream vegetation (%)	Bank Height (m)	Bank slope (°)	Bank Cover (%)	Canopy Cover (%)	Riffle (%)	Glide (%)	Pool (%)	Flow Velocity (m/s)	Rock (%)	Cobble (%)	Gravel (%)	Fine (%)	Shade (%)
1	Blackwater (Longwood)	3	30	50	40	4	45	100	85	0	100	0	0.2	20	20	20	40	50
2	Blackwater (Longwood)	2.5	30	40	20	0.5	45	100	20	0	100	0	0.02	0	0	0	100	20
3	Mulgeeth	2.5	30	40	20	0.5	45	100	20	0	100	0	0.02	0	0	0	100	20
4	Coolree 07	2	15	20	40	1	90	100	40	20	80	0	0.3	20	20	10	50	40
5	Coolree 07	0.5	5	20	0	1.5	80	95	95	30	40	30	0.2	0	30	40	30	95
6	Boyne	6	1	1.8	8	2	20	100	0	0	50	50	0.2	0	5	70	25	0
7	Slate	1.2	40	50	80	2.5	75	100	0	0	100	0	0.03	0	0	20	80	0
8	Slate	2.5	30	40	20	0.5	45	100	20	0	100	0	0.02	0	0	0	100	20
9	Figile	6	50	100	40	1.8	75	100	0	0	100	0	0.02	0	10	80	10	0
10	Abbeylough	1.5	15	20	40	1	80	100	70	0	100	0	0.01	10	40	40	10	70

**Assessment follows Environment Agency (2003) River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003.*

Table 6: Results of the River Corridor Survey (RHS) assessments of survey sites at proposed Maighne wind farm site.

Site	Watercourse Name	EPA code	Drained	Wetted width (m)	Gradient (Low/Med/High) *	Siltation (Heavy/Moderate/Normal/Free)*	Filamentous algae (Y/N)	Eroding banks (Y/N)	Braided channel (Y/N)	Artificial features (Y/N)
1	Blackwater (Longwood)	07B02	Yes	3	L	H	N	N	N	Y
2	Blackwater (Longwood)	07H03	Yes	2.5	L	H	N	N	N	Y
3	Mulgeeth	07M54	Yes	2.5	L	H	N	N	N	Y
4	Coolree 07	07C23	Yes	2	L	H	N	N	N	Y
5	Coolree 07	07C23	Yes	0.5	L	M	Y	N	N	Y
6	Boyne	07B04	Yes	6	L	M	Y	N	N	Y
7	Slate	14S01	Yes	1.2	L	M	Y	N	N	N
8	Slate	14S01	Yes	2.5	L	H	N	N	N	Y
9	Figile	14F01	Yes	6	L	N	N	N	N	Y
10	Abbeylough	14A01	Yes	1.5	L	M	N	N	N	Y

**Visual assessment.*

Table 7: Results of the fisheries habitat assessments of survey sites at proposed Maighne wind farm site.

Site	Watercourse Name	Salmonid nursery (Y/N)	Salmonid fishery (Y/N)	Coarse nursery (Y/N)	Coarse fishery (Y/N)	Salmon (P/A)	Trout (P/A)	Coarse fish (P/A)	Eel (P/A)	Lamprey Habitat (P/A)	Lamprey (P/A)	Crayfish (P/A)	FWPM (P/A)	Floating river vegetation (Y/N)
1	Blackwater (Longwood)	N	N	N	N	A	P	A	L	P	L	A	A	N
2	Blackwater (Longwood)	N	N	N	N	A	L	L	L	A	A	A	A	N
3	Mulgeeth	N	N	N	N	A	L	L	L	A	A	A	A	N
4	Coolree 07	Y	N	N	N	A	L	A	L	P	L	A	A	N
5	Coolree 07	N	N	N	N	A	A	A	L	A	A	A	A	N
6	Boyne	Y	Y	Y	Y	P	P	P	P	P	P	P	A	Y
7	Slate	Y	N	Y	N	P	P	P	P	A	A	A	A	N
8	Slate	N	N	N	N	A	L	L	L	A	A	A	A	N
9	Figile	Y	Y	Y	N	A	A	P	A	A	A	A	A	N
10	Abbeylough	Y	N	N	N	A	P	P	P	A	A	A	A	N

Y = Yes, N= No, P = Present, A = Absent, L = not recorded but likely to occur in the waterbody

Table 8: Biological water quality and WFD status at the aquatic ecology and fisheries survey sites.

Site	Watercourse Name	EPA code	EPA Q-value	ECOFACT Q-value	ECOFACT SSRS	WFD status	Morphological status* (High / Good / Moderate / Poor / Bad)	Biological status* (High / Good / Moderate / Poor / Bad)	Fisheries status* (High / Good / Moderate / Poor / Bad)
1	Blackwater (Longwood)	06B02	N/A	Q3	N/A	Poor	P	M	M
2	Blackwater (Longwood)	06B02	Q3/Q3-4	Q3	N/A	Poor/Moderate	P	P	P
3	Mulgeeth	07M54	N/A	Q3	N/A	Poor	P	P	P
4	Coolree 07	07C23	N/A	Q3	N/A	Poor	P	P	P
5	Coolree 07	07C23	N/A	Q3	Bad	Poor	P	P	P
6	Boyne	07B04	Q3-4	Q3-4	N/A	Moderate	P	M	M/G
7	Slate	14S01	Q3-4	Q3	N/A	Poor/Moderate	P	P	M
8	Slate	14S01	N/A	Q3	N/A	Poor	P	P	P
9	Figile	14F01	N/A	Q3	N/A	Poor	P	P	M
10	Abbeylough	14A01	N/A	Q3	Bad	Poor	P	P	P

**categories follow EEA (2012).*

Table 9: Macroinvertebrates recorded during the biological surveys.

	Pollution sensitivity group	Functional group	Site 2- Longwood Blackwater	Site 8 - Slate River	Site 9 - Figile River
MAYFLIES (Uniramia, Ephemeroptera)					
Large dark olive Baetis rhodani	C	Scraper & gathering collector		****	
CASED CADDIS FLIES (Trichoptera)					
Northern caddisflies (Limnephilidae)				**	
Phryganeidae					
Phryganea sp.	B	Shredder			**
CASELESS CADDIS FLIES (Trichoptera)					
Grey flags (Hydropsychidae)					
Hydropsyche sp.	C	Filtering Collector	*****	****	****
Trumpet-net caddisflies (Polycentopodidae)					
Polycentropus sp.	C	Filtering collector			**
DAMSELFLIES (Odonata, Zygoptera)					
Jewelwings/Demoiselles (Agriidae)					
Banded jewelwing *Agrion splendens*	B	Predator			***
TRUE FLIES (Diptera)					
Craneflies (Tipulidae)	C	Shredder			
Dicronata sp.	C	Shredder			***
Family Chironomidae					
BEETLES (Coeloptera)					
Gyrinidae					
Whirligig beetle larvae (Gyrinidae)					
Common whirligig beetle *Gyrinus sp.*	C	Predator			**
Haliplidae	C	Predator			
Diving beetles (Dytiscidae)					
Sub family Hydroporinae					
Stictotarsus duodecimpustulatus	C	Predator	***		
Potamonectes depressus elegans	C	Predator	**		
SNAILS (Mollusca, Gastropoda)					
Family Lymnaeidae					
Wandering Snail *Lymnaea peregra*	D	Shredder	**		
Great Pond Snail *Lymnaea stagnalis*	C	Shredder			**
Family Planorbiidae					
Keeled Ramshorn Snail *Planorbis carinatus*	C	Scraper			*****
Hydrobiidae					
Bithynia tentaculata	C	Shredder	*****		
Jenkins spire shell *Potamopyrgus*	C	Grazer		******	*****

	Pollution sensitivity group	Functional group	Site 2- Longwood Blackwater	Site 8 - Slate River	Site 9 - Figile River
jenkinsi					
Family Ancylidae					
River limpet *Ancylus fluviatilis*	C		****	**	
MUSSELS (Mollucsa, Lamellibranchiata)					
Duck mussel Anodonta anatina					*
Orb/Pea Mussels (Family Sphaeridae)	D	Filtering Collector	**		
CRUSTACEANS (Crustacea)					
Amphipods (Amphipoda, Gammaridae)					
Freshwater shrimp *Gammarus sp*	C	Shredder	*****	***	**
Isopods, Asellidae					
Hog louse *Asellus aquaticus*	D	Shredder	*****	****	***
LEECHES (Hirudinae)					
Piscicolidae					
Piscicola geometra	C	Predator		*	*
Glossiphonidae					
Glossiphonia complanata	D	Predator		*	
BUGS (Hemiptera)					
Lesser Water Boatmen (Corixidae)		Predator			**
Notonectidae					
Notonecta sp.	C	Predator			*
ALDERFLIES (Megaloptera)					
Alderfly larvae (Sialidae)					*
OLIGOCHAETAE					
Aquatic worm (Lumbriculidae)	D	Collector		*	

**Present (1 or 2 individuals), **Scarce/Few (<1%), ***Small Numbers (<5%), ****Fair Numbers (5-10%), *****Common (10-20%), ******Numerous (25-50%), *******Dominant (50-75%), ********Excessive (>75%).*

Table 10: Biological water quality results for sites assessed for the proposed Maighne wind farm site during the August/October 2013 survey.

Site	Catchment	Relevant component of wind farm	Sub-catchment	River	Watercourse	Q-value	WFD Status	SSRS
1	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Blackwater (Longwood)	Q3	Poor	-
2	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Hortland	Q3	Poor	-
3	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Mulgeeth	Q3	Poor	-
4	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Coolree 07	Q3	Poor	-
5	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Coolree 07	Q3	Poor	Bad
6	Boyne	Ballynakill, Windmill	Boyne	Boyne	Boyne	Q3-4	Moderate	-
7	Barrow	Cloncumber	Figile	Slate	Slate	Q3	Poor	-
8	Barrow	Cloncumber	Figile	Slate	Slate	Q3	Poor	-
9	Barrow	Derrybrennan	Figile	Figile	Figile	Q3	Poor	-
10	Barrow	Derrybrennan	Figile	Figile	Abbeylough	Q3	Poor	-

1.4 Potential Impacts

Wind farm developments, as with all major construction projects, have the potential to have significant negative impacts on aquatic habitats and the key ecological receptors in the aquatic environment. Wind farm projects are often located near the sources of streams or rivers. These reaches are generally minor watercourses and are therefore potentially vulnerable to even relatively small pollution events. Such areas can also be important salmonid spawning and nursery areas; or can act as vectors of pollution to downstream areas which are important in this respect. Minor headwaters and upper reaches can be of importance to protected or ecologically important features downstream.

The impacts of wind farm developments on aquatic areas generally occur only during the construction phase. Ongoing operation and maintenance of wind farms is unlikely to result in any significant effects in the receiving aquatic environment. Impacts may also potentially occur during wind farm decommissioning.

It is likely that that the proposed development will require clearance of some trees/vegetation to build site access roads, turbine foundations, borrow pits, hardstanding areas, cable trenches and provide site drainage. These operations can impact on the quality of habitats present for aquatic organisms. Wind farm construction can increase suspended solids loading of watercourses, alter recharge or drainage/runoff patterns and change surface water quantity thereby increasing flood risk for downstream watercourses, eroding watercourse banks and edges, widenening channels and altering stream beds. No matter where a road/track is built, it must intersect a drainage basin, and where this occurs, alteration of the local hydrology is inevitable (Tsunokawa and Hoban, 1997).

The potential impacts of the proposed wind farm development are outlined below for the construction, operation and decommissioning (as applicable) phases of the project. These are the potential impacts that could potentially occur in the absence of mitigation measures.

Under Section 173 of the Fisheries (Consolidation) Act, 1959, it is an offence to '*obstruct the passage of the smolts or fry of salmon, trout, or eels or injure or disturb the spawn or fry of salmon, trout or eels or injure or disturb any spawning bed, bank or shallow where the spawn or fry of salmon, trout or eels may be*'.

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.

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 any substance that is liable to injure fish; 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.

Under the European Community (Surface Water) Regulations, 2009, it is noted under Part III, Section 33 that '*Failure to achieve good ecological status, or where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water resulting from new modifications or alterations to the physical characteristics of a surface water body, or failure to prevent deterioration of a body of surface water from high status to good status resulting from new sustainable human development activities shall not be a breach of these Regulations when all the following conditions are met:*

(1) All practicable steps are taken to mitigate the adverse impact on the status of the body of surface water.

(2) The reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 of the 2003 Regulations and the objectives are reviewed every six years.

(3) The reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives established by Article 28 of these Regulations are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and

(4) The beneficial objectives served by these modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option'.

It is therefore imperative that no significant impacts (direct, indirect or cumulative) occur on the streams on the site or the downstream catchment areas during the construction, operation of decommissioning phases of the proposed wind farm project.

1.4.1 Potential Impacts during Construction

1.4.1.1 Location of proposed development in relation to surface water features

All the rivers and streams which drain the various components of the proposed development are potential receiving water for pollutants arising from construction operations associated with the proposed development. Figures 6.1 and 6.2 show the water features in the study area - these watercourses potentially affected by the proposed development at crossing points and where works take place in close proximity in particular. The individual components of the proposed Maighne Wind Farm are discussed below under the Boyne and the Barrow catchments. The proposed MV cable route which traverses the Boyne and the Barrow catchments is also discussed. It is noted that a proposed external access track follows the same route as the cable.

1.4.1.1.1 Boyne catchment

1.4.1.1.1.1 Drehid-Hortland

The Blackwater (Longwood) River and a number of its tributaries (Mulgeeth River, Ballynamullagh River, Coolree River) drain the Drehid-Hortland component of the proposed development. There are a number of proposed turbines located near watercourses at this site. Turbines 16 and 22 are located approximately 120m from the Ballynamullagh River while turbine 17 is a similar distance from the Coolree River. Proposed access tracks would cross the Ballynamullagh River at four locations and there one be one crossing of a 1st order tributary of the Ballynamullagh River.

An access track to turbine 48 would run alongside a 1st order tributary of the Ballynamullagh River for a distance of ca. 120m. An access track to the south of turbine would run adjacent to the Blackwater (Longwood) River over a distance of 550m and this track would also cross this watercourse at two locations as well as the Mulgeeth River and Coologmartin Stream. There is a proposed site compound located approximately 30m from the headwaters of the Ballynamullagh River.

Within the Drehid-Hortland section of the proposed Maighne wind farm, the MV cable would cross the Blackwater (Longwood) River, the Mulgeeth River (twice), the Coologmartin Stream, the Ballynamullagh River, the Coolree River and the Knockcor Stream.

1.4.1.1.1.2 Ballynakill

The proposed development at Ballynakill is drained by the River Boyne main channel to the north, the Boolykeagh River and the Glash River to the west. Within this part of the development, turbine 4 is located ca. 80m to the east of the 1st order reach of the Boolykeagh River while turbine 3 is located ca. 60m to the south of a 1st order tributary of the Boolykeagh River. Turbine 1 would be located ca. 60m from the Boolykeagh River which flows into the River Boyne less than 1km upstream of the cSAC. An access track would run alongside the Boolykeagh River between turbine 3 and 4 over a distance of ca. 270m and a borrow pit is proposed ca. 50 from this watercourse.

1.4.1.1.1.3 Windmill

The Windmill portion of the proposed development is located in the Glash River sub-catchment where the development lands are drained by the 2nd order Balrinnet River and the Glash Stream. The nearest component of the proposed development to a surface watercourse in this part of the site is the MV cable, where there would be a single crossing of the Glash Stream. There are three proposed turbines in this part of the wind farm site and none of these turbines are located within 500m of a watercourse. The MV cable would cross the upper reaches of the Knockcor Stream and the Clonuff River to the east of the Windmill site where it links the Drehid-Hortland and Ballynakill components of the wind farm.

1.4.1.1.2 Barrow catchment

1.4.1.1.2.1 Cloncumber

The Cloncumber component of the proposed development is located in close proximity to the Slate and Cloncumber Rivers. There would be one crossing of the Slate River where an access track is proposed between turbines 30 and 31 and a single crossing of the Cloncumber Stream between turbines 33 and 34. Proposed turbines 29 and 30 would be located ca. 90m and 95m from the Slate River. There are 5 borrow pits proposed within the Cloncumber site. One of these is located ca. 200m to the south-west of the Cloncumber Stream and another ca. 270m south east of the Slate River. The MV cable route from the Cloncumber site connects to the Derrybrennan site. It traverses the Slate River at Agar Bridge to the west of the Cloncumber site, the Drumsru Stream twice and a 1st order reach of the Lullymore River.

1.4.1.1.2.2 Derrybrennan

The Figile River (EPA code 14F01) drains the Derrybrennan component of the proposed development. The closest watercourse to this site is the Abbeylough River which is approximately 900m to the north. There would be one MV cable route crossing of the Abbeylough River, the Kileasin Stream, and the Figile River between the Derrybrennan and Drehid-Hortland components of the proposed development.

1.4.1.2 Potential Direct Impact

Access tracks will be built/upgraded to access proposed turbine locations where no access tracks currently exist. The proposed works will also include comprise trenching to facilitate the laying of cabling. Where these cables need to cross watercourses there will be the potential direct impacts on the aquatic environment (disturbance and degradation of fluvial and riparian habitats). Where possible a trenchless crossing technique will be employed, using directional drilling techniques.

Alternative trenchless techniques are also being considered and these overground methods would have less significant potential direct impacts on watercourses (e.g. fixing of cables to bridges). The entire cable route is along existing roadways for example at Agar Bridge over the Slate River and the bride over the Coolree River.

There is potential for releases of suspended solids and other substances associated with upgrading, realigning and construction of access roads and trenching within the site and also during the excavation work associated with proposed borrow pits. Installation, upgrading and/or extension of an internal road network on a wind farm site and excavations can result in increased silt runoff. Suspended solids in even quite small quantities may have a serious effect on the spawning sites of salmonids (O'Connor & Andrew, 1998; Turnpenny & Williams, 1980; Shackle *et al*., 1999).

Engineering works in the vicinity of streams and at stream crossings can also impact directly on physical habitat, for example the spawning or nursery areas of fish. Permanent loss of aquatic habitats can also occur where access roads are constructed over or in close proximity to streams/rivers or where streams/rivers are permanently diverted to new channels. Obstruction to upstream movement of fish, particularly salmon and trout, due to construction of culverts can also potentially occur.

'Improved' drainage of the site can potentially result in increased erosion of nearby streams, and may result in lower water levels in dry weather, which will reduce the habitat available to fish. Any operations which result in loss of sediment will also result in increased nutrients being released from the soil. This has the potential to cause eutrophication of streams thereby lowering the capacity of the streams to support fish and invertebrate fauna. The construction of the wind farm is not expected to significantly affect the drainage regime on the site, with direct impacts affecting watercourses and aquatic ecology minimised via the protection of water quality within the site.

1.4.1.3 Potential Indirect Impacts

The most likely potential impact during the construction phase of the Drehid-Hortland, Ballynakill, Windmill, Cloncumber and Derrybrennan wind energy developments on receiving watercourses and aquatic habitats arises indirectly via impacts affecting water quality, such as accidental releases of silt laden runoff. Other potential impacts affecting aquatic ecology during the construction phase could also occur as a result of accidental spillage of cement or hydrocarbons stored on site impacting upon water quality. Waste from on-site toilets and wash facilities could also potentially impact on aquatic ecology.

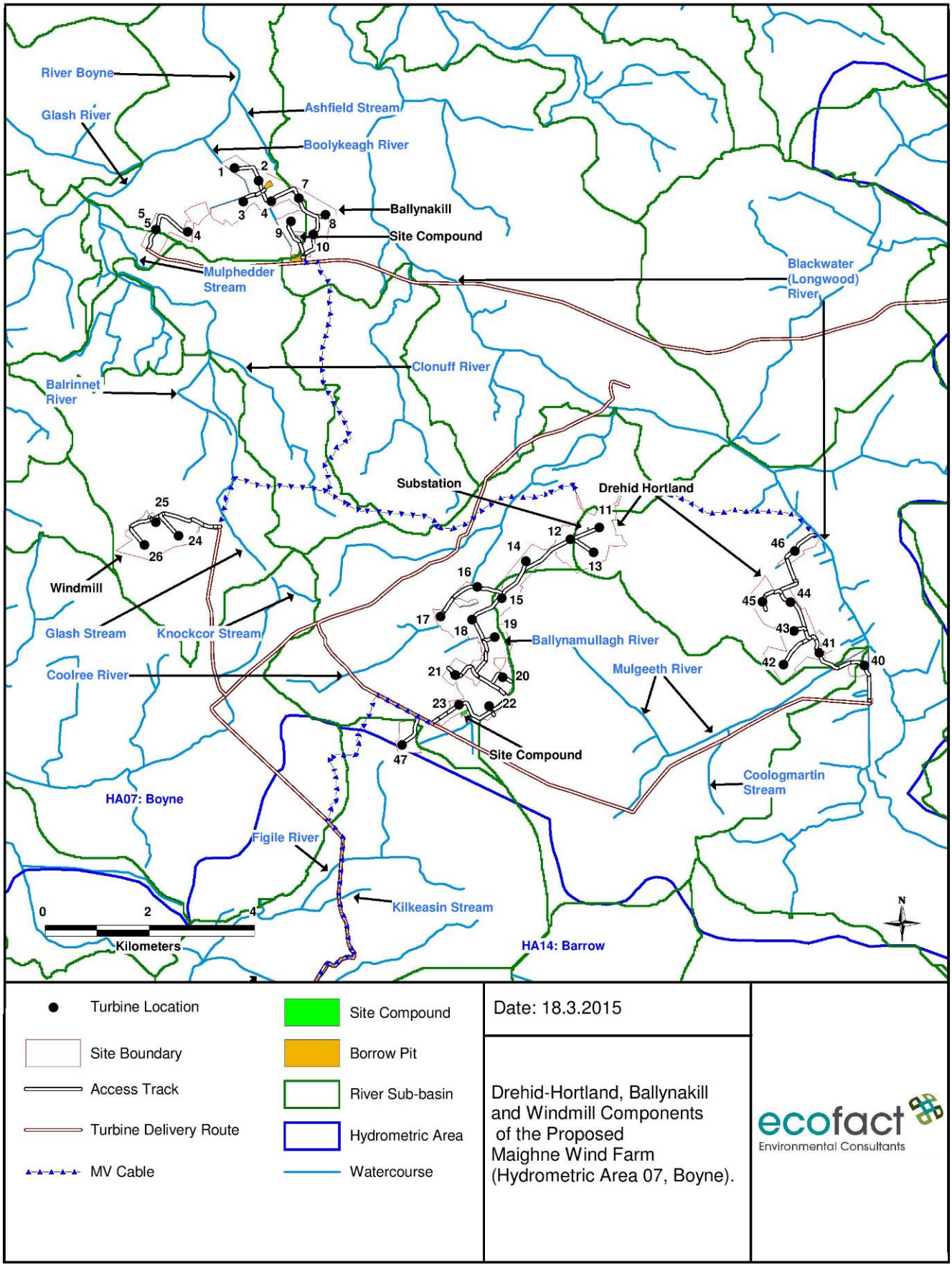

Figure 6: Drehid-Hortland, Ballynakill and Windmill components of the proposed Maighne Wind Farm (Hydrometric Area 14, Barrow)

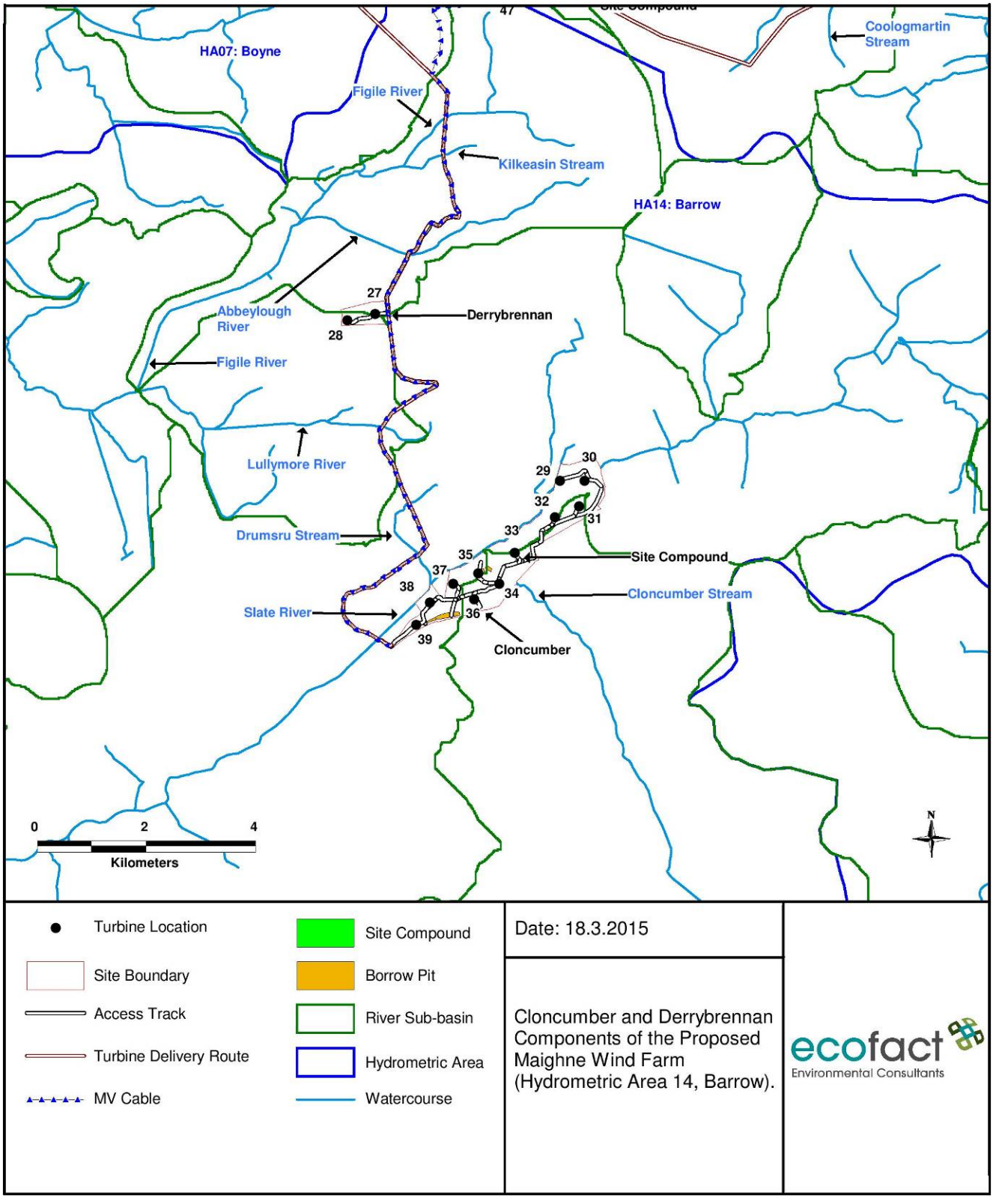

Figure 7: Cloncumber and Derrybrennan components of the proposed Maighne Wind Farm (Hydrometric Area 14, Barrow).

Indirect water quality impacts can potentially occur during trenching work. This would involve machines digging linear trenches and would result in excavated material being accumulated. This material could be a source of contaminated runoff particularly if it were to be stockpiled near a sensitive watercourse during a period of wet weather. The trenching works could also generate a significant amount of waste material which is not suitable for backfilling and this would be a risk to adjoining watercourses if not stored and disposed of appropriately. Trenches can also become flooded (i.e. during a high rainfall event) and if this water was pumped into an adjoining sensitive watercourse then significant water quality impacts could be realised. The proposed wind farm development poses a potential risk to watercourses in terms of alteration of drainage regimes, silt run-off and pollution events originating from site works which gives rise to the potential for impacts affecting fish and fisheries, as well as aquatic invertebrate communities within the study area.

Any engineering works which cause runoff of sediments can also increase the levels of nutrients in receiving streams. This can result in the enrichment or eutrophication of the affected streams and catchment areas further downstream, and a possible change in overall water quality status. Suspended solids or sediment in a river is also a major concern and can have serious negative impacts on aquatic invertebrate and instream flora. Aquatic species listed on Annex II of the EU Habitats Directive (1992) within the study area include the Atlantic salmon and the white-clawed crayfish. Potential impacts affecting these species could occur as a result of water quality impacts arising through accidental pollution events including the increased erosion which may give rise to elevated suspended solids and siltation effects.

There is a risk that machinery or materials imported onto the site could act as a vector for introducing or dispersing non-native invasive species.

1.4.1.4 Potential Cumulative Impacts

The area of the proposed site is subject to additional pressures on water quality and aquatic ecology, particularly in relation to agricultural activities. Where wind farm construction and agricultural activities occur at the same time there is the potential for significant in-combination or cumulative impacts on local watercourses. The risk of such impacts would, for example, greatly increase if such works were taking place during the winter months or times of very high rainfall.

Within the River Boyne catchment, other cumulative impacts could occur in relation to the construction of the proposed Emlagh wind farm. A component of this wind farm is located within the Moynalty River within the Boyne catchment. Impacts arising from this development correspond to those outlined above for the current proposal. The proposed development is also located in an area where huge quantities of peat are extracted from the Bog of Allen annually. Peat extraction and associated operations have the potential or adversely affect water quality in the Slate, Figile and Blackwater (Longwood) Rivers.

1.4.2 Potential Impacts during Operation

Operational wind farms are not normally considered to have the potential to significantly impact on the aquatic environment. The main risk to watercourses is when oils and lubricants are used on the site. If such substances leaked from the turbines or maintenance areas or were disposed of inappropriately, there is a risk of water pollution. However, the likelihood of this occurring is very low and the potential significance of this impact can be mitigated through proper management. Spills of any oil or fuels from site vehicles onto the access roads may find its way to the local stream network. However, this is unlikely to be a significant impact considering the low numbers of vehicles involved and the high quality standards that are implemented on a well managed site.

Upgrading of the site track/road network could allow increased public access to the site. This could potentially result in illegal dumping of domestic rubbish or possibly facilitate access of poachers to fish spawning areas. Provision of access to off road vehicles (including quad bikes) is also a potential impact. Such vehicles can cause direct damage to streams, particularly in the headwaters of catchments and indirect effects on aquatic sites such as erosion of soils.

1.4.3 Potential Impacts during Decommissioning

The decommissioning phase of the proposed wind farm site gives rise to similar potential impacts as can be realised during the construction phase; although the magnitude of the impact of decommissioning is normally reduced as all infrastructure is already in place on the site. With suitable planning and provision of adequate mitigation potential impacts on the receiving aquatic environment during decommissioning can be minimised.

1.5 Mitigation Measures

1.5.1 Construction

In advance of any works taking place, a method statement for protecting watercourses and waterbodies on the site, along with a Surface Water Management Plan will be drawn up and agreed with the IFI and NPWS. An outline Construction Environmental Management Plan (CEMP) has been prepared and is included in the Environmental Impact Statement. The Construction Method Statement will be distributed and discussed with all parties involved in the construction of the wind farm site (including any sub-contractors) in order to protect aquatic conservation interests within the study area. The Surface Water Management Plan will set out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase.

The Surface Water Management Plan and detailed method statement will include preparatory works on the site, including installation of silt fences and bunds. The preparatory work including assessment of existing bridge crossings will be undertaken in advance of any excavations on the site. A sealed silt fence will be placed at both sides of the crossing points and to a minimum of 10m upstream and downstream of each crossing at both sides of the road. All measures provided for the protection of aquatic ecology and fisheries within the proposed development site, in addition to the mitigation measures for water quality protection to be detailed in the Surface Water Management Plan, will effectively protect aquatic ecological interests downstream of the proposed development.

All access tracks will be designed to minimise excavation on the site and reduce the risk of sediment runoff. Swales for turbine bases and hard standings will be constructed. It is not expected that overland flows will be obstructed to any great extent as a result of the layout of the wind farm, however where required, interceptor channels will collect overland flows on the upslope side of the access tracks and hard standing areas. The interceptor channels will cross the access tracks in cross-drains which will be provided at regular intervals

A buffer of 50 m from watercourses has been adopted. Where site tracks are existing rather than a new site track, this buffer will not apply.

All infrastructure should set back 50 m away from all streams within the site except for the main crossing The contractor should also ensure that trafficking on site is kept to a minimum and the routes of haul roads are kept away from watercourses as far as possible. Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Again, maintenance and monitoring of such silt fences will be subject to an on-site quality management system set out in the CEMP.

Cross-drains will be provided for drainage crossings and conveying flows from existing and proposed drains across the access tracks. Any new or upgraded culverts will be sized appropriately. A method statement for streams crossings (roads and cables) will be agreed in advance with NPWS and IFI and will follow the guidelines set out in (Murphy, 2004) and the NRA (2008) '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' and also the latest IFI guidelines. In relation to cable crossing, directional drilling will be used when other alternatives (i.e. placing cables on bridges) are not practical. There are two options available:

1. Horizontal Directional Drilling is a method of installing underground pipes and cables whereby a surface-launched drilling rig would be used to drill in an underground arc beneath the watercourse, with minimal impact on the surrounding area.
2. An alternative option would involve digging two pits, an entrance pit and a receiving pit, on either side of the watercourse. The two pits would then be connected by ducts underground, installed either by a drilling or pipe ramming method, without disturbing the watercourse above.

The optimal construction technique will be selected on the basis of detailed site investigation at the crossing locations and following consultation with Meath County Council and statutory authorities including Inland Fisheries Ireland."

The contractor shall ensure that erosion control and attenuation facilities, namely silt fences and silt curtains are regularly maintained during the construction phase. Spoil heaps from the excavations for the turbine bases and trenches (if cables are to be buried) will be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. Berms will be covered with a geo-textile matting to avoid sediment runoff; berms will be surrounded by silt fencing until vegetation has been established in the following growing season. If cables will be installed in trenches, the will be located underneath and directly adjacent to access tracks as far as possible. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within any cable trenches at intervals.

An Emergency Erosion and Silt Control Response Plan will be included as a contingency in the Surface Water Management Plan which will detail the required measures for the Contractor to implement in the event of a 'worst case' scenario on the site. Timing of the proposed works will also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream environment during the salmonid close season.

A risk assessment will be prepared prior to any wet concrete operations being carried out. This will be agreed with NPWS and the IFI authorities in advance of works taking place and will require specific mitigation and water quality protection measures at a micro-site level. All concreting works will be fully detailed in the Contractor's Construction Method Statement and will be minimised, particularly adjacent to the aquatic environment.

Standing water in the excavations at the turbine bases will contain an increased concentration of suspended solids. The excavations will be pumped into temporary settlement basins as necessary which will be lined and which will drain into existing or proposed drainage channels on site. The settlement basins will be constructed in advance of any excavations for the turbine bases.

Wheel washing facilities will be provided at the site entrance draining to silt traps. Additional silt fencing will be kept on site for the ongoing maintenance of the structures provided. Portaloos will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licensed waste disposal contractor and will not be discharged on site.

Any diesel or fuel oils stored on site will be bunded to 110 % of the capacity of the storage tank. Such facilities will not be located near any drain or watercourse. Design and installation of fuel tanks will be in accordance with best practice guidelines. Refuelling of plant during construction will be carried out at a number of dedicated refuelling station locations on site, typically at each compound or at least 100m from a watercourse using mobile bowsers. Drip trays and spill kits will be kept available on site. Only emergency breakdown maintenance will be carried out on site. Appropriate containment facilities will be provided to ensure that any spills from the vehicle are contained and removed off site.

Appropriate preventative measures will be detailed within the CEMP to ensure that non-native aquatic/riparian species are not introduced into the site. These measures should follow as relevant the manual '*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads'* by NRA (2010).

The contractor will carry out visual examinations of watercourses receiving flows from the proposed development during the construction phase and regular water samples will be taken.

The provision of a detailed Surface Water Management Plan for the site will effectively result in the control of erosion and siltation on the site. This is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters. The works programme for the site will incorporate erosion and sediment control to be detailed in the Surface Water Management Plan including the installation of drainage and runoff controls before starting site clearance and earthworks; minimisation of the area of exposed ground; preventing runoff entering the site from adjacent ground; provision of appropriate control and containment measures on site; monitoring and maintenance of erosion and sediment controls throughout the project; and establishing vegetation as soon as practical on all areas where soil has been exposed.

The design of all silt and erosion control measures on the site including silt traps and siltation ponds, culverts and cross-drains will be based on the peak flood flows determined using the procedure set out in CIRIA (2006).

Due to fact that the proposed site is located within the catchment areas of important salmonid rivers, effective water runoff protection methods will be integrated into the Construction Environmental Management Plan (CEMP) and contractor's method statement. The Water Quality chapter of the EIS also provides run-off prevention measures that will be utilised in the preparation of a Surface Water Management Plan for the development. The implementation of the water quality protection measures will be incorporated into an Environmental Commitments audit checklist for the site.

There will no excavations in close proximity to watercourses / riparian habitats, no instream works will be undertaken during the salmonid close season (October–March annually) in order to protect spawning salmonids, incubating ova and emerging fry. Any upgraded bridges or culverts must be designed to be passable by fish. Details of any such crossings, and any crossing areas for cables, will need to be agreed in advance with IFI and NPWS.

1.5.2 Operation

The operational wind farm will have a negligible effect on aquatic ecological interests and fisheries, as there are no further potential impacts on surface water run-off or watercourses within the site. During the operation phase, oils will required for cooling the transformers giving rise to the potential for oil spills within the site. However, the transformers will be bunded to over 110 % of the volume of oil within them.

It is not envisaged that maintenance will involve any significant impacts on the hydrological regime of the area. Weekly inspections of the erosion and sediment control measures on site will be required during the construction period, followed by fortnightly inspections until the risk of erosion or siltation has declined following the successful establishment of vegetation during the operational phase.

Access to the site will be limited using a gate to prevent illegal dumping on the site, use off road vehicles etc.

1.5.3 Decommissioning

In the event of decommissioning of the proposed wind farm, activities will take place in a similar fashion to the construction phase. There will be disturbance to underlying soils and therefore a risk again of silt laden run-off entering the receiving watercourse. Mitigation measures for this phase will be agreed in advance with the relevant authorities (IFI and NPWS). The mitigation measures outlined above will be implemented for the protection of aquatic ecological interests during the decommissioning phase.

1.6 Residual Impacts

The proposed wind farm will have a Slight negative impact on aquatic ecology and fisheries during the construction phase in the local context in the absence of mitigation measures. However, this will be effectively reduced to an Imperceptible negative impact with the mitigation measures proposed; where the direct loss of riparian habitats due to the required crossings of watercourses within the site remain the most sensitive receptors. The limitation of indirect impacts arising from water quality pollution events such as siltation and run-off of suspended solids will significantly reduce the potential for impacts affecting aquatic ecological interests within the site.

Localised water quality impacts as a result of construction phase will be reduced by undertaking the most sensitive elements of the works outside the salmonid close season and protection of water quality following the implementation of the water management measures detailed in the Water Quality section of the EIS. With the mitigation measures proposed, residual impacts are evaluated to be limited to a local context and will not affect the conservation status of aquatic ecology receptors in the receiving waters.

It is important to note that the failure to implement the mitigation measures proposed for the minimisation of impacts affecting aquatic ecology and fisheries would negate the results of the impact assessment provided in the current assessment.

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Plates

Boyne catchment

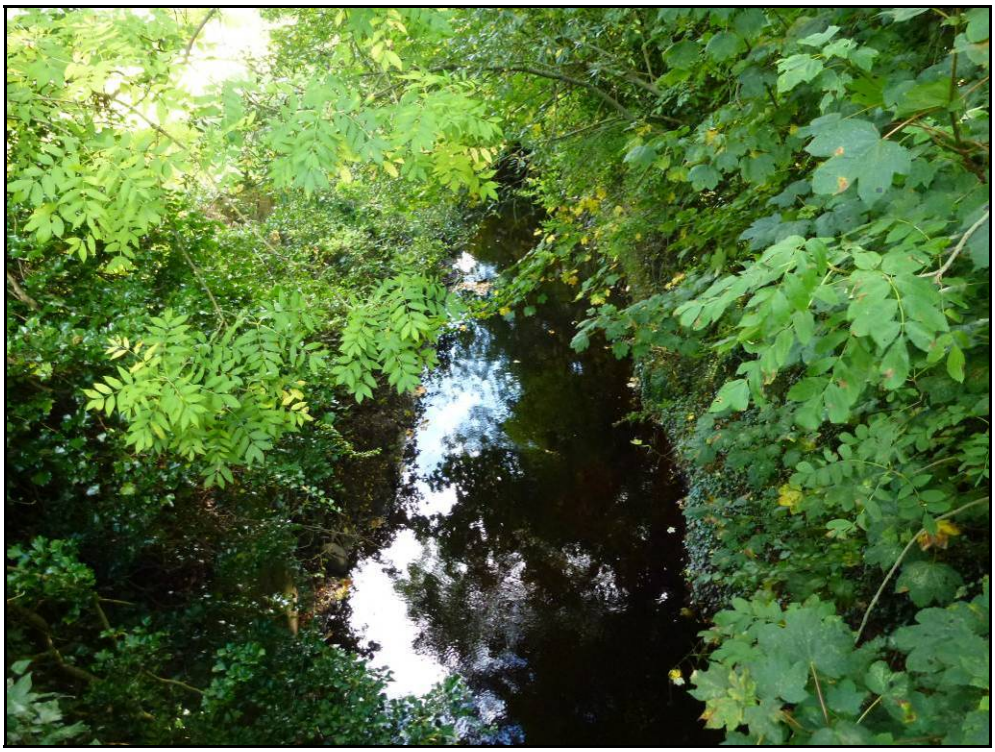

Plate 1: Site 1 was located on the Blackwater (Longwood) River approximately 1km downstream of New Bridge. This part of the Longwood River is a highly modified and sluggish watercourse. It drains the eastern extent of Drehid-Hortland component of the proposed development

Plate 2: The Blackwater (Longwood) River at Site 2. This watercourse drains the eastern extent of Drehid-Hortland component of the proposed development

Plate 3: Biological sampling on the Blackwater (Longwood) at Site 2.

Plate 4: Site 3 was located on the Mulgeeth River approximately 2km upstream of the Blackwater (Longwood) River. This 2nd order watercourse drains the southern extent of the proposed Drehid-Hortland component of the proposed development

Plate 5: Mulgeeth River at Timahoe Cross Roads. This 1st order watercourse drains the Timahoe component of the proposed development.

Plate 6: Site 4 was located on the Fear English River, a tributary of the Blackwater (Longwood) River. This 3rd order stream drains the northern component of the proposed Drehid-Hortland development.

Plate 7: Site 5 was located on the Coolree (Kilcooney) River at Art's Bridge. This site drains the eastern extent of the Drehid-Hortland component of the proposed development

Plate 8: The River Boyne at Ashfield Bridge (Site 6). This stretch of the river drains the Ballynakill component of the proposed development.

Barrow catchment

Plate 9: The Slate River drains the Cloncumber component of the proposed development within the Barrow catchment. It is a channelised and highly modified river. Shown above is the stretch upstream of Agar Bridge at the western extent of the proposed Cloncumber component of the proposed development.

Plate 10: Site 7 was located on the Slate River on the northern boundary of the Cloncumber component of the proposed development. An external road is proposed to access the proposed development site from the north which would involve a crossing of this river.

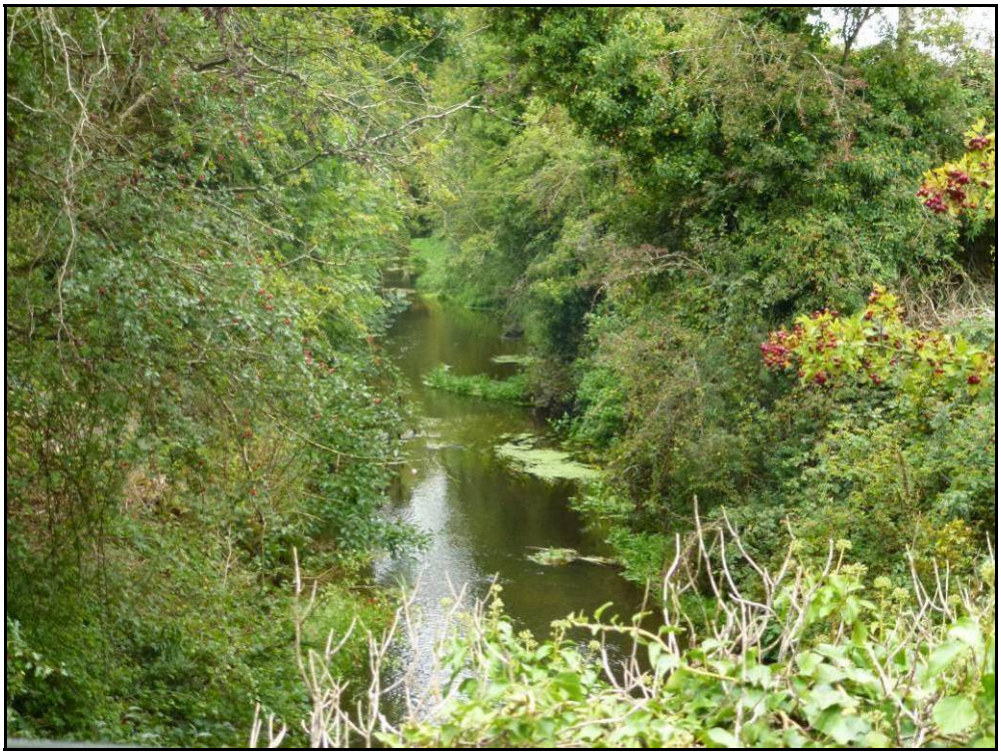

Plate 11: Site 8 was located on the Slate River at the upstream extent of the Cloncumber component of the proposed development.

Plate 12: Site 9 was located on the Figile River approximately 4km south of Edenderry. The Figile River drains the Derrybrennan component of the proposed development.

Plate 13: Pike *Esox lucius* recorded during electrical fishing at Site 9 on the Figile River

Plate 14: European eel occurs in most watercourses draining the proposed development

Plate 15: Duck/Swan mussel *Anodonta* sp. recorded during biological sampling at Site 9 on the Figile River

Plate 16: Larvae of the cased caddisfly *Phryganea* sp. was recorded in the Figile River during the current assessment (Site 9).

Plate 17: Site 10 was located on the Abbeylough River at the R403 Bridge. This part of the watercourse is approximately 2.5km north east of the Derrybrennan component of the proposed development.

Plate 18: Cloncumber Stream approximately 1km upstream of the Slate River (downstream view). The Cloncumber Stream flows through the proposed Cloncumber component of the proposed development to meet the Slate River where it forms the northern boundary of this proposed development site.

Plate 19: Cloncumber Stream approximately 1km upstream of the Slate River confluence (downstream view).

Plate 20: Otter recorded in the Slate River at Agar Bridge.

Appendix F8 – Guidance Documents

Definition of Terms relating to Magnitude

Magnitude	Description
Very high	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. *Guide: < 20% of population / habitat remains*
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. *Guide: 20-80% of population/ habitat lost*
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. *Guide: 5-20% of population/ habitat lost*
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/ habitat lost*
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. *Guide: < 1% population/ habitat lost*

Risk classifications or likelihood that an impact will occur on a three point scale from low to medium to high, from Percival 2007.

Probability	Description	Comments
High	Impact is likely to occur (>50% likelihood)	Species known to be vulnerable to specific impact
Medium	Impact may occur (5-50% likelihood)	Species may be affected by specific impact
Low	Impact is very unlikely (<5% likelihood)	Species known to be tolerant to specific impact

Significance Matrix for high probability impacts (species known to be vulnerable to specific impact (34)).

Significance		Sensitivity			
		Very high	High	Medium	Low
Magnitude	Very high	Very high	Very high	High	Medium
	High	Very high	Very high	Medium	Low
	Medium	Very high	High	Low	Very low
	Low	Medium	Low	Low	Very low
	Negligible	Low	Very low	Very low	Very low

Significance Matrix for medium probability impacts (species may be affected by specific impact (34)).

Significance		Sensitivity			
		Very high	High	Medium	Low
Magnitude	Very high	High	High	Medium	Low
	High	High	High	Low	Very low
	Medium	High	Medium	Low	Very low
	Low	Medium	Low	Very low	Very low
	Negligible	Low	Very low	Very low	Very low

Significance Matrix for low probability impacts (species known to be tolerant of specific impact (34)).

Significance		Sensitivity			
		Very high	High	Medium	Low
Magnitude	Very high	Medium	Medium	Medium	Low
	High	Medium	Medium	Low	Very low
	Medium	Medium	Low	Very low	Very low
	Low	Medium	Very low	Very low	Very low
	Negligible	Low	Very low	Very low	Very low

Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes

NRA
National Roads Authority
An tÚdarás um Bóithre Náisiúnta

CONTENTS