Plantecol Limited

Cloiche Wind Farm:

Methods used in calculating the extent of direct and indirect impacts of the proposed development on the habitats and vegetation

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CLOICHE WIND FARM: METHODS USED IN CALCULATING THE EXTENT OF DIRECT AND INDIRECT IMPACTS OF THE PROPOSED DEVELOPMENT ON THE HABITATS AND VEGETATION

1. Introduction

1.1 Background

This report gives the methods and results of the calculation of the area of habitats and vegetation types impacted directly and indirectly by the 29 Turbine Proposed Development at Cloiche Wind Farm. This report, is therefore, provided as Additional Information (AI) comprising a technical appendix to **Chapter 4 – Ecology (Volume 1)**.

2. Methods

2.1 Data Analysis

The shapefiles of the vegetation and habitats produced by Headley (2021) for the area within 50 metres of all of the 36 Turbine Proposed Development infrastructure wind farm development, were used in calculating the direct and indirect impacts. The shapefiles for the 29 Turbine Proposed Development was overlaid over the habitat and vegetation shapefiles using QGIS 3.24. A track width of 6.5 metres was used for all sections of track, even though sections of floated track will only have a maximum width of 5.5 metres. The shapefiles for the hard standings, turbine bases, anemometer (LiDAR) bases, turning circles, borrowpits, substation and construction compound were combined with the track shapefile to produce one shapefile for the direct imprint of the 29 Turbine Proposed Development. The area polygons for the different vegetation types and habitats within this shapefile was used in the calculation of the area of each habitat and vegetation type lost directly to the 29 Turbine Proposed Development. A 10 metre zone around all the infrastructure was generated in order to clip the habitat and vegetation shapefiles. This 10 metre buffer zone was used for the calculation of the area of indirect impacts from the 29 Turbine Proposed Development on those habitats that will be affected by changes in hydrology. This is mostly applicable to the blanket bog habitat.

The cover for each habitat or vegetation type within each polygon in the survey are within ranges and these are presented in Table 1 of Headley (2021). The mid-point for each of these class intervals are given in Table 1 of this report were multiplied by the polygon area to obtain the area of habitat that would be either directly or indirectly impacted by the 29 Turbine Proposed Development. The lower and upper limits of each of the class intervals were used to calculate the range in area for each habitat or vegetation type in each polygon.

3. Results

3.1 Impacts on Habitats

The area of each habitat lost directly from the 29 Turbine Proposed Development is presented in Table 2. The total area of the habitats directly and indirectly impacted is slightly greater than the actual area covered as shown in the bottom row of Table 2. This is due to the nature of using class intervals for estimating the area of each polygon occupied by the component habitats present. The total sum of the estimated area of all the habitats impacted directly is 48.13 ha. This is 4.87 ha more than the actual area that will be directly impacted by the 29 Turbine Proposed Development. This difference is largely due to much of the bare peat and bare rock estimated being included within the area of modified blanket bog and wet heath habitat. When the estimated area of all the habitats is summed it gives a total area of 55.94 ha, which is 6.66 ha more than the 49.28 ha that is within 10 metres of all the infrastructure, including the borrowpits. Again, this is largely due to most of the areas of bare peat and bare rock being within areas that were mapped as modified blanket bog or wet heath.

The greatest direct impact of the development is on modified blanket bog, followed closely by wet dwarf-shrub heath. There is also a similar pattern for the indirect impacts being for the most part on modified blanket bog and wet dwarf-shrub heath. However, the area of modified blanket bog lost directly and indirectly would be 2.1 and 2.7%, respectively, of the total area of this habitat within the site boundary. A slightly higher proportion of the wet dwarf-shrub heath habitat is impacted at 3.5 and 4.4% of the area of this habitat within the development area (Table 2).

The area of montane heath that would be directly lost is very small at less than 0.5 ha, which represents less than 1% of the area of this habitat within the site boundary (Table 2).

Although it appears half of the area of neutral flush, primarily of the M32 type vegetation would be lost to the 29 Turbine Proposed Development, this does not mean that there are no other areas of this habitat within the development area. This very localised habitat that covers a few square metres at any one location will not necessarily have been encountered when doing the more extensive survey outside of the 50 metre buffer zone around all the infrastructure that was surveyed. The same also applies to the calcareous flushes that were found within the 50 metre buffer zone of the proposed infrastructure.

The areas of running water, burns, that will be crossed by the wind farm tracks, amounts to a very small fraction of this habitat present within the wider area of the 29 Turbine Proposed Development (Table 2). The habitat will not necessarily be totally lost as it depends on how the streams/burns are crossed.

Although areas of montane heath, wet dwarf-shrub heath, acid grassland, marshy grassland, acid flush, neutral flush and calcareous flush are present within the 10 metre indirect impact zone, little or none of these areas may or may not be affected by the development. For example, areas of acid grassland immediately adjacent to the infrastructure are very unlikely to be impacted. Similarly, flushes upslope of any infrastructure are also unlikely to be affected by the construction of any tracks or hard standings. However, any flushes on the downslope are likely to be impacted through alterations to the surface water movements downslope.

As all of the blanket bog habitat within the site is considered to be modified through extensive erosion means that the hydrological impact of the construction of the infrastructure is likely to be rather limited. This is because the hydrological units will be limited to the catchments of each erosion gully.

3.2 Impacts on the different Vegetation types

The estimated area of each plant community, using the National Vegetation Classification (NVC) system, impacted directly and potentially indirectly through the 29 Turbine Proposed Development is presented in Table 3. The communities are ranked according to the area directly lost to the development. The M15 type of plant community, a type of wet heath community, would be impacted the most by the 29 Turbine Proposed Development. This is more than the area of the wet dwarf-shrub heath that would be directly impacted. This difference is due to the fact a significant proportion of the M15 type vegetation is on deep peat, i.e. more than 50 cm thick, and is consequently within areas of modified bog habitat.

The total area assigned to NVC plant communities within the areas directly impacted and potentially indirectly impacted from the 29 Turbine Proposed Development is less than the total area for these areas given in the bottom row of Table 2. This is because there are significant areas of bare peat and rock within the areas that will be impacted by the 29 Turbine Proposed Development as well as some stands of vegetation that could not be readily assigned to a plant community. This includes the areas of ephemeral and short perennial vegetatin that have become established on former borrowpits that will be used again as borrowpits for the 29 Turbine Proposed Development. Also, the sum in ranges for all the plant communities for the directly and indirectly impacted areas given in the bottom row of Table 3 overlap the actual hectarage for these two zones of impact given in Table 2. This indicates the level of certainty that one can assign at best to the areas impacted by the 29 Turbine Proposed Development on the habitats and plant communities.

4. References

Headley, A.D. 2021. Cloiche Wind Farm: Habitat and Vegetation Survey and Assessment of Condition of the Blanket bog and Montane Heath Habitats. Unpublished report to SSE Renewables.

5. Tables

Table 1. *The class intervals used for assessing the proportion of a polygon or quadrat occupied by the component habitat or plant community.*

Cover value	Range	Mid-point
8	95 – 100%	97.5%
7	75 – 95%	85%
6	50 – 75%	62.5%
5	25 – 50%	37.5%
4	10 – 25%	17.5%
3	5 – 10%	7.5%
2	1 – 5%	3%
1	<1%	0.5%

Table 2. *The results of calculations of the area (hectares or % of the total area of the habitat found within the red-line of the development in 2021) of each habitat considered to be directly impacted or potentially indirectly impacted by the proposed 29 turbine development. *All of the areas of bare ground were mapped and included within the areas of blanket bog and wet heath habitat. †All areas of blanket bog are either dry or wet modified blanket bog.*

Habitat	**Direct loss to infrastructure**		**Temporary loss to borrowpits and compound**		**Indirect impacts due to infrastructure**		**Indirect impacts from borrowpits and compound**		**All areas within the red-line**
	ha	**%**	**ha**	**%**	**ha**	**%**	**ha**	**%**	**ha**
†Blanket bog (all)	12.20	1.4	7.00	0.8	21.75	2.4	2.09	0.2	898.5
Dry modified Blanket Bog	8.21	1.1	4.97	0.7	14.72	2.0	1.68	0.2	745.0
Wet modified Blanket Bog	3.99	2.6	2.03	1.3	7.03	4.6	0.40	0.3	153.5
Wet heath	13.38	2.6	4.87	0.9	21.47	4.1	1.70	0.3	523.1
Montane heath	0.33	0.5	0.13	0.2	0.29	0.5	0.13	0.2	62.7
Acid grassland	0.44	11.2	0.01	0.3	0.41	10.5	0.00	0.0	3.9
Marshy grassland	0.11	0.1	0.00	0.0	0.35	0.4	0.00	0.0	83.1
Acid flush	0.18	3.0	0.25	4.2	0.03	0.5	0.00	0.0	6.0
Neutral flush	0.01	25	0.02	50	0.01	25	0.00	0.0	0.04
Calcareous flush	0.003	15	0.01	50	0.005	25	0.00	0.0	0.02
Ephermal and short perennials (disturbed ground)	0.00	0.0	3.74	7.2	0.00	0.0	0.63	1.2	51.4
Tracks (extant)	0.004	<<0.1	0.00	0.0	0.05	0.1	0.00	0.0	
*Bare ground (peat + rocks)	3.71	7.2	1.83	3.6	6.15	12.0	0.58	1.1	
Water (streams + lochs)	0.004	0.1	0.00	0.0	0.01	0.4	0.00	0.0	2.8
Total	**26.47**	**1.6**	**16.75**	**1.0**	**44.32**	**2.7**	**4.70**	**0.3**	**1,628.6**

Table 3. *The estimated area (hectares and % of total within the red-line of the proposed development) for each plant community (National Vegetation Classification code) directly and indirectly impacted by the proposed 29 turbine development. Ranges are given in parentheses.*

NVC code	Direct loss to infrastructure		Temporary loss to borrowpits and construction compound		Indirect impacts due to infrastructure		Indirect impacts from borrowpits and construction compound		All areas within the red-line
	Ha	%	ha	%	ha	%	ha	%	ha
U2	0.001 (0.001 – 0.002)	5.0	0.0	0	0.004 (0.002 – 0.005)	20	0.0	0	0.02 (0.01 – 0.03)
U5	0.07 (0.04 – 0.09)	0.7	0.0	0	0.14 (0.08 – 0.20)	1.3	0.0	0	10.6 (6.1 – 15.1)
U6	0.42 (0.19 – 0.65)	1.8	(0 – 0.001)	<0.1	0.56 (0.26 – 0.86)	2.4	(0 - 0.001)	<0.1	23.5 (13 – 34)
U7	0.16 (0.11 – 0.21)	3.9	0.01 (0 – 0.02)	0.2	0.16 (0.10 – 0.21)	3.9	(0 – 0.005)	<0.1	4.1 (2.6 – 5.5)
H12	0.02 (0.006 – 0.04)	1.3	0.0	0	0.04 (0.01 – 0.07)	2.6	0.0	0	1.54 (0.72 – 2.36)
H13	0.37 (0.33 – 0.41)	0.7	0.14 (0.13 – 0.16)	0.3	0.39 (0.31 – 0.46)	0.7	0.13 (0.12 – 0.14)	0.2	54 (46 – 62)
H20	0.07 (0.04 – 0.11)	7.0	0.0	0	0.07 (0.04 – 0.10)	7.0	0.0	0	1.00 (0.57 – 1.43)
M15	13.24 (11.0 – 15.5)	1.7	7.26 (6.04 – 8.48)	1.0	21.5 (18.2 – 24.9)	2.8	2.17 (0.52 – 0.74)	0.3	761 (624 – 898)
M2	0.05 (0.01 – 0.09)	1.9	0.06 (0.02 – 0.1)	2.3	0.10 (0.03 – 0.18)	3.8	0.02 (0.006 – 0.03)	0.8	2.6 (0.6 – 4.6)
M3	0.38 (0.16 – 0.62)	0.9	0.55 (0.26 – 0.85)	1.3	0.70 (0.28 – 1.13)	1.7	0.15 (0.07 – 0.25)	0.4	41 (19 – 63)
M17	2.74 (2.16 – 3.32)	1.9	2.62 (2.05 – 3.2)	1.8	5.43 (4.32 – 6.54)	3.8	0.57 (0.48 – 0.81)	0.4	142 (101 – 182)
M19	4.98 (3.74 – 6.23)	1.6	1.76 (1.29 – 2.22)	0.6	8.84 (6.89 – 10.8)	2.9	0.53 (0.48 – 0.89)	0.2	307 (220 – 393)
M20	0.21 (0.16 – 0.26)	1.6	0.0	0	0.20 (0.14 – 0.26)	1.5	0.0	0	13.3 (7.3 – 19.3)
M6	0.18 (0.10 – 0.26)	0.4	0.28 (0.21 – 0.34)	0.7	0.47 (0.31 – 0.63)	1.1	0.01 (0.004 – 0.02)	<0.1	42 (28 – 56)
M10	(0 – 0.006)	6.0	0.009 (0 – 0.02)	18	0.005 (0 – 0.01)	10	(0 – 0.009)	5.0	0.05 (0.01 – 0.09)
M31	0.008 (0.002 – 0.02)	4.7	0.01 (0 – 0.02)	0.06	0.01 (0.003 – 0.03)	<0.1	(0 – 0.013)	3.8	0.17 (0.03 – 0.31)
M32	0.003 (0.001 – 0.005)	0.9	0.008 (0 – 0.01)	4.7	0.01 (0.008 – 0.02)	<0.1	0.0	0	0.17 (0.04 – 0.29)
Total	**22.91 (28.2 – 43.3)**	**1.9**	**12.7 (9.99 – 15.4)**	**0.9**	**38.64 (33.9 – 51.2)**	**3.1**	**3.58 (3.50 – 5.42)**	**0.2**	**1,443 (1,095 – 1,788)**