



Appendix 9.9

Cumulative impact assessment additional calculations

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Appendix 9.9 – Additional calculations for Cumulative Impact Assessment

As the seasonal period definitions used in Furness (2015) do not match the definitions in the SNH guidance, the approach recommended by SNH is to assume a flat rate of collisions during the season, and to recalculate according to the relative lengths of the periods. For kittiwake, the autumn post breeding period in the BDMPS report (Furness 2015) is 20 weeks from August to December. The SNH recommendation is from September to December, which is 16 weeks. As such, a proportionate recalculation based on the relative length of time in the two periods is required. Therefore Columns One, Three, Five and Seven in Table 1 and Table 2 below, were multiplied by 0.8 ($16 \text{ weeks} / 20 \text{ weeks} = 0.8$) to calculate the final corrected value. The corrected figures for adults are shown in Chapter 8: Table 8.152.

Corrected figures for immature kittiwakes in the autumn period of the non-breeding season are shown in Table 2. These corrected figures for immatures are shown in Chapter 8: Table 8.153.

For kittiwake, the spring migration period in the BDMPS report (Furness 2015) is 16 weeks from January to April inclusive. The SNH recommendation is from January to mid-April, which is 14 weeks. As such, a proportionate recalculation based on the relative length of time in the two periods is required. Therefore 0.875 multiplied by the number of collisions in spring is the final value required.

Therefore Columns One, Three, Five and Seven in Table 3 below, were multiplied by 0.875 ($14 \text{ weeks} / 16 \text{ weeks} = 0.875$) to calculate the final corrected value. The corrected figures for adults in the spring period of the non-breeding season are shown in Chapter 8: Table 8.154.

Corrected figures for immature kittiwakes in the spring period of the non-breeding season are shown in Table 4. These corrected figures for immatures are shown in Chapter 8: Table 8.155.

Table 1: Corrected number of adult kittiwakes from the Forth Islands SPA involved in collisions at NnG (2017 design), proposed Forth and Tay Wind Farms (2014 design), and other UK North Sea Wind Farms in the autumn period of the non-breeding season

Project	Number of adults from Buchan Ness to Collieston SPA	Corrected Number of adults from Buchan Ness to Collieston SPA	Number of adults from Fowlsheugh SPA	Corrected Number of adults from Fowlsheugh SPA	Number of adults from Forth Islands SPA	Corrected Number of adults from Forth Islands SPA	Number of adults from St Abb's to Fast Castle SPA	Corrected Number of adults from St Abb's to Fast Castle SPA
NnG (2017)	0.27	0.22	0.18	0.14	0.07	0.06	0.07	0.06
Inch Cape (2014)	1.27	1.02	0.85	0.68	0.34	0.27	0.34	0.27
Seagreen A (2014)	3.45	2.76	2.30	1.84	0.92	0.74	0.92	0.74
Seagreen B (2014)	1.96	1.56	1.30	1.04	0.52	0.42	0.52	0.42
East Anglia 3	1.22	0.98	0.82	0.65	0.33	0.26	0.33	0.26
East Anglia 1	1.65	1.32	1.10	0.88	0.44	0.35	0.44	0.35
Hornsea 3	1.70	1.36	1.13	0.91	0.45	0.36	0.45	0.36
Blyth Demonstrator	0.05	0.04	0.03	0.03	0.01	0.01	0.01	0.01
Dogger Creke Beck A&B	3.55	2.84	2.36	1.89	0.95	0.76	0.95	0.76
Dogger Teeside A&B	5.34	4.27	3.56	2.85	1.42	1.14	1.42	1.14
Dudgeon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hornsea 1	0.80	0.64	0.53	0.42	0.21	0.17	0.21	0.17
Hornsea 2	0.21	0.17	0.14	0.11	0.06	0.05	0.06	0.05
Humber Gateway	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
Lincs	0.05	0.04	0.03	0.03	0.01	0.01	0.01	0.01
Race Bank	0.24	0.19	0.16	0.13	0.06	0.05	0.06	0.05
Teeside	0.78	0.62	0.52	0.42	0.21	0.17	0.21	0.17

Project	Number of adults from Buchan Ness to Collieston SPA	Corrected Number of adults from Buchan Ness to Collieston SPA	Number of adults from Fowlsheugh SPA	Corrected Number of adults from Fowlsheugh SPA	Number of adults from Forth Islands SPA	Corrected Number of adults from Forth Islands SPA	Number of adults from St Abb's to Fast Castle SPA	Corrected Number of adults from St Abb's to Fast Castle SPA
Triton Knoll	0.84	0.67	0.56	0.45	0.22	0.18	0.22	0.18
Westernmost Rough	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Aberdeen demonstrator	0.22	0.18	0.15	0.12	0.06	0.05	0.06	0.05
Beatrice	0.41	0.33	0.28	0.22	0.11	0.09	0.11	0.09
Galloper	0.22	0.18	0.15	0.12	0.06	0.05	0.06	0.05
Greater Gabbard	0.30	0.24	0.20	0.16	0.08	0.06	0.08	0.06
Kentish Flats	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01
London Array	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Moray Firth 1	0.17	0.14	0.12	0.09	0.05	0.04	0.05	0.04
Thanet	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00

Table 2: Corrected number of immature kittiwakes from the Forth Islands SPA involved in collisions at NnG (2017 design), proposed Forth and Tay Wind Farms (2014 design), and other UK North Sea Wind Farms in the autumn period of the non-breeding season

Project	Number of immatures from Buchan Ness to Collieston SPA	Corrected Number of immatures from Buchan Ness to Collieston SPA	Number of immatures from Fowlsheugh SPA	Corrected Number of immatures from Fowlsheugh SPA	Number of immatures from Forth Islands SPA	Corrected Number of immatures from Forth Islands SPA	Number of immatures from St Abb's to Fast Castle SPA	Corrected Number of immatures from St Abb's to Fast Castle SPA
NnG (2017)	0.24	0.19	0.16	0.13	0.05	0.04	0.06	0.04
Inch Cape (2014)	1.13	0.90	0.75	0.60	0.23	0.18	0.26	0.21

Project	Number of immatures from Buchan Ness to Collieston SPA	Corrected Number of immatures from Buchan Ness to Collieston SPA	Number of immatures from Fowlsheugh SPA	Corrected Number of immatures from Fowlsheugh SPA	Number of immatures from Forth Islands SPA	Corrected Number of immatures from Forth Islands SPA	Number of immatures from St Abb's to Fast Castle SPA	Corrected Number of immatures from St Abb's to Fast Castle SPA
Seagreen A (2014)	3.06	2.45	2.04	1.63	0.61	0.49	0.71	0.57
Seagreen B (2014)	1.73	1.39	1.16	0.92	0.35	0.28	0.40	0.32
East Anglia 3	1.09	0.87	0.72	0.58	0.22	0.17	0.25	0.20
East Anglia 1	1.47	1.17	0.98	0.78	0.29	0.23	0.34	0.27
Hornsea 3	1.51	1.21	1.01	0.80	0.30	0.24	0.35	0.28
Blyth Demonstrator	0.04	0.03	0.03	0.02	0.01	0.01	0.01	0.01
Dogger Creke Beck A&B	3.14	2.52	2.10	1.68	0.63	0.50	0.73	0.59
Dogger Teeside A&B	4.74	3.79	3.16	2.53	0.95	0.76	1.11	0.88
Dudgeon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hornsea 1	0.71	0.56	0.47	0.38	0.14	0.11	0.16	0.13
Hornsea 2	0.19	0.15	0.13	0.10	0.04	0.03	0.04	0.04
Humber Gateway	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00
Lincs	0.04	0.03	0.03	0.02	0.01	0.01	0.01	0.01
Race Bank	0.21	0.17	0.14	0.11	0.04	0.03	0.05	0.04
Teeside	0.69	0.55	0.46	0.37	0.14	0.11	0.16	0.13
Triton Knoll	0.75	0.60	0.50	0.40	0.15	0.12	0.17	0.14
Westermost Rough	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Aberdeen demonstrator	0.20	0.16	0.13	0.11	0.04	0.03	0.05	0.04

Project	Number of immatures from Buchan Ness to Collieston SPA	Corrected Number of immatures from Buchan Ness to Collieston SPA	Number of immatures from Fowlsheugh SPA	Corrected Number of immatures from Fowlsheugh SPA	Number of immatures from Forth Islands SPA	Corrected Number of immatures from Forth Islands SPA	Number of immatures from St Abb's to Fast Castle SPA	Corrected Number of immatures from St Abb's to Fast Castle SPA
Beatrice	0.37	0.29	0.24	0.20	0.07	0.06	0.09	0.07
Galloper	0.20	0.16	0.13	0.11	0.04	0.03	0.05	0.04
Greater Gabbard	0.27	0.21	0.18	0.14	0.05	0.04	0.06	0.05
Kentish Flats	0.03	0.02	0.02	0.02	0.01	0.00	0.01	0.01
London Array	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Moray Firth 1	0.16	0.12	0.10	0.08	0.03	0.02	0.04	0.03
Thanet	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00

Table 3: Corrected number of adult kittiwakes from the Forth Islands SPA involved in collisions at NnG (2017 design), proposed Forth and Tay Wind Farms (2014 design), and other UK North Sea Wind Farms in the spring period of the non-breeding season

Project	Number of adults from Buchan Ness to Collieston SPA	Corrected Number of adults from Buchan Ness to Collieston SPA	Number of adults from Fowlsheugh SPA	Corrected Number of adults from Fowlsheugh SPA	Number of adults from Forth Islands SPA	Corrected Number of adults from Forth Islands SPA	Number of adults from St Abb's to Fast Castle SPA	Corrected Number of adults from St Abb's to Fast Castle SPA
NnG (2017)	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01
Inch Cape (2014)	0.24	0.21	0.18	0.16	0.06	0.05	0.06	0.05
Seagreen A (2014)	1.03	0.90	0.78	0.68	0.26	0.23	0.26	0.23
Seagreen B (2014)	1.38	1.21	1.03	0.90	0.34	0.30	0.34	0.30
East Anglia 3	0.48	0.42	0.36	0.31	0.12	0.10	0.12	0.10

Project	Number of adults from Buchan Ness to Collieston SPA	Corrected Number of adults from Buchan Ness to Collieston SPA	Number of adults from Fowlsheugh SPA	Corrected Number of adults from Fowlsheugh SPA	Number of adults from Forth Islands SPA	Corrected Number of adults from Forth Islands SPA	Number of adults from St Abb's to Fast Castle SPA	Corrected Number of adults from St Abb's to Fast Castle SPA
East Anglia 1	0.49	0.43	0.37	0.32	0.12	0.11	0.12	0.11
Hornsea 3	0.23	0.20	0.17	0.15	0.06	0.05	0.06	0.05
Blyth Demonstrator	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01
Dogger Creke Beck A&B	6.57	5.75	4.93	4.31	1.64	1.44	1.64	1.44
Dogger Teeside A&B	2.61	2.28	1.96	1.71	0.65	0.57	0.65	0.57
Dudgeon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hornsea 1	0.30	0.27	0.23	0.20	0.08	0.07	0.08	0.07
Hornsea 2	0.18	0.16	0.13	0.12	0.04	0.04	0.04	0.04
Humber Gateway	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00
Lincs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Race Bank	0.05	0.05	0.04	0.03	0.01	0.01	0.01	0.01
Teeside	0.08	0.07	0.06	0.05	0.02	0.02	0.02	0.02
Triton Knoll	0.24	0.21	0.18	0.16	0.06	0.05	0.06	0.05
Westermost Rough	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aberdeen demonstrator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beatrice	0.72	0.63	0.54	0.47	0.18	0.16	0.18	0.16
Galloper	0.19	0.16	0.14	0.12	0.05	0.04	0.05	0.04
Greater Gabbard	0.13	0.12	0.10	0.09	0.03	0.03	0.03	0.03

Project	Number of adults from Buchan Ness to Collieston SPA	Corrected Number of adults from Buchan Ness to Collieston SPA	Number of adults from Fowlsheugh SPA	Corrected Number of adults from Fowlsheugh SPA	Number of adults from Forth Islands SPA	Corrected Number of adults from Forth Islands SPA	Number of adults from St Abb's to Fast Castle SPA	Corrected Number of adults from St Abb's to Fast Castle SPA
Kentish Flats	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
London Array	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Moray Firth 1	0.45	0.39	0.34	0.30	0.11	0.10	0.11	0.10
Thanet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 4: Corrected number of immature kittiwakes from the Forth Islands SPA involved in collisions at NnG (2017 design), proposed Forth and Tay Wind Farms (2014 design), and other UK North Sea Wind Farms in the spring period of the non-breeding season

Project	Number of immatures from Buchan Ness to Collieston SPA	Corrected Number of immatures from Buchan Ness to Collieston SPA	Number of immatures from Fowlsheugh SPA	Corrected Number of immatures from Fowlsheugh SPA	Number of immatures from Forth Islands SPA	Corrected Number of immatures from Forth Islands SPA	Number of immatures from St Abb's to Fast Castle SPA	Corrected Number of immatures from St Abb's to Fast Castle SPA
NnG (2017)	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00
Inch Cape (2014)	0.16	0.14	0.11	0.09	0.03	0.03	0.04	0.03
Seagreen A (2014)	0.69	0.60	0.46	0.40	0.14	0.12	0.16	0.14
Seagreen B (2014)	0.92	0.80	0.61	0.53	0.18	0.16	0.21	0.19
East Anglia 3	0.32	0.28	0.21	0.19	0.06	0.06	0.07	0.06
East Anglia 1	0.33	0.29	0.22	0.19	0.07	0.06	0.08	0.07
Hornsea 3	0.15	0.13	0.10	0.09	0.03	0.03	0.03	0.03
Blyth Demonstrator	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00

Project	Number of immatures from Buchan Ness to Collieston SPA	Corrected Number of immatures from Buchan Ness to Collieston SPA	Number of immatures from Fowlsheugh SPA	Corrected Number of immatures from Fowlsheugh SPA	Number of immatures from Forth Islands SPA	Corrected Number of immatures from Forth Islands SPA	Number of immatures from St Abb's to Fast Castle SPA	Corrected Number of immatures from St Abb's to Fast Castle SPA
Dogger Creke Beck A&B	4.37	3.82	2.91	2.55	0.87	0.76	1.02	0.89
Dogger Teeside A&B	1.74	1.52	1.16	1.01	0.35	0.30	0.41	0.35
Dudgeon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hornsea 1	0.20	0.18	0.14	0.12	0.04	0.04	0.05	0.04
Hornsea 2	0.12	0.10	0.08	0.07	0.02	0.02	0.03	0.02
Humber Gateway	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Lincs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Race Bank	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01
Teeside	0.05	0.05	0.04	0.03	0.01	0.01	0.01	0.01
Triton Knoll	0.16	0.14	0.11	0.09	0.03	0.03	0.04	0.03
Westermost Rough	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aberdeen demonstrator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beatrice	0.48	0.42	0.32	0.28	0.10	0.08	0.11	0.10
Galloper	0.12	0.11	0.08	0.07	0.02	0.02	0.03	0.03
Greater Gabbard	0.09	0.08	0.06	0.05	0.02	0.02	0.02	0.02
Kentish Flats	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
London Array	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Moray Firth 1	0.30	0.26	0.20	0.17	0.06	0.05	0.07	0.06

Project	Number of immatures from Buchan Ness to Collieston SPA	Corrected Number of immatures from Buchan Ness to Collieston SPA	Number of immatures from Fowlsheugh SPA	Corrected Number of immatures from Fowlsheugh SPA	Number of immatures from Forth Islands SPA	Corrected Number of immatures from Forth Islands SPA	Number of immatures from St Abb's to Fast Castle SPA	Corrected Number of immatures from St Abb's to Fast Castle SPA
Thanet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00