Technical Appendix 7.1: Phase 1 and NVC Habitat Surveys 2023

Introduction

1. This report presents the habitat survey work that has been carried out for the proposed Killean Wind Farm (the 'Proposed Development'). The surveys were undertaken by Steve Percival, a highly experienced ecological surveyor with over 20 years ecological surveying for renewable energy projects (exceeding CIEEM competency requirements).

Study Area

2. The Proposed Development is located about 22km north of Campbeltown in Argyll. The survey area was chosen to include all areas within the potential zone of ecological influence of the proposed development and a buffer around that to be contextual information on the site's habitats. The survey area covered a total area of 12.4 km^2 (see Figure 1 and 2). It comprised predominantly commercial forestry plantation and upland moorland habitat. It lies within the 'Argyll West and Islands' NatureScot Natural Heritage Zone (NHZ 14).

Survey Methods

Phase 1 Habitat Survey Methods

3. An extended Phase 1 survey was carried out during 1-3 August 2023, including identification and mapping of the vegetation communities present within the study area, following the standard (JNCC 2016[1]) Phase 1 survey methodology. Any rare or scarce plant species found were also recorded, and habitat suitability was assessed for protected species (to inform the need for any further surveys). Aerial photography was used to help define habitat boundaries.

NVC Habitat Survey Methods

4. Further, more detailed, habitat surveys (Phase 2) were undertaken to map the NVC across the site at the same time as the Phase 1 surveys. This included the acquisition of vegetation species composition and percentage cover data from a series of representative quadrats from each community. These data also informed the potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) within the site. These were mapped and have been assessed as part of the hydrological impact assessment (see Chapter 9).

5. The vegetation communities within each of the survey fields were mapped to a minimum mappable polygon size of 150m^2. At least five 2x2m quadrat samples of vegetation composition and cover (recorded to the estimated percentage cover) were taken in each vegetation class of the main stand types (following Rodwell *et al*. 1992[2]). A total of 81 quadrats were sampled. The field quadrat samples were assigned to NVC class using the MAVIS analysis software (Smart *et al*. 2016[3]) and professional judgement. The condition of the habitats was assessed using the JNCC Common Standards Monitoring (JNCC 2009).

Limitations and Assumptions

6. No significant information gaps have been identified. Inevitably with any ecological survey it cannot be guaranteed to detect all target species/individuals and surveys cannot be fully representative of all conditions (e.g. severely reduced visibility). However, in this case it was concluded that the baseline surveys provide a robust baseline data set.

Survey Results

Phase 1/NVC habitats

7. The Phase 1 habitats recorded in the survey area are summarised in Table 7.1.1, and their distributions are shown in EIAR Figure 7.3. Table 7.6 also gives details of the NVC communities recorded and their distributions are shown in EIAR Figure 7.4. The Table also gives the EUNIS codes for each habitat type[4].

8. Summary quadrat data for each vegetation type are given in Appendix 7.1.1. This includes a species list, mean percentage cover and constancy value (1-5, after Rodwell *et al*. 1992).

[1] JNCC 2016. Handbook for Phase 1 habitat survey. A technique for environmental audit.
[2] Rodwell, J. S. et al. (1992) British Plant Communities: Volume 3 Grasslands and montane communities, Cambridge: Cambridge University Press.
[3] Smart, S., Goodwin, A., Wallace, H. and Jones, M. (2016). MAVIS (Ver 1.03) User Manual. https://www.ceh.ac.uk/services/modular-analysis-vegetation-information-system-mavis
[4] https://www.nature.scot/doc/naturescot-commissioned-report-766-manual-terrestrial-eunis-habitats-scotland

9. Summaries of the JNCC (2009) CSM Habitat Condition Assessment are given in Appendix 7.1.2, for the main habitats of conservation value. All were in Favourable condition, apart from the M25a wet modified bog/blanket bog (as a result of a low diversity and low cover of positive indicator species). Habitats were largely in Favourable condition as a result of only a low grazing pressure (there was no stock grazing the eastern moorland area and only low sheep-grazing levels on the western part) and an absence of evidence of any recent burning.

Table 7.1.1: Phase 1 and NVC habitats within the ecology survey area.

Phase 1 Habitat	Phase 1 Code	NVC Class	EUNIS Code	Total Area (ha.)	% Survey Area
Acid flush	E2.1	M29	D2.3#	0.03	0.002%
		M6d	D2.22	6.72	0.56%
Acid grass	B1.1	U4a	E1.72	8.46	0.70%
Blanket bog	E1.6.1	M17a	D1.21	97.70	8.08%
		M17b	D1.21	37.89	3.13%
		M19a	D1.22	168.5	13.9%
Bracken	C1.1	U20	E5.31	8.49	0.70%
		U20a	E5.31	16.78	1.39%
		U20c	E5.31	0.88	0.07%
Broad-leaved plantation	A1.1.2	W9	G1.A2#1	4.80	0.40%
Broad-leaved semi-natural woodland	A1.1.1	W7	G1.21	9.80	0.81%
Coniferous plantation	A1.2.2	-	-	329.3	27.2%
Recently-felled conifer	A4.2	-	-	215.8	17.9%
Dry heath	D1.1	H10c	F4.25	0.40	0.03%
		H12	F4.21	73.95	6.12%
		H21a	F4.21	1.42	0.12%
Improved grassland	B4	MG7	E2.6	0.73	0.06%
Marshy grassland (rush pasture)	B5	M23	E3.42	31.38	2.60%
		M23a	E3.42	72.68	6.01%
		M23b	E3.41	4.05	0.33%
Mixed plantation	A1.3.2	-	-	2.20	0.18%
Neutral grass - semi-improved	B2.2	MG6	E2.112	14.40	1.19%
	B6	MG10	E3.44	10.47	0.87%
Bog pool		M1	D1.21	0.02	<0.01%
		M3	D1.21	0.01	<0.01%
Open water	G1	-	-	10.94	0.90%
Quarry (disused)	I2.1	-	-	0.28	0.02%
Scrub - dense/continuous	A2.1	W23	E3.14	2.60	0.21%
		W7	E1.41	4.94	0.41%
Wet heath	D2	M15	F4.11	1.81	0.15%
		M15b	F4.11	24.50	2.03%
		M15c	F4.11	14.25	1.18%
		M15d	F4.11	12.94	1.07%
Wet modified bog	E1.7	M17a	D1.21	5.06	0.42%
		M19a	D1.22	5.23	0.43%
		M25a	D1.21	9.69	0.80%

Coniferous plantation and clearfell

10. Much of the survey area was commercial coniferous plantation of various ages (including recent clear-fell), mainly comprising Sitka spruce *Picea sitchensis*. It covered 45% of the survey area, and the large majority of the wind farm itself (including 8 of the 9 wind turbines).

Broad-leaved semi-natural woodland

11. Semi-natural broad-leaved woodland was found mainly in the lower western part of the survey area along the Killean Burn, with 9.8ha. (0.8% of the survey area) in total (plus a further 7.5ha. of scrub). None of this has been identified as ancient woodland. It was classed as NVC community W7.

Broad-leaved/mixed plantation

12. There were small areas of broad-leaved plantation, also mainly along the Killean Burn (4.8ha., 0.4% of the survey area), and a smaller area of mixed plantation (2.2ha. 0.2% of the survey area).

Scrub

13. This was also found mainly along the Killean Burn and along some of the watercourses within the clearfell/forestry. Most (4.9ha.) was goat willow-dominated wet woody scrub (W7), though also with some gorse (W23) (2.6ha.).

Blanket Bog

14. Blanket bog covered 25% of the survey area (304ha) and supported a species-rich peatland community. This included *Sphagnum* bog mosses, and abundant dwarf shrubs including heather and cross-leaved heath *Erica t*etralix. One of the wind turbines would be located on blanket bog (though on relative shallow peat of less than 1m depth).

15. The blanket bog habitat was classed as three NVC communities, M17a, M17b and M19a.

Wet Modified Bog

16. Wet modified bog was more restricted, covering 1.7% of the survey area (20ha). This habitat type was classified as M17a, M19a and M25a Purple moor grass *Molinia caerulea* – Tormentil *Potentilla e*recta mire (where purple moor-grass was extensive and dominant, with little bog moss *Sphagnum* or dwarf shrub cover).

Bog pool

17. There were a small number of bog pools within the blanket bog habitat in the eastern part of the survey area, including M1 and M3.

Dry Heath

18. Dry heathland habitats were common in the open moorland on shallower soils, covering 6.3% of the survey area (76ha). It was predominantly classed as NVC community H12, though some smaller areas of H10c and H21a were also found. It was found mainly in the lower western part of the site, though also with some small remnant patches within the conifer forestry (including within the wind farm) (see Figure 7.3).

Wet Heath

19. Wet heathland habitats were scarcer than the mires and dry heath, covering 4.4% of the survey area (53ha). It was classed as NVC communities M15b, M15c and M15d. It was widely distributed across the survey area, though with only a few small remnant patches within the proposed wind farm itself (see Figure 7.3).

Acid Flush

20. Small areas of acid flush (6.8ha) were scattered across the eastern part of the survey area, covering only 0.6% of the survey area (Figure 8.4). They were mainly found along watercourses. This habitat type comprises a combination of rushes and/or sedges over a thick layer of *Sphagnum* mosses and *Polytrichum commune*. It was classified as NVC community M6d *Carex echinata – Sphagnum fallax/denticulatum* mire. There was also a small patch of M29 acid flush (0.03ha, see Figure 8.4).

Marshy Grassland

21. Marshy grassland was another common Phase 1 habitat, covering 8.9% of the survey area. It was found mainly in the western part of the survey area (Figure 8.4). Two NVC communities were identified within the marshy grassland habitat:
    - M23a – Soft/sharp-flowered rush *Juncus effusus/acutiflorus* – Marsh bedstraw *Galium palustre* rush pasture – Juncus acutiflorus sub-community). It was much the most frequent M23 sub-community (95% was this type).
    - M23b – Soft/sharp-flowered rush *Juncus effusus/acutiflorus* – Marsh bedstraw *Galium palustre* rush pasture – Juncus effusus sub-community).

Bracken

22. Patches of bracken-dominated vegetation were widespread in drier parts of the western part of the survey area. A total of 26ha. (2.2%) of the survey area was covered in continuous bracken habitat. It was classed as NVC community U20a *Pteridium aquilinum – Galium saxatile* community (95%) and U20c (5%).

Acid Grassland

23. Small areas of acid grassland (8.5ha.) were located within the western part of the survey area (Figure 8.4). They were classed as NVC community U4d.

Neutral semi-improved and improved grassland

24. Much of the land alongside the lower parts of the site access track is agricultural grassland of these types (Figure 8.4). They covered a total area of 26ha. (2.1% of the survey area). Most were classified as MG10 and MG6, with a smaller area of more improved MG7.

Groundwater Dependent Terrestrial Ecosystems

25. Three of the NVC communities recorded have been identified by SEPA[5] as having high potential to be GWDTE:
    - Marshy grassland (M23);
    - Wet broad-leaved woodland/scrub (W7); and
    - Acid flush (M6, M29).
26. A further three habitats have moderate potential to be GWDTE:
    - Wet heath (M15);
    - Wet modified bog (M25); and
    - Neutral (semi-improved grassland (MG10).
27. The distribution of these habitats across the site is shown in EIAR Figures 7.3 and 7.4.

Ecological Conservation Evaluation

Conservation Evaluation of Habitats

28. The conservation value of the habitats was determined using the criteria specified in Table 7.2. The results are summarised in Table 7.8. All of the species with very high - low value have been taken forward in the ecological assessment (i.e. only those with negligible value have been scoped out).

Table 7.8: Conservation Evaluation of the Habitats in the Killean Wind Farm survey area

Habitat	NVC	EU Habs Dir priority	UK BAP priority habitat	Scottish BAP habitat	Argyll LBAP habitat	Potential GWDTE	Conservation Value
Acid flush	M6d	✓	✓	✓	✓	High	High
	M29	✓	✓	✓	✓	High	High
Acid grass	U4a						
Blanket bog	M17a	✓	✓	✓	✓		High
	M17b	✓	✓	✓	✓		High
	M19a	✓	✓	✓	✓		High
Bog pool	M1	✓	✓	✓	✓		High
	M3	✓	✓	✓	✓		High
Bracken	U20a						Negligible
Broad- leaved woodland	W7	✓	✓	✓	✓	High	High
	W9	✓	✓	✓	✓		High
Broad-leaved plantation	n/a						Negligible
Coniferous plantation	n/a						Negligible
Recently-felled conifer	n/a						Negligible
Dry heath	H10c	✓	✓	✓	✓		High
	H12	✓	✓	✓	✓		High

[5] https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions.pdf

Habitat	NVC	EU Habs Dir priority	UK BAP priority habitat	Scottish BAP habitat	Argyll LBAP habitat	Potential GWDTE	Conservation Value
	H21a	✓	✓	✓	✓		High
Improved grassland	MG6a						Negligible
Marshy grassland	M23a		✓	✓	✓	High	Medium
Mixed plantation	n/a						Negligible
Neutral grass - semi-improved	MG6						Negligible
	MG10					Medium	Negligible
Scrub - dense/continuous	W7		✓	✓	✓	High	Medium
	W23						Negligible
Wet heath	M15b	✓	✓	✓	✓	Medium	High
	M15c	✓	✓	✓	✓	Medium	High
	M15d	✓	✓	✓	✓	Medium	High
Wet modified bog	M17a	✓	✓	✓	✓		High
	M19a	✓	✓	✓	✓		High
	M25a	✓	✓	✓	✓	Medium	High

29. Seven habitats were classed as high sensitivity, though their listing as EU Habitats Directive Annex 1 habitats: blanket bog, bog pool, dry heath, wet heath, wet modified bog, acid flush and broad-leaved woodland.
30. Two habitats were classed as medium conservation value: scrub and marshy grassland (rush pasture). Both were classed as medium value for their listing as UK Biodiversity Action Plan (BAP)/Scottish Biodiversity List priority habitats.

APPENDIX 7.1.1. HABITAT DATA – QUADRAT PERCENTAGE COVER AND CONSTANCY

Acid Flush (M6d)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Sweet Vernal-grass	*Anthoxanthum odoratum*	1	0.6%
Lady-fern	*Athyrium filix-femina*	1	0.1%
Heather	*Calluna vulgaris*	2	1.3%
Star Sedge	*Carex echinata*	1	0.2%
Glaucous Sedge	*Carex flacca*	1	0.2%
Bottle Sedge	*Carex rostrata*	2	2.0%
Marsh thistle	*Cirsium palustre*	2	0.8%
Wavy hair grass	*Deschampsia flexuosa*	1	0.3%
Marsh Willowherb	*Epilobium palustre*	1	0.1%
Water Horsetail	*Equisetum fluviatile*	1	0.2%
Cross-leaved heath	*Erica tetralix*	3	1.7%
Eyebright	*Euphrasia officinalis*	1	0.1%
Yorkshire-fog	*Holcus lanatus*	2	3.3%
Marsh pennywort	*Hydrocotyle vulgaris*	1	0.3%
Sharp-flowered rush	*Juncus acutiflorus*	5	58.9%
Soft rush	*Juncus effusus*	3	7.8%
Bogbean	*Menyanthes trifoliata*	2	1.4%
Purple Moor-grass	*Molinia caerulea*	4	10.0%
Bog Asphodel	*Narthecium ossifragum*	1	0.8%
Common Milkwort	*Polygala vulgaris*	1	0.2%
Star moss	*Polytrichum commune*	2	1.1%
Tormentil	*Potentilla erecta*	5	3.6%
Lesser Spearwort	*Ranunculus flammula*	1	0.1%
Common sorrel	*Rumex acetosa*	1	0.1%
Common Ragwort	*Senecio jacobaea*	1	0.1%
Bog moss	*Sphagnum fallax*	4	2.9%
Bog moss	*Sphagnum palustre*	3	2.7%
Bog moss	*Sphagnum papillosum*	3	6.0%
Devil's-bit Scabious	*Succisa pratensis*	1	0.2%
Marsh Violet	*Viola palustris*	3	0.9%

Acidic Grassland (U4a)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Common bent	*Agrostis capillaris*	5	16.7%
Sweet Vernal-grass	*Anthoxanthum odoratum*	4	16.0%
Heather	*Calluna vulgaris*	3	2.0%
Common sedge	*Carex nigra*	2	0.2%
Marsh Thistle	*Cirsium palustre*	1	0.2%
Cock's-foot	*Dactylis glomerata*	2	1.0%
Sheep's fescue	*Festuca ovina*	4	6.0%
Soft rush	*Juncus effusus*	2	1.0%
Heath rush	*Juncus squarrosus*	2	2.0%
Purple moor grass	*Molinia caerulea*	3	11.0%
Mat-grass	*Nardus stricta*	2	1.0%
Lousewort	*Pedicularis sylvatica*	1	0.2%
Ribwort Plantain	*Plantago lanceolata*	2	3.0%

Common name	Scientific name	Constancy (1-5)	Mean % cover
Moss	*Pleurozium schreberi*	2	1.0%
Tormentil	*Potentilla erecta*	5	4.0%
Selfheal	*Prunella vulgaris*	3	0.4%
Meadow Buttercup	*Ranunculus acris*	3	0.4%
Common sorrel	*Rumex acetosa*	2	0.4%
Common Ragwort	*Senecio jacobaea*	1	0.2%
Devil's-bit Scabious	*Succisa pratensis*	4	0.8%
Bilberry	*Vaccinium myrtillus*	2	0.4%

Acidic Grassland (U4b)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Common bent	*Agrostis capillaris*	5	17.5%
Sweet Vernal-grass	*Anthoxanthum odoratum*	5	30.0%
Marsh Thistle	*Cirsium palustre*	2	0.5%
Sheep's fescue	*Festuca ovina*	4	10.0%
Yorkshire-fog	*Holcus lanatus*	5	30.0%
Soft rush	*Juncus effusus*	4	5.0%
Moss	*Pleurozium schreberi*	2	2.5%
Tormentil	*Potentilla erecta*	5	4.0%
Common sorrel	*Rumex acetosa*	4	3.5%

Marshy grassland (M23a) – rush pasture

Common name	Scientific name	Constancy (1-5)	Mean % cover
Lady-fern	*Athyrium filix-femina*	2	0.6%
Marsh thistle	*Cirsium palustre*	3	1.0%
Marsh Willowherb	*Epilobium palustre*	2	0.4%
Sheep's fescue	*Festuca ovina*	1	1.0%
Yorkshire fog	*Holcus lanatus*	5	12.0%
Sharp-flowered rush	*Juncus acutiflorus*	4	30.0%
Soft rush	*Juncus effusus*	5	51.0%
Star moss	*Polytrichum commune*	1	0.4%
Tormentil	*Potentilla erecta*	4	2.0%
Meadow Buttercup	*Ranunculus acris*	1	0.4%
Creeping Buttercup	*Ranunculus repens*	1	0.6%
Common sorrel	*Rumex acetosa*	4	5.0%
Marsh violet	*Viola palustris*	1	0.2%

Marshy grassland (M23b) – rush pasture

Common name	Scientific name	Constancy (1-5)	Mean % cover
Yorkshire fog	*Holcus lanatus*	5	15%
Soft rush	*Juncus effusus*	5	80%
Tormentil	*Potentilla erecta*	3	1%
Creeping Buttercup	*Ranunculus repens*	3	3%
Common sorrel	*Rumex acetosa*	2	5%

Dwarf shrub heath (H10)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	5	80%
Bell Heather	*Erica cinerea*	2	2%
Purple moor grass	*Molinia caerulea*	3	20%
Moss	*Pleurozium schreberi*	3	5%
Tormentil	*Potentilla erecta*	2	2%

Dwarf shrub heath (H12)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	5	71.3%
Crowberry	*Empetrum nigrum*	5	1.8%
Cross leaved heath	*Erica tetralix*	1	0.5%
Moss	*Hypnum jutlandicum*	4	3.8%
Heath rush	*Juncus squarrosus*	3	1.8%
Purple moor grass	*Molinia caerulea*	5	15.0%
Bog Asphodel	*Narthecium ossifragum*	1	0.5%
Moss	*Pleurozium schreberi*	4	3.8%
Star moss	*Polytrichum commune*	1	0.3%
Tormentil	*Potentilla erecta*	3	0.8%
Deergrass	*Scirpus caespitosus*	1	1.3%
Bog moss	*Sphagnum compactum*	4	8.8%
Bog moss	*Sphagnum cuppress*	1	2.5%
Bilberry	*Vaccinium myrtillus*	5	6.5%
Cowberry	*Vaccinium vitis-idaea*	1	1.3%

Wet dwarf shrub heath (M15b)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Sweet Vernal-grass	*Anthoxanthum odoratum*	3	6.4%
Heather	*Calluna vulgaris*	4	6.4%
Common sedge	*Carex nigra*	1	0.7%
Lichen	*Cladonia impexa*	1	1.6%
Wavy hair grass	*Deschampsia flexuosa*	3	5.0%
Cross leaved heath	*Erica tetralix*	5	21.4%
Common Cottongrass	*Eriophorum angustifolium*	1	0.1%
Harestail cotton grass	*Eriophorum vaginatum*	1	0.7%
Yorkshire fog	*Holcus lanatus*	1	1.1%
Marsh Pennywort	*Hydrocotyle vulgaris*	1	0.1%
Sharp-flowered Rush	*Juncus acutiflorus*	2	2.0%
Soft rush	*Juncus effusus*	1	0.7%
Heath rush	*Juncus squarrosus*	1	1.4%
Common wood-rush	*Luzula multiflora*	1	0.1%
Purple moor grass	*Molinia caerulea*	5	33.6%
Bog Asphodel	*Narthecium ossifragum*	4	6.1%
Grass-of-Parnassus	*Parnassia palustris*	1	0.1%
Moss	*Pleurozium schreberi*	1	1.4%
Tormentil	*Potentilla erecta*	5	4.6%
Common sorrel	*Rumex acetosa*	1	0.7%

Common name	Scientific name	Constancy (1-5)	Mean % cover
Bog moss	*Sphagnum compactum*	3	3.6%
Bog moss	*Sphagnum capillifolium*	1	0.7%
Devil's-bit Scabious	*Succisa pratensis*	1	1.1%
Deergrass	*Trichophorum cespitosum*	3	12.1%
Bilberry	*Vaccinium myrtillus*	1	1.4%

Wet dwarf shrub heath (M15c)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	5	38.3%
Lichen	*Cladonia impexa*	5	4.0%
Wavy hair grass	*Deschampsia flexuosa*	2	1.7%
Bell Heather	*Erica cinerea*	5	6.7%
Cross leaved heath	*Erica tetralix*	5	5.0%
Moss	*Hypnum jutlandicum*	2	1.7%
Heath rush	*Juncus squarrosus*	2	0.7%
Purple moor grass	*Molinia caerulea*	5	23.3%
Bog Asphodel	*Narthecium ossifragum*	5	4.0%
Moss	*Pleurozium schreberi*	2	1.7%
Tormentil	*Potentilla erecta*	5	1.7%
Moss	*Racomitrium languinosum*	5	8.3%
Devil's-bit Scabious	*Succisa pratensis*	2	0.3%
Deergrass	*Trichophorum cespitosum*	5	11.7%
Bilberry	*Vaccinium myrtillus*	2	1.0%

Wet dwarf shrub heath (M15d)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	5	35%
Wavy hair grass	*Deschampsia flexuosa*	3	5%
Crowberry	*Empetrum nigrum*	1	1%
Bell Heather	*Erica cinerea*	3	5%
Cross leaved heath	*Erica tetralix*	5	5%
Common Cottongrass	*Eriophorum angustifolium*	1	1%
Harestail cotton grass	*Eriophorum vaginatum*	3	5%
Purple moor grass	*Molinia caerulea*	5	25%
Tormentil	*Potentilla erecta*	4	3%
Moss	*Racomitrium languinosum*	3	5%
Bog moss	*Sphagnum compactum*	3	5%
Deergrass	*Trichophorum cespitosum*	4	10%
Bilberry	*Vaccinium myrtillus*	4	15%

Blanket bog (purple moor-grass) (M25a)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	Calluna vulgaris	4	6.3%
Lichen	Cladonia impexa	1	0.5%
Wavy hair-grass	Deschampsia flexuosa	2	0.8%
Round-leaved Sundew	Drosera rotundifolia	2	0.3%
Broad Buckler-fern	Dryopteris dilatata	1	0.3%

Common name	Scientific name	Constancy (1-5)	Mean % cover
Cross leaved heath	Erica tetralix	5	6.8%
Harestail cotton grass	Eriophorum vaginatum	4	5.0%
Purple moor grass	Molinia caerulea	5	77.5%
Bog Asphodel	Narthecium ossifragum	5	7.5%
Star moss	Polytrichum juniperinum	3	1.0%
Tormentil	Potentilla erecta	4	2.0%
Moss	Racomitrium languinosum	1	0.5%
Bog moss	Sphagnum compactum	1	1.3%
Bog moss	Sphagnum capillifolium	1	1.3%

Blanket bog (M17a)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	5	35.0%
Lichen	*Cladonia impexa*	3	1.5%
Wavy hair grass	*Deschampsia flexuosa*	4	5.5%
Bell Heather	*Erica cinerea*	1	1.3%
Cross leaved heath	*Erica tetralix*	5	5.5%
Harestail cotton grass	*Eriophorum vaginatum*	4	8.8%
Moss	*Hypnum cuppressiforme*	3	2.5%
Purple moor grass	*Molinia caerulea*	5	20.0%
Bog Asphodel	*Narthecium ossifragum*	1	2.5%
Sitka spruce	*Picea sitchensis*	1	0.3%
Star moss	*Polytrichum commune*	1	0.5%
Tormentil	*Potentilla erecta*	5	2.8%
Moss	*Racomitrium languinosum*	1	1.3%
Bog moss	*Sphagnum capillifolium*	5	6.3%
Bog moss	*Sphagnum compactum*	1	1.3%
Deergrass	*Trichophorum cespitosum*	5	3.5%
Bilberry	*Vaccinium myrtillus*	4	6.3%

Blanket bog (M17b)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	5	35%
Wavy hair grass	*Deschampsia flexuosa*	3	10%
Crowberry	*Empetrum nigrum*	2	2%
Bell Heather	*Erica cinerea*	1	1%
Cross leaved heath	*Erica tetralix*	3	5%
Purple Moor-grass	*Molinia caerulea*	4	15%
Deergrass	*Trichophorum cespitosum*	4	15%

Blanket bog (M19a)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Hard-fern	*Blechnum spicant*	1	0.1%
Heather	*Calluna vulgaris*	5	44.7%
Glaucous Sedge	*Carex flacca*	1	0.1%
Lichen	*Cladonia impexa*	1	0.5%
Wavy hair grass	*Deschampsia flexuosa*	2	2.7%

Common name	Scientific name	Constancy (1-5)	Mean % cover
Round-leaved Sundew	*Drosera rotundifolia*	1	0.1%
Crowberry	*Empetrum nigrum*	3	2.6%
Bell Heather	*Erica cinerea*	2	0.8%
Cross leaved heath	*Erica tetralix*	4	4.9%
Harestail cotton grass	*Eriophorum vaginatum*	4	11.8%
Moss	*Hypnum cuppressiforme*	1	0.1%
Moss	*Hypnum jutlandicum*	1	0.9%
Purple moor grass	*Molinia caerulea*	4	19.7%
Bog Asphodel	*Narthecium ossifragum*	3	3.4%
Sitka spruce	*Picea sitchensis*	1	0.2%
Moss	*Pleurozium schreberi*	3	2.0%
Star moss	*Polytrichum commune*	1	0.5%
Star moss	*Polytrichum juniperum*	1	0.1%
Tormentil	*Potentilla erecta*	4	2.1%
Moss	*Racomitrium languinosum*	1	1.4%
Bog moss	*Sphagnum capillifolium*	4	5.2%
Bog moss	*Sphagnum compactum*	2	2.9%
Bog moss	*Sphagnum palustre*	1	0.6%
Bog moss	*Sphagnum papillosum*	1	0.3%
Deergrass	*Trichophorum cespitosum*	1	0.3%
Bilberry	*Vaccinium myrtillus*	3	4.4%
Cowberry	*Vaccinium vitis-idaea*	1	0.1%

Wet modified bog (M25a)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	4	5.0%
Wavy hair-grass	*Deschampsia flexuosa*	2	2.0%
Cross leaved heath	*Erica tetralix*	5	7.0%
Harestail cotton grass	*Eriophorum vaginatum*	2	2.0%
Purple moor grass	*Molinia caerulea*	5	79.0%
Bog Asphodel	*Narthecium ossifragum*	2	4.0%
Tormentil	*Potentilla erecta*	5	2.6%
Moss	*Racomitrium languinosum*	2	2.4%
Bog moss	*Sphagnum compactum*	3	2.6%
Bog moss	*Sphagnum capillifolium*	2	2.0%
Deergrass	*Trichophorum cespitosum*	3	2.4%

Wet modified bog (M19a)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	5	35%
Wavy hair-grass	*Deschampsia flexuosa*	1	2%
Cross leaved heath	*Erica tetralix*	3	5%
Harestail cotton grass	*Eriophorum vaginatum*	4	10%
Purple moor grass	*Molinia caerulea*	3	25%
Bog Asphodel	*Narthecium ossifragum*	1	2%
Sitka spruce	*Picea sitchensis*	1	1%
Tormentil	*Potentilla erecta*	3	3%
Bog moss	*Sphagnum capillifolium*	2	10%

Common name	Scientific name	Constancy (1-5)	Mean % cover
Bilberry	*Vaccinium myrtillus*	2	20%

Bog pool (M1)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	3	2.5%
Carnation Sedge	*Carex panicea*	1	0.5%
Bottle sedge	*Carex rostrata*	2	0.5%
Round-leaved Sundew	*Drosera rotundifolia*	3	2.0%
Cross leaved heath	*Erica tetralix*	5	5.5%
Common cotton grass	*Eriophorum angustifolium*	5	10.0%
Harestail cotton grass	*Eriophorum vaginatum*	5	7.5%
Bogbean	*Menyanthes trifoliata*	5	6.3%
Purple moor grass	*Molinia caerulea*	2	2.5%
Bog Asphodel	*Narthecium ossifragum*	4	7.5%
Broad-leaved Pondweed	*Potamogeton polygonifolius*	3	5.0%
Bog moss	*Sphagnum capillifolium*	1	1.3%
Bog moss	*Sphagnum cuspidatum*	2	1.3%
Bog moss	*Sphagnum palustre*	2	1.3%
Bog moss	*Sphagnum papillosum*	5	16.3%
Deergrass	*Trichophorum cespitosum*	1	1.3%

Bog pool (M3)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Heather	*Calluna vulgaris*	5	7.5%
Round-leaved Sundew	*Drosera rotundifolia*	4	1.5%
Cross leaved heath	*Erica tetralix*	5	10.0%
Common cotton grass	*Eriophorum angustifolium*	5	12.5%
Harestail cotton grass	*Eriophorum vaginatum*	4	5.0%
Purple moor grass	*Molinia caerulea*	2	2.5%
Bog Asphodel	*Narthecium ossifragum*	4	4.0%
Bog moss	*Sphagnum papillosum*	5	30.0%
Deergrass	*Trichophorum cespitosum*	2	2.5%

Bracken (U20a)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Common Bent	*Agrostis capillaris*	3	1.8%
Sweet Vernal-grass	*Anthoxanthum odoratum*	1	1.3%
Marsh thistle	*Cirsium palustre*	1	0.3%
Yorkshire fog	*Holcus lanatus*	5	12.5%
Bluebell	*Hyacinthoides non-scripta*	1	0.8%
Soft rush	*Juncus effusus*	3	3.8%
Wood-sorrel	*Oxalis acetosella*	1	0.3%
Tormentil	*Potentilla erecta*	4	1.3%
Bracken	*Pteridium aquilinum*	5	78.8%
Meadow Buttercup	*Ranunculus acris*	1	0.3%
Creeping Buttercup	*Ranunculus repens*	1	0.5%
Common sorrel	*Rumex acetosa*	4	2.3%

Common name	Scientific name	Constancy (1-5)	Mean % cover
White Clover	*Trifolium repens*	1	0.3%
Common Dog-violet	*Viola riviniana*	1	0.3%

Bracken (U20c)

Common name	Scientific name	Constancy (1-5)	Mean % cover
Yorkshire fog	Holcus lanatus	4	5%
Bracken	Pteridium aquilinum	5	95%

APPENDIX 7.1.2. HABITAT CONDITION ASSESSMENT SUMMARIES

Blanket Bog/Wet Modified Bog

Attribute	Target	Current condition (Blanket Bog M17a/b)	Current condition (Blanket Bog M19a)	Current condition (Blanket Bog M25a)	Current condition (Wet Modified Bog M19a)	Current condition (Wet Modified Bog M25a)
Feature extent	There should be no measurable decline in the area of the feature.	Favourable: no apparent change since 2015	Favourable: no apparent change since 2015	Favourable: no apparent change since 2015	Favourable: no apparent change since 2015	Favourable: no apparent change since 2015
Vegetation composition -frequency of indicator species.	At least 6 indicator species should be present.	Favourable: mean 6.6 species/quadrat	Favourable: mean 7.4 species/quadrat	**Unfavourable: mean 5.0 species/quadrat**	Favourable: mean 6.0 species/quadrat	**Unfavourable: mean 4.6 species/quadrat**
Vegetation composition - cover of indicator species.	(1) At least 50% of vegetation cover should consist of at least 3 indicator species.	Favourable: mean 70% indicator sp cover	Favourable: mean 86% indicator sp cover	**Unfavourable: mean 29% indicator sp cover**	Favourable: mean 82% indicator sp cover	**Unfavourable: mean 27% indicator sp cover**
	(2) *Sphagnum* cover should not consist only of *Sphagnum fallax (S. recurvum* p.p.).	Favourable	Favourable	Favourable	Favourable	Favourable
	(3) Any one of *Eriophorum vaginatum*, Ericaceous species collectively, or *Trichophorum* should not individually exceed 75% of the vegetation cover.	Favourable	Favourable	Favourable	Favourable	Favourable
Vegetation composition - cover of other species	(1) Less than 1% of vegetation cover should be made up of non-native species.	Favourable	Favourable	Favourable	Favourable	Favourable
	(2) Less than 10% of	Favourable	Favourable	Favourable	Favourable	Favourable

Attribute	Target	Current condition (Blanket Bog M17a/b)	Current condition (Blanket Bog M19a)	Current condition (Blanket Bog M25a)	Current condition (Wet Modified Bog M19a)	Current condition (Wet Modified Bog M25a)
	vegetation cover should be made up of scattered native trees and scrub.					
	(3) Less than 1% of vegetation cover should consist of, collectively, *Agrostis capillaris*, *Holcus lanatus*, *Phragmites australis*, *Pteridium aquilinum*, *Ranunculus repens*.	Favourable	Favourable	Favourable	Favourable	Favourable
Vegetation structure – indicators of browsing.	(1) Less than 33% of the last complete growing season's shoots of dwarf-shrub species (collectively but excluding *Betula nana* and *Myrica gale*) should shows signs of browsing.	Favourable	Favourable	Favourable	Favourable	Favourable
	(2) In pioneer stage regrowth, or where there is *Betula nana* or *Myrica gale* (at any stage of regrowth), less than 66% of the last complete growing season's shoots of the dwarf-shrubs, (collectively) should show	Favourable	Favourable	Favourable	Favourable	Favourable

Attribute	Target	Current condition (Blanket Bog M17a/b)	Current condition (Blanket Bog M19a)	Current condition (Blanket Bog M25a)	Current condition (Wet Modified Bog M19a)	Current condition (Wet Modified Bog M25a)
	signs of browsing.					
Vegetation structure - disturbance	(1) There should be no observable signs of burning into the moss, liverwort or lichen layer or exposure of peat surface due to burning.	Favourable	Favourable	Favourable	Favourable	Favourable
	(2) There should be no signs of burning or other disturbance (e.g. mowing) in the sensitive areas.	Favourable	Favourable	Favourable	Favourable	Favourable
Physical structure - peat erosion.	The extent of eroding peat should be less than the extent of stable re-deposited peat and new growth of bog vegetation within the feature.	Favourable	Favourable	Favourable	Favourable	Favourable
Physical structure - indicators of active drainage and/or ground disturbance due to herbivore and human activity.	(1) Less than 10% of the total feature area, should be disturbed bare ground and/or show signs of active drainage, resulting from ditches or heavy trampling or tracking.	Favourable	Favourable	Favourable	Favourable	Favourable

Attribute	Target	Current condition (Blanket Bog M17a/b)	Current condition (Blanket Bog M19a)	Current condition (Blanket Bog M25a)	Current condition (Wet Modified Bog M19a)	Current condition (Wet Modified Bog M25a)
	(2) Less than 10% of the *Sphagnum* cover should be crushed, broken, and/or pulled-up.	Favourable	Favourable	Favourable	Favourable	Favourable

Wet heath

Attribute	Target	Current condition (Wet Heath M15b)	Current condition (Wet Heath M15c)	Current condition (Wet Heath M15a)
Feature extent	There should be no measurable decline in the area of the feature.	Favourable: no apparent change since 2015	Favourable: no apparent change since 2015	Favourable: no apparent change since 2015
Vegetation composition - frequency of indicator species.	*Erica tetralix* should be present within a 20m radius of the centre of the quadrat.	Favourable	Favourable	Favourable
Vegetation composition - cover	(1) At least 50% of vegetation cover should consist of indicator species and at least 20% of the vegetation cover should consist of ericoid species.	Favourable: mean 54% indicator sp cover, mean ericoid cover 28%	Favourable: mean 74% indicator sp cover, mean ericoid cover 45%	Favourable: mean 77% indicator sp cover, mean ericoid cover 56%
	(2) Less than 20% of vegetation cover should be made up of scattered native trees and scrub	Favourable	Favourable	Favourable
	(3) <10% cover should be bracken	Favourable	Favourable	Favourable
	(4) <1% cover should be non-native species	Favourable	Favourable	Favourable
	(5) Less than 1% of vegetation cover should consist of, collectively, *Agrostis capillaris, Holcus lanatus, Phragmites australis, Pteridium aquilinum, Ranunculus repens*	Favourable	Favourable	Favourable

Attribute	Target	Current condition (Wet Heath M15b)	Current condition (Wet Heath M15c)	Current condition (Wet Heath M15a)
	(6) Less than 10% of the vegetation cover should consist of *Juncus effusus*	Favourable	Favourable	Favourable
	(7) None of the following should make up more than 75% of vegetation cover: (a) dwarf-shrubs; or (b) graminoids.	Favourable	Favourable	Favourable
Vegetation structure – indicators of browsing.	(1) Less than 33% of the last complete growing season's shoots of dwarf-shrub species (collectively but excluding *Betula nana* and *Myrica gale*) should shows signs of browsing.	Favourable	Favourable	Favourable
	(2) In pioneer stage regrowth, or where there is *Betula nana* or *Myrica gale* (at any stage of regrowth), less than 66% of the last complete growing season's shoots of the dwarf-shrubs, (collectively) should show signs of browsing.	Favourable	Favourable	Favourable
Vegetation structure - disturbance	(1) There should be no observable signs of burning into the moss, liverwort or lichen layer or exposure of peat surface due to burning.	Favourable	Favourable	Favourable
	(2) There should be no signs of burning or other disturbance in the sensitive areas.	Favourable	Favourable	Favourable
Physical structure - indicators of increased active drainage and drying-out, and peat erosion.	(1) Less than 10% of the total feature area, should be disturbed bare ground and/or show signs of active drainage, resulting from ditches or heavy trampling or tracking.	Favourable	Favourable	Favourable

Attribute	Target	Current condition (Wet Heath M15b)	Current condition (Wet Heath M15c)	Current condition (Wet Heath M15a)
	(2) The extent of eroding peat and/or mineral soil should be less than the extent of re-deposited peat and/or mineral soil and new growth of wet heath and/or bog vegetation within the feature	Favourable	Favourable	Favourable
Physical structure – indicators of ground disturbance due to herbivore and human activity	(1) Less than 10% of the *Sphagnum* cover should be crushed, broken, and/or pulled-up.	Favourable	Favourable	Favourable
	(2) Less than 10% of the ground should be disturbed bare ground*	Favourable	Favourable	Favourable

Dry Dwarf Shrub Heath

Attribute	Target	Current condition (Dry Dwarf Shrub Heath H10)	Current condition (Dry Dwarf Shrub Heath H10)
Feature extent	There should be no measurable decline in the area of the feature.	Favourable: no apparent change since 2015	Favourable: no apparent change since 2015
Vegetation composition - frequency of bryophytes and lichens.	At least 1 species of moss or liverwort or non-crustose lichen should be present.	Favourable	Favourable
Vegetation composition – cover and frequency of dwarf shrubs	(1) At least 50% of vegetation cover should consist of indicator species.	Favourable: mean 80% indicator sp cover	Favourable: mean 81% indicator sp cover
	(2) At least 25% of dwarf-shrub cover should be made up of Group (i) indicators	Favourable: 100% dwarf shrubs Group (i)	Favourable: 100% dwarf shrubs Group (i)
	(3) Less than 50% of dwarf shrub cover should be made up of Group (ii) indicators	Favourable – zero Group (ii) indicators	Favourable – zero Group (ii) indicators
	(4) For all types of heath at least two indicator species should be present from Group (i)	Favourable: mean 2.0 indicator species present.	Favourable: mean 3.5indicator species present.
Vegetation composiion – cover of other species	(1) <1% cover should be non-native species	Favourable	Favourable
	(2) <10% cover should be bracken	Favourable	Favourable

Attribute	Target	Current condition (Dry Dwarf Shrub Heath H10)	Current condition (Dry Dwarf Shrub Heath H10)
	(3) Less than 20% of vegetation cover should be made up of scattered native trees and scrub	Favourable	Favourable
	(4) Less than 1% of the vegetation cover should consist of invasive "weedy" species (collectively Cirsium arvense, Cirsium vulgare, large docks (excluding Rumex acetosa), , Ranunculus repens, or Urtica dioica).	Favourable	Favourable
	(5) Less than 10% of the vegetation cover should consist of *Juncus effusus*	Favourable	Favourable
Vegetation structure - disturbance	(1) There should be no signs of burning or other disturbance in the sensitive areas.	Favourable	Favourable
	(2) On the remainder of the feature, outside areas identified in (1), all growth phases of heather should occur throughout the area. At least 10% of the heather should be in the late mature growth phase.	Favourable	Favourable
Vegetation structure – indicators of browsing.	(1) Less than 33% of the last complete growing season's shoots of dwarf-shrub species (collectively but excluding *Betula nana* and *Myrica gale*) should shows signs of browsing.	Favourable	Favourable
	(2) In pioneer stage regrowth, or where there is *Betula nana* or *Myrica gale* (at any stage of regrowth), less than 66% of the last complete growing season's shoots of the dwarf-shrubs, (collectively) should show signs of browsing.	Favourable	Favourable
Physical structure — indicators of ground disturbance due to herbivore and human activity	(1) Less than 10% of the ground should be disturbed bare ground	Favourable	Favourable

Mire Grasslands and Rush pasture

Attribute	Target	Current condition (Rush pasture M23a)	Current condition (Rush pasture M25b)
Feature extent	No significant loss of the feature.	Favourable: no apparent change since 2015	Favourable: no apparent change since 2015
Sward composition - frequency of indicators.	Positive indicators confirm presence of target community.	Favourable	Favourable
Sward composition: frequency and cover of Molinia caerulea and bulky Juncus spp	Cover of all species combined should be within the range 25-80%. For M25, *Molinia* should be at least frequent throughout the sward.	Favourable	Favourable

Attribute	Target	Current condition (Rush pasture M23a)	Current condition (Rush pasture M25b)
Sward composition: frequency of negative indicators agricultural weeds	No species should be more than occasional throughout the sward or together more than 5% cover.	Favourable	Favourable
Sward composition: cover of negative indicators agriculturally favoured species	No species should be individually at more than 10% cover, or collectively at more than 20% cover	Favourable	Favourable
Sward composition: cover of negative indicators rank grasses and sedge	*Arrhenatherum* and *Deschampsia* together should cover less than 10% of the sward. Bulky wetland species collectively should cover less than 20% or the sward	Favourable	Favourable
Sward composition: cover of negative indicators scrub and tree species, and bracke	Woody species and bracken together should be at no more than 5% cover	Favourable	Favourable
Sward structure: average height	Swards should usually be within the range 5-80 cm	Favourable	Favourable
Sward structure: litter	Total extent of litter should be no more than 25% cover of the sward	Favourable	Favourable
Sward structure: extent of bare ground (not rock)	Total extent should be no more than 10% of the sward	Favourable	Favourable