

Technical Appendix 7: Ecology

TA 7.1: Habitats and Vegetation

TA 7.2: Protected Species

TA 7.3: Outline Habitat Management Plan

TA 7.4: Information to Inform Habitats Regulations Appraisal

Technical Appendix 7.1: Habitats and Vegetation

Artfield Forest Wind Farm
Technical Appendix 7.1: Habitats and Vegetation



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1 INTRODUCTION

1.1.1 This Technical Appendix has been prepared to accompany Chapter 7: Ecology of the Artfield Forest Wind Farm (hereafter the Proposed Development) Environmental Impact Assessment (EIA) Report.

1.1.2 It presents detailed methodologies and results of ecology desk studies and field surveys to inform the design and assessment of the Proposed Development.

1.1.3 It should be read with reference to the following figures, presented in **Volume 3a** of the EIA Report:

- **Figure 7.2:** Phase 1 Habitat Plan;
- **Figure 7.3:** National Vegetation Classification Plan; and,
- **Figure 7.4:** Protected and Notable Flora Records.

1.2 Site Overview

1.2.1 The Site is located approximately 8km northwest of Kirkcowan, 15km west of Newton Stewart, east of Artfield Fell. The Site is shown on Figure 7.1: Statutory Designated Sites for Nature Conservation (EIA Volume 3a).

1.2.2 The habitats comprise a mix of commercially managed coniferous forestry and rough grazing pastures. The Site also supports areas of recently felled and replanted woodland together with compartments of mixed plantation woodland.

1.2.3 Several watercourses intersecting the Site, which primarily drain into the Tarf Water. The Mulniegarroch Burn / Purgatory Burn form part of the Site's north western boundary.

1.2.4 The eastern extent of the Site hold previous planning consent for the Gass Wind Farm, comprising nine wind turbines and associated infrastructure (Dumfries and Galloway Council Planning Reference 14/P/1/0674). Reference is made in this report to the Environmental Impact Assessment undertaken for that application¹.

1.3 Key Guidance

1.3.1 Field survey methodologies and subsequent interpretation of results have made reference to the following key pieces of guidance:

- An Illustrated Guide to British Upland Vegetation (Averis *et al*, 2014)²;
- Handbook for Phase 1 Habitat Survey - a technique for environmental audit (Joint Nature Conservation Committee (JNCC), 2010)³;
- Commissioned Report 766 - Manual of terrestrial EUNIS habitats in Scotland (SNH, 2017)⁴;

¹ Sgurr Energy 2014 14_P_1_0674 Environmental Statement Vol. 2 Appendix 7A phase 1 Habitat and NVC Survey, and Drawing no. 162183-003 Figure 7.5 NVC Results.

² Averis, A., Averis, B., Birks, J., Horsfield, D., Thompson, D. & Yeo, M. (2004). An Illustrated Guide to British Upland Vegetation. JNCC, Peterborough

³ JNCC (2010). Handbook for Phase 1 Habitat Survey - a technique for environmental audit. Revised Reprint 2010. JNCC, Peterborough

- National Vegetation Community Users' Handbook (Rodwell *et al* 2006)⁵;
- British Plant Communities. Volume 2. Mires and Heaths (Rodwel *et al* 1993)⁶;
- British Plant Communities. Volume 3. Grasslands and montane communities (Rodwell, J. S. (ed.), 1992)⁷;
- Field flora of the British Isles (Stace, C. 1997)⁸; and,
- Land Use Planning System Scottish Environment Protection Agency (SEPA) Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (SEPA, 2014)⁹.

2 METHODOLOGY

2.1.1 This section provides detailed methodologies of desk studies and field studies undertaken to establish baseline habitat and vegetation information to inform the design and assessment of the Proposed Development.

2.2 Objectives

2.2.1 The objectives of the baseline studies were to:

- Establish the spatial distribution of habitats and vegetation communities which may be impacted by the Proposed Development;
- Identify the presence and distribution of habitat listed on Annex 1 of the EC Habitats Directive and United Kingdom Biodiversity Action Plan (UKBAP) Priority Habitats and potential Groundwater Dependent Terrestrial Ecosystems for (GWDTEs) for subsequent hydrological assessment; and,
- Identify the presence of protected and/or notable plant species.

2.3 Desk Study

2.3.1 A desk study was undertaken to ascertain existing habitat and vegetation records. Key sources are summarised in **Table 2.1**.

Table 2.1: Desk study sources.

Source	Information Obtained	Search Area
South West Scotland Environmental	Existing records of protected and	Within 5km of the Site.

⁴ SNH (2017) Commissioned Report 766 - Manual of terrestrial EUNIS habitats in Scotland - correspondence tables.

⁵ Rodwell, J. S. (2006). National Vegetation Community Users' Handbook. JNCC, Peterborough

⁶ Rodwell, J. S. (ed.) (1993). British Plant Communities. Volume 2. Mires and Heaths. Cambridge University Press, Cambridge

⁷ Rodwell, J. S. (ed.) (1992). British Plant Communities. Volume 3. Grasslands and montane communities. Cambridge University Press, Cambridge

⁸ Stace, C. (1997). Field flora of the British Isles. Cambridge University Press, Cambridge

⁹ Scottish Environment Protection Agency (2014) Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems.

Source	Information Obtained	Search Area
Information Centre (SWSEIC)	notable habitats and plant species.	
Gass Wind Farm Environmental Statement (ES)	Existing records of protected and notable habitats and plan species.	Within the Site.

2.4 Field Surveys

Habitat Study Area

2.4.1 The Habitat Study Area has comprised all terrestrial habitats within the Site, defined as the red line planning application boundary shown in **Figure 7.2** and **7.3 (EIAR Volume 3a)**.

Phase 1 Habitat Survey

2.4.2 A Phase 1 habitat survey was undertaken on the 1st and 2nd of June 2019. A terrestrial mammal survey was undertaken in September 2020 (see Technical Appendix 7.2: Protected Species) where any notable changes in the habitats were noted.

2.4.3 The survey was undertaken in accordance with the UK industry standard JNCC Phase 1 Habitat Methodology (JNCC, 2010)³.

2.4.4 During the survey all habitats within the Site were surveyed and mapped according to industry standards and described using a series of 'target notes' (TNs).

NVC Survey

2.4.5 An NVC survey was undertaken between the 15th and 17th September 2019 following the guiding principles detailed within the '*National Vegetation Classification: User's Handbook*' (Rodwell, 2006)⁵.

2.4.6 The NVC Study Area comprised all noteworthy habitats within the Site, concentrating on those areas where plant communities were deemed likely to form Annex 1 habitats, UKBAP Priority Habitats and/or represent GWDTEs.

2.4.7 During survey, appropriately sized quadrats were distributed throughout homogenous stands of vegetation identified in order to provide a representative sample of the vegetation community present.

2.4.8 In each quadrat sample area, data was collected on the presence and abundance of vascular plant species using the Domin scale. These data were then analysed and classified to an NVC vegetation community, where possible, using the keys in Rodwell (various) British Plant Communities Volumes 1 and 3.

Field Survey Personnel

2.4.9 Field surveys were conducted by Ms. S. Turner, Mr A. Hulme and Mr M Wood; all competent botanists with considerable experience of undertaking Phase 1 Habitat and NVC surveys for proposed renewable energy developments, including across numerous comparable sites in Scotland.

2.4.10 NVC analysis was conducted by Ms S Turner, a competent botanist with experience of undertaking NVC surveys for similar upland and afforested sites across Scotland.

3 RESULTS

3.1 Desk Study

3.1.1 This section provides details of existing habitat information and existing records of protected and notable plant species identified within and in proximity to the Site from desk study sources listed in **Table 2.1**.

SWSEIC

3.1.2 Records of Scarlet-cup lichen *Cladonia coccifera s. lat.*, small mouthed thread moss *Bryum archangelicum* and whorled caraway *Carum verticillatum* were received from SWSEIC.

3.1.3 Records are presented on **Figure 7.4 (EIAR Volume 3a)**.

Gass Wind Farm ES

3.1.4 Baseline habitat and vegetation surveys to inform the previously consented Gass Wind Farm, located within the eastern extent of the Site, were completed in 2012 and 2014. Detailed survey methodologies, Study Areas and results are presented within Chapter 7: 'Ecology', Appendix 7A: 'Phase 1 Habitat and NVC Survey' and Figures 7.4: 'Phase 1 Habitat' and 7.5: 'NVC Results' of the Gass Wind Farm ES.

3.1.5 **Table 3.1** provides a summary of previously recorded baseline habitats within the Site together with corresponding NVC communities. It should be noted that the Study Area used during previous completed baseline habitat studies is restricted to the eastern extent of the Site.

3.1.6 No protected or notable species were recorded during the survey, but records were received of protected and notable species from the Botanical Society for the British Isles (BSBI). These records are summarised in **Table 3.2**.

Table 3.1: Existing habitat and NVC communities identified within the Site – Gass Wind Farm ES.

Reproduced from Table 3.4 of Appendix 7.1 of the Gass Wind Farm ES.

Phase 1 Habitat Type	JNCC Code	NVC Community
Woodland, broad-leaved, semi-natural	A1.1.1	N/A
Woodland, broad-leaved, plantation	A1.1.2	N/A
Woodland, coniferous, plantation	A1.2.2	N/A
Scattered trees, broad-leaved	A3.1	N/A
Recently felled woodland, coniferous	A4.2	N/A
Acid grassland, unimproved	B1.1	U4
Marshy grassland	B5	M23, M25, MG10
Bracken, scattered	C1.2	N/A
Acid, wet dwarf shrub heath	D2	M15
Acid, wet dwarf shrub heath / acid grassland mosaic	D6	Includes species poor and modified extent of above M15.
Blanket bog	E1.6.1	M17
Acid/neutral flush	E2.1	M6
Swamp	F1	S4

Phase 1 Habitat Type	JNCC Code	NVC Community
Standing water	G1	N/A
Running water, oligotrophic	G2.3	N/A
Ephemeral vegetation	J1.3	N/A
Woodland, broad-leaved, semi-natural	A1.1.1	N/A
Woodland, broad-leaved, plantation	A1.1.2	N/A
Woodland, coniferous, plantation	A1.2.2	N/A
Scattered trees, broad-leaved	A3.1	N/A
Recently felled woodland, coniferous	A4.2	N/A
Acid grassland, unimproved	B1.1	U4
Marshy grassland	B5	M23, M25, MG10

Table 3.2: BSBI Plant Species Records – Gass Wind Farm ES.

Reproduced from Table 3.2 of Appendix 7.1 of the Gass Wind Farm ES.

Latin Name	English Name	Nationally Rare	Nationally Scarce	WCA S8	UKBAP Priority Species	ICUN		
						Data Deficient	Vulnerable	Near Threatened
Vascular Plants								
<i>Anagallis minima</i>	Chaffweed							X
<i>Euphrasia confuse</i>	Little kneeling eyebright					X		
<i>Galeops specioso</i>	Large flower hemp nettle						X	
<i>Glebionis segetum</i>	Corn marigold						X	
<i>Hieracium dissimile</i>	Scandinavian hawkweed	X					X	
<i>Hyacinthoides non-scripta</i>	Bluebell			X				
<i>Meconopsis cambric</i>	Welsh poppy		X					
<i>Platanthera chlorantha</i>	Greater butterfly orchid							X
<i>Pseudochris albida</i>	Small white orchid				X			
<i>Radiola linoides</i>	Allseed							X
<i>Spergula arvensis</i>	Corn spurrey						X	
<i>Viola tricolour</i>	Wild pansy							X
Non-vascular Plants								
<i>Sphagnum austinii</i>	Austin's bog moss		X					

Latin Name	English Name	Nationally Rare	Nationally Scarce	WCA S8	UKBAP Priority Species	ICUN		
						Data Deficient	Vulnerable	Near Threatened
<i>Sphagnum pulchrum</i>	Golden bog-moss		X					
<i>Bryum archanglelanicum</i>	Archangel bog-moss	X			X			
<i>Bryum pallescens</i>	Tall-clustered bog-moss		X					

3.2 Field Survey

- 3.2.1 This section presents the results of baseline field surveys completed in 2019 and 2020, including an overview of habitat types present within the Study Area and their distribution. It should be read with reference to **Figures 7.2 and 7.3 (EIAR Volume 3a)**.
- 3.2.2 The Site is predominately comprised of commercial plantation forestry with a mosaic of grassland, wet heath and blanket bog habitats within open areas and along the Tarf Water.
- 3.2.3 Phase 1 habitat survey target notes (TNs) are detailed in **Annex 1** and NVC data tables are presented in **Annex 2**. Photographs of key habitats and target notes are presented in **Annex 3**.
- 3.2.4 Forestry comprises Sitka spruce *Picea sitchensis* plantation woodland (A1.2.2), of varying maturity and height (between 5m and 20m), with areas of clear-fell (A4.2) and recent replanting recorded within the eastern extent of the Site (north west of Low Airies). One area of recently planted clear-fell in the south east of the Site also contained areas of native broadleaved planting (A1.1.2), comprising alder *Alnus* sp., willow *Salix* sp. and birch *Betula* sp.
- 3.2.5 A small area of mixed plantation woodland was also recorded to the east of the Site, lining the Tarf Water, consisting of young *Larix* sp., pine *Pinus* sp., rowan *Sorbus aucuparia*, oak *Quercus* sp. and ash *Fraxinus excelsior* (approximately 5-15 years old). A further small area of broadleaved plantation woodland (A1.1.2) was also recorded to the southern boundary of the Site (TN12), predominantly consisting of down birch *Betula pubescens*.
- 3.2.6 Narrow strips of semi-natural broadleaved woodland (A1.1.1) line the Tarf Water and a tributary in the south east of the Site. Stands consist of mature trees and are open in nature supporting a grassy ground flora (TN9 and TN11). Tree species include sycamore *Acer pseudoplatanus*, beech *Fagus sylvatica*, alder, willow, oak, pine and larch.
- 3.2.7 A small number of mature ash trees are also present adjacent to a derelict stone cottage in the north east of the Site (TN1). Scattered mature sycamore and beech trees are present in fields in the south east of the Site, with occasional willow present along the main track running north-south through the western side of the Site.
- 3.2.8 Forest rides generally consist of narrow, linear tracts of marshy grassland (B5) or wet heath vegetation (D2), often in mosaics and with abundant purple moor grass *Molinia caerulea*, frequent rushes (including soft rush *Juncus effusus* and sharp-flowered rush *Juncus acutiflorus*) and a range of sphagnum species, and varying amounts of ling *Calluna vulgaris* and bilberry *Vaccinium myrtillus*. Wetter areas occasionally include hair's-tail cotton grass *Eriophorum vaginatum*, star sedge *Carex echinata* and cross-leaved heath *Erica tetralix*.

- 3.2.9 Some wetter areas around drainage ditches and small pools include species such as creeping forget-me-not *Omphalodes verna*, bog stitchwort *Stellaria alsine*, bog pondweed *Potamogeton polygonifolius* and *Sphagnum cuspidatum* (e.g. TN3).
- 3.2.10 In the more open well-drained area to the north east of the Site, with recently planted conifers, acid grassland type vegetation (B1) is present with soft rush, Yorkshire fog *Holcus lanatus*, sweet vernal grass *Anthoxanthum odoratum*, tufted hair grass *Deschampsia cespitosa*, common bent *Agrostis capillaris*, white clover *Trifolium repens*, tormentil *Potentilla erecta*, foxglove *Digitalis purpurea*., sheep's sorrel *Rumex acetosella* and heath bedstraw *Galium saxatile* (TN2).
- 3.2.11 One ride in the north west showed typical blanket bog vegetation on deeper peat (TN21). Bog forming sphagnums were abundant including *S. capillifolium* and *S. magellanicum* with deer grass, common heather, hare's tail and common cotton grasses *Eriophorum angustifolium*.
- 3.2.12 Several fields of semi-improved neutral pasture (B2.2) are present within the southeast of the Site, mainly with dominant Yorkshire fog and frequent creeping bent, perennial rye-grass *Lolium perenne*, common sorrel *Rumex acetosa*, white clover, creeping buttercup *Ranunculus repens* and chickweed *Stellaria media*, with occasional cuckoo-flower *Cardamine pratensis*.
- 3.2.13 A large cattle grazed field present centrally to the south of the Site (TN14), consists of a complex mosaic of acid grassland, wet heath and marshy grassland (D6) on uneven topography, with small rock exposures and occasional pockets of deeper peat. Abundant species include Yorkshire fog, wavy hair grass *Deschampsia flexuosa*, sweet vernal grass, soft rush, deer grass *Trichophorum cespitosum*, creeping bent, tormentil and *Sphagnum subnitens*. A diverse range of frequent species typical of such habitats are also present, including sphagnums *S. capillifolium* and *S. papillosum*.
- 3.2.14 Beyond forest rides, areas of marshy grassland (B5) are present along the narrow valley bottom of Tarf Water (TN4) with abundant soft rush and frequent sharp flowered rush, purple moor grass, Yorkshire fog, tufted hair grass, *Sphagnum fallax* and marsh bedstraw *Galium palustre*. In a low-lying area in the south east of the Site, between two prominent glacial hillocks (TN8), lie areas of relatively species-rich marshy grassland, with Yorkshire fog and soft rush abundant with frequent creeping buttercup, common sorrel and marsh thistle *Cirsium palustre*. In lowest lying areas, sphagnums (including *S. palustre*), bog myrtle and meadow sweet *Filipendula ulmaria* are present. Further south in the Site in well grazed pastures, less species rich areas of marshy grassland are dominated by soft rush.
- 3.2.15 A small area of deeper peat with characteristic blanket bog vegetation is present at the southern end of the mosaic field (TN13). Deer grass and hare's-tail cotton grass are abundant, frequent ling, cross-leaved heath, bog myrtle *Myrica gale*, and also soft rush in wetter areas.
- 3.2.16 Two small areas of wet acid heath are present alongside the Tarf Water (TN6), with frequent sphagnums, common heather, bilberry, hare's-tail cotton grass and bog myrtle. Adjacent to this within one of the pasture fields is an area of valley mire (TN7) on deeper peat, with dominant deergrass, and abundant hare's-tail cottongrass and sphagnums.
- 3.2.17 The main watercourse intersecting the Site comprises the Tarf Water, flowing northwest to southeast. This is predominantly a rocky fast flowing mountain stream (TN4, TN5, TN6, TN11), with a gravelly bed forming pools and riffles. The steep earth banks are gravelly in places and vegetated except where undercut. In the far north of the Site (TN20) the river is in contrast wide and slow, with peaty banks, meandering across a wide level area dominated by purple moor grass and soft rush.
- 3.2.18 The Site is also drained by a number of small streams and ditches, mainly flowing into Tarf Water. These are typically small with steep peat or earth banks and a few centimetres depth of flowing water, widening out in more peaty substrates (TN5, TN8, TN10, TN15, TN20).

3.2.19 Two ponds were recorded within the Site during the survey. P1 (see Annex 3 photo 22) is located in a clear fell area on the far eastern edge of the Site, set within a small quarry with a stony substrate. Blanketweed *Spirogyra* sp., starwort *Callitriche stagnalis* and pondweed *Potamogeton* sp. are present, however there is limited marginal and bank vegetation. P2 (See Annex 3, photo 23) is located just outside the eastern boundary of the Site adjacent to the access track. The pond has gently sloping banks vegetated with grasses, bracken and soft rush, and there is extensive emergent vegetation. A third pond was identified adjacent to the forestry access track (P3) which was very shaded by overhanging forestry.

3.2.20 A former pond was recorded within the forestry in the northwest area of the Site (TN19). This is now completely vegetated and forms a damp depression, with sedges, sphagnum, rush, purple moor grass, bog myrtle and cross-leaved heath.

3.2.21 During a protected mammal walkover in September 2020 (**Technical Appendix 7.2: Protected Species**), some tracks in the west of the Site had recently undergone some improvement works by raising the profile of the tracks. This had created seasonal small pools either side of the track.

Wet Heath

M15 *Scirpus cespitosus* – *Erica tetralix* wet heath

3.2.22 Wet heath occupies a large field located centrally at the southern end of the Site, where it forms a mosaic with lesser amounts of acid grassland.

3.2.23 The best NVC community match for majority of wet heath within the Site is M15 *Scirpus cespitosus* – *Erica tetralix* wet heath, a ubiquitous wet heath community type across much of Scotland. It is a community type with few constants and which is variable in its floristic composition and dominant species. *Calluna vulgaris*, *Erica tetralix*, *Trichophorum cespitosum* (formerly *Scirpus cespitosus*) and *Molinia caerulea* are generally of high frequency, interspersed with *Potentilla erecta*, *Narthecium ossifragum* and *Eriophorum angustifolium* (Averis, 2004). The habitat did not fall clearly into a particular sub-community.

3.2.24 The community is characteristic of thinner or better drained areas of ombrogenous peat, with drainage extending its coverage to formerly deeper and wetter peats, in which blanket mire communities are likely to have been previously present (e.g. Rodwell *et al.*, 1991 and Elkington *et al.*, 2001). On this site it forms the dominant habitat within a mosaic on undulating ground, with variable peat depths, mostly under 0.5m but with deeper pockets. Other elements of the mosaic are more limited in area and include M17b blanket mire, U4 acid grassland and M23b rush pasture. The habitat has been modified by drainage and grazing with cattle.

3.2.25 A small pocket of wet heath was mapped at target note TN6, on the west bank of Tarf Water, in the 2019 Phase 1 survey, this was not included in the NVC analysis in 2019. The 2014 NVC (Sgurr Energy, 2014) suggested the community to be more in line with the M25a *Molinia Caerulea* – *Potentilla erecta* mire, *Erica tetralix* subcommunity, with its more frequent *Calluna vulgaris* than other M25 mire sub communities.

Calcifugeous Grasslands

U4 *Festuca ovina* – *Agrostis capillaris* - *Galium saxatile* grassland

3.2.26 Areas of acid grassland occur in pockets within the south of the Site, forming a mosaic with the wet heath described above, and in mosaics with marshy grasslands along the Tarf Water. The best NVC community match for acid grasslands within the Site is U4 *Festuca ovina* – *Agrostis capillaris* - *Galium saxatile* grassland.

3.2.27 This community is characteristic of well-drained rough grazing pastures, and typically forms mosaics with heaths and mires, often on areas of higher, better drained local topography. The community within the Site generally supports a grass rich sward with constancies of *Festuca rubra*, *Nardus stricta* and *Molinia caerulea* and frequent *Deschampsia flexuosa*, *Festuca ovina* and *Nardus Stricta*. *Potentilla erecta* is also a constant associate, with a characteristic well developed moss layer of *Pleurozium schreberi*. The constant presence of *Molinia caerulea* and lack of *Anthoxanthum odoratum* suggest this is not a very typical U4 community and it may be in places grading into adjacent wet heath or marshy grassland habitats with which it forms a detailed mosaic.

Mesotrophic Grasslands

MG6 *Lolium perenne* – *Cynosurus cristatus* grassland

Sub-communities: MG6a – typical subcommunity

3.2.28 MG6a represents the better drained pasture grasslands within the southern part of the Site. This is a major permanent pasture grassland community found on moist but free draining soils.

3.2.29 On Site the grasslands are dominated by *Holcus lanatus*, *Cynosurus cristatus* and *Lolium perenne*. *Deschampsia flexuosa* is also a constant which is unusual for this community, perhaps reflecting other nearby habitats including acid grassland and wet heath. Fairly typical constant herb species are present including *Trifolium repens*, *Ranunculus repens* and *Rumex acetosa*.

MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland

3.2.30 MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland community is found in a narrow band along the banks of the Tarf Water. This community is characteristic of permanently moist and/or periodically inundated soils, often occurring in forest rides and wetland margins.

3.2.31 The community examples within the Site typically support a coarse and tussocky sward dominated by *Deschampsia cespitosa*, with other associates limited but including *Rumex acetosa* and *Hypnum jutlandicum*.

MG10 *Holcus lanatus* – *Juncus effusus* rush pasture

3.2.32 MG10 occurs in a mosaic with a *Molinia caerulea*-*Potentilla erecta* mire community (M25a), occupying an area to the west of the Tarf Water, north of Black Hill.

3.2.33 The community requires consistently high levels of soil moisture (Rodwell *et al.*, 1992) and can form significant components of rush-dominated mire mosaics. Typically constant species include *Juncus effusus*, *Holcus lanatus* and *Agrostis stolonifera*.

Blanket Mires and Flushes

M4 *Carex rostrata* - *Sphagnum fallax* mire

3.2.34 A small area of M4 *Carex rostrata* - *Sphagnum fallax* mire is found along in a meander bend of the Tarf Water. The community is characteristic of pools and seepage areas on peat soils and soligenous mires, typically in the wettest parts of water-tracks.

3.2.35 The community example within the Site is characterised by a cover of sedges including *Carex lasiocarpa* and *Carex rostrata* over a carpet of *Sphagnum fallax*, together with lesser amounts of *Juncus acutiflorus*, *Galium palustre* and *Rumex acetosa*.

M6 *Carex echinata* – *Sphagnum fallax/denticulatum* mire

- 3.2.36 M6 mire comprises a species-poor fen community, generally featuring small sedges or rushes over a carpet of *Sphagna*. It typically occurs in small stands among heath, other mire communities, grasslands and wetland communities.
- 3.2.37 Within the Site, examples of M6 are scattered along the course of the Tarf Water, mostly present as localised flushes but forming notable components of larger mosaic within the M23a community along its course through the centre of the Site. Elsewhere in the fields in the south of the site localised M6 flushes occur within the M23b community.
- 3.2.38 *Juncus acutiflorus* and *Juncus effusus* form key components of this community on site along with *Sphagnum fallax*, and increased *Molinia caerulea* in places. *Carex echinata* is often present along with and lesser amounts of other Sphagnums and sedges.

M17 *Trichophorum cespitosum* – *Eriophorum vaginatum* blanket mire

Sub-communities: M17b *Cladonia* spp.

- 3.2.39 Two areas of the M17 mire are found within the Site, including one area of the M17b *Scirpus cespitosus* - *Eriophorum vaginatum* blanket mire, *Cladonia* subcommunity. This community is more typical of lower altitudes, in areas of high humidity and milder winters and is characterised by dominant mixtures of grasses, ericoids and *Sphagnum* spp. Abundant *Trichophorum cespitosus*, constant *Molinia caerulea* and the lack of *Sphagnum magellanicum* separate this community from the similar M18 blanket mire.
- 3.2.40 The M17b sub community forms a small but continuous area at the south of the Site, and a component of the adjacent mosaic dominated by M15 wet heath. In these areas *sphagnum* cover does not extend throughout the habitat and consists predominantly of *S. capillifolium* and limited *S. papillosum*. These factors along with the presence of *Cladonia* spp. confirm the M17b sub community. A small area of M17 is present further north, just south east of Mid Hill, this was identified in the 2014 NVC (Sgurr Energy, 2014).

M19 *Calluna vulgaris*-*Eriophorum vaginatum* blanket mire

Sub-communities recorded: M19a

- 3.2.41 M19 blanket mire, specifically the M19a *Erica tetralix* sub-community is found in a single linear tract along a forest ride in the north west of the Site, probably representing the remnant of a much wider area of blanket mire present on deep peat, prior to the forestry planting. The community is typically confined to areas of deeper peats, and dominated by mixtures of *Eriophorum vaginatum* and ericoids. Sphagnums can be constant and dominant over wetter ground, but not as rich or carpeting as the M17 mire (Rodwell *et al.*, 1991).
- 3.2.42 The sub-community example within the Site is characterised by the dominance of *Calluna vulgaris*, with constants of *Eriophorum vaginatum*, *Eriophorum angustifolium*, *Erica tetralix* and *Sphagnum capillifolium*. Other associates recorded include *Molinia caerulea*, *Vaccinium myrtillus*, *Trichophorum cespitosum*, *Deschampsia flexuosa*, *Narthecium ossifragum* and *Carex echinata* with mosses *Hylocomium splendens* and *Pleurozium schreberi*, with *Sphagnum magellanicum*, *Sphagnum cuspidatum*, *Sphagnum papillosum* also present but infrequent.

M23 *Juncus effusus/acutiflorus* – *Galium palustre* rush pasture

Sub-communities recorded: M23a *Juncus acutifloris* and M23b *Juncus effusus*

- 3.2.43 The M23 rush pasture is a community typically around the margins of soligenous flushes, zones around topogenous mires and wet heaths and in unimproved (or reverted) pastures. The community can therefore be potentially groundwater dependent, but can also be associated with surface water flows and collections. Community stands are typically characterised by the abundance of rushes *Juncus effusus* and/or *J. acutiflorus*, with a diverse range of other associates.
- 3.2.44 Large areas of the M23b *Juncus effusus* subcommunity are present within the south east corner of the Site in low lying, poorly drained areas within a series of pasture fields. The subcommunity is also appears within large mosaics with M25a *Molinia caerulea* – *Potentilla erecta* mire and U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland adjacent to the Tarf Water.
- 3.2.45 The M23b sub community within the Site is generally quite species poor throughout, dominated by mixtures of *Juncus effusus* and *Juncus acutiflorus* with a low diversity of grasses including *Holcus lanatus*, *Molinia caerulea*, *Festuca rubra*, *Festuca ovina* and *Agrostis stolonifera*. The herb layer, where present, is usually dominated by *Rumex acetosa*, with *Ranunculus acris*, *Epilobium palustre* and *Galium palustre* amongst other species noted. However a more diverse and species-rich area was noted around target note TN8.
- 3.2.46 Further north along the Tarf water, sub community M23a, with a greater prevalence of *Juncus acutiflorus*, forms a mosaic with M6 mire communities, which have similar vascular plant composition but greater presence of sphagnums, especially *S. fallax*, U4 acid grassland on areas of higher topography and occasional small stands of common reed *Phragmites australis* in wetter areas (S4).

M25 *Molinia caerulea* – *Potentilla erecta* mire

Sub-communities recorded: M25a *Erica tetralix*

- 3.2.47 This community dominated by *Molinia caerulea*, and this certainly is the case on Site, where it is fairly species poor with occasional *Juncus effusus*, *Erica tetralix*, scattered Sphagnums but a greater presence of other bryophytes. On site it is present along the Tarf water valley bottom and around the base of Black Hill, forming mosaics with MG10 Marshy grassland and M23 rush pasture.

Swamp and Tall-herb Fens

S4 *Phragmites australis* swamp and reed beds

- 3.2.48 On Site this habitat is represented by small, localised stands of dominant *Phragmites australis*, forming a minor component of the M23a / M25 / U4 / M6 / S4 mosaic community along the Tarf Water.

Forest Rides

- 3.2.49 The phase 1 survey identified the forest rides as generally consisting of narrow, linear tracts of marshy grassland or wet heath vegetation. It is considered that these habitats are less likely to form clear, meaningful NVC communities, due to the disturbance and drainage relating to forestry operations, and the narrowness reducing the likelihood of typical vegetation stands developing. Consequently only a small number of rides were subject to NVC.
- 3.2.50 One ride in the north west of the Site (Target note TN21) did appear to have blanket bog vegetation on deep peat, this was subject to NVC survey and appeared to represent an M19a community, as described above.
- 3.2.51 Five quadrats were undertaken across different rides in the north west of the site. The results were not conclusive but the best fit community is considered to be M15 *Scirpus cespitosus* – *Erica tetralix* wet heath. *Molinia caerulea* was a constant dominant, with *Sphagnum capillifolium* forming high

cover in some of the quadrats but absent in others, and *Calluna vulgaris* and *Vaccinium myrtillus* also with a patchy distributions.

3.2.52 The variability between quadrats and the consistent *Molinia* suggest these reflect habitats present prior to forestry including potentially wet heath, acid grassland, marshy grassland and blanket bog where peat is deeper, now highly modified by disturbance, drainage and the presence of forest trees.

3.3 NVC Summary

3.3.1 Vegetation communities present within the Site are summarised in **Table 3.3**, along with corresponding Annex Habitat types and potential GWDTE status in accordance with SEPA Guidance Note 31 (2014) and SNH NVC / EUNIS / Annex 1 correspondence tables (2017).

Table 3.3: Summary of vegetation communities.

NVC community	Principal Corresponding Habitats Directive Annex 1 Habitat Type(s)	Potential Groundwater Dependency 1 = High 2 = Moderate 3 = Low
M15 <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath	Northern Atlantic wet heaths with <i>Erica tetralix</i>	2
U4 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland	None directly applies	3
MG9 <i>Holcus lanatus</i> – <i>Deschampsia cespitosa</i> grassland	None directly applies	2
MG10 <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush pasture	None directly applies	2
M4 <i>Carex rostrata</i> - <i>Sphagnum fallax</i> mire	Transition mires and quaking bogs	1
M6 <i>Carex echinata</i> – <i>Sphagnum fallax/denticulatum</i> mire	None directly applies.	1
M17 <i>Trichophorum cespitosum</i> – <i>Eriophorum vaginatum</i> blanket mire	Active raised bog and blanket bog.	3
M19 <i>Calluna vulgaris</i> - <i>Eriophorum vaginatum</i> blanket mire	Active raised bog and blanket bog.	3
M23 <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture	None directly applies.	1
M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire	Only if degraded bogs capable of natural regeneration and /or deep peat.	2
S4 <i>Phragmites australis</i> swamp and reed beds	None directly applies	1-2

ANNEX 1: PHASE 1 HABITAT SURVEY TARGET NOTES

Target Note	Description	Photograph Ref. (Annex 3)
TN1	Ruined stone cottage with no roof, group of approximately 10 mature ash <i>Fraxinus excelsior</i> nearby. The area around has been clear felled and replanted.	1
TN2	Area recently clear felled and replanted with Sitka spruce <i>Picea sitchensis</i> saplings. Some small areas of broad leaf planting, including alder <i>Alnus glutinosa</i> , willow <i>Salix sp.</i> and birch <i>Betula sp.</i> , protected by tree guard tubes. Between trees and along the access track are acid grassland areas with key species soft rush <i>Juncus effusus</i> , Yorkshire fog <i>Holcus lanatus</i> , sweet vernal grass <i>Anthoxanthum odoratum</i> , tufted hair grass <i>Deschampsia cespitosa</i> , common bent <i>Agrostis stolonifera</i> , white clover <i>Trifolium repens</i> , tormentil <i>Potentilla erecta</i> , foxglove <i>Digitalis purpurea</i> , sheep's sorrel <i>Rumex acetosella</i> and heath bedstraw <i>Galium saxatile</i> . Small patches of bracken <i>Pteridium aquilinum</i> are also present.	2
TN3	Rides between recently clear felled and replanted area and mature forest. Generally similar vegetation to TN2 in drier areas. Some wetter areas around drainage ditches include dominant purple moor grass <i>Molinia caerulea</i> , along with soft rush, sphagnum (<i>S. capillifolium</i> , <i>subnitens</i> , <i>palustre</i> , <i>fallax</i> and <i>fimbriatum</i>), hare's tail cotton grass <i>Eriophorum vaginatum</i> , sharp flowered rush <i>Juncus acutiflorus</i> , star sedge <i>Carex Echinata</i> and cross leaved heath <i>Erica tetralix</i> . Ditches and pools including creeping forget-me-not <i>Myotis secunda</i> , bog stitchwort <i>Stellaria alsine</i> and bog pondweed <i>Potamogeton polygonifolius</i> . Other small pools with <i>Sphagnum cuspidatum</i> .	3
TN4	Flat valley bottom adjacent to Tarf Water, with damp ground. Marshy grassland with abundant soft rush and frequent sharp flowered rush, purple moor grass, Yorkshire fog, tufted hair grass, <i>sphagnum fallax</i> and marsh bedstraw <i>Galium palustre</i> . Occasional small well-drained hillocks present with acid grassland and patches of bracken.	4
TN5	Tarf Water follows a naturally meandering course, 3-4m wide and 0.5-1m deep, with occasional rocks, boulders and gravel. Banks are steep to vertical, mostly densely vegetated with bracken, Yorkshire fog, tufted hair grass, soft rush and foxglove but with some bare earth where steepest. A small ditch with flowing water 10-20 cm deep enters the river here, with stone bed and steep banks vegetated with grass, bracken and bog myrtle <i>Myrica gale</i> . Adjacent to the river at this location is an open grassy area with similar vegetation to the river bank, but also with wavy hair grass <i>Avenella flexuosa</i> , tormentil, heath bedstraw and occasional willow scrub.	5,6
TN6	Tarf Water, rocky, bouldery fast flowing mountain stream as in TN5. On the west bank vegetation corresponds to wet heath with sphagnum, common heather <i>Calluna vulgaris</i> , bilberry <i>Vaccinium myrtillus</i> , hare's-tail cotton grass and bog myrtle, with scattered young Sitka spruce and willow scrub. On the east bank (not accessed) areas of rush suggest damper ground, and there	7

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Target Note	Description	Photograph Ref. (Annex 3)
	has been recent planting of broad-leaved trees with tree-guard tubes.	
TN7	Valley mire type vegetation on pocket of deeper peat, at the base of drumlin landform. Deer grass <i>Trichophorum cespitosum</i> dominant, with abundant hare's-tail cotton grass and sphagnum (<i>S. capillifolium</i> , <i>S. subnitens</i>). Occasional wavy hair grass and purple moor grass. Grading into marshy grassland vegetation uphill towards the semi-improved grassland.	8
TN8	Species-rich marshy grassland on poorly drained area at base of drumlin landforms. Yorkshire fog and soft rush abundant. Frequent creeping buttercup, common sorrel, marsh thistle. Occasional jointed and compact rush also present. In lowest lying areas, sphagnum (<i>S. palustre</i>), bog myrtle and meadow sweet <i>Filipendula ulmaria</i> present. Small flowing stream at southern end, water only a few cm deep with a gravel substrate, sides vertical with dense grass vegetation.	9
TN9	Open semi-natural broad-leaved woodland along continuation of stream in TN7 (flowing south east to join Tarf Water), within the marshy grassland area. Trees with a mix of species and ages, including alder, beech <i>Fagus sylvatica</i> , pine <i>Pinus sp.</i> , oak <i>Quercus sp.</i> and willow.	10
TN10	Pasture with contrasting areas of well-grazed (sheep and cattle) semi-improved neutral grassland in elevated, well drained areas, and lower lying areas of marshy grassland, drained by small artificially excavated ditches. Substrate mostly glacial sands and gravels, although occasional small pockets of peat (1m deep) noted. Marshy grassland species-poor in comparison to TN8, dominant soft rush, with occasional jointed rush <i>Juncus articulatus</i> and grasses.	11
TN11	Narrow strip of mature, open, semi-natural, predominantly broadleaved woodland along the banks of Tarf Water, with grassy ground flora. Ash is abundant. Also present are pine, larch <i>Larix sp.</i> , sycamore <i>Acer pseudoplatanus</i> , beech. Here the river is wide and shallow (less than 0.5m), with a rocky substrate forming pools and riffles.	12
TN12	Small plantation woodland consisting of dominant downy birch with occasional willow, ash and rowan <i>Sorbus aucuparia</i> .	No photo
TN13	Area of blanket bog on pocket of deeper peat at southern end of Site, within area of mosaic habitats. Evidence of past peat cutting but depth still over 0.5m deep. Deer grass and hare's-tail cotton grass abundant, frequent common heather, cross-leaved heath, bog myrtle, and also soft rush in wetter areas. Bog asphodel <i>Narthecium ossifragum</i> is scattered through out and occasional common cotton grass <i>Eriophorum angustifolium</i> is present.	13
TN14	Complex mosaic of acid grassland, wet heath and marshy grassland vegetation on uneven topography, with small rock exposures in places and occasional small pockets of deeper peat (only a few metres across). Signs of occasional grazing by cattle. Abundant species include, Yorkshire fog, wavy hair grass, sweet vernal grass, soft rush, deer grass, creeping bent, tormentil and <i>sphagnum subnitens</i> . Frequent species include glaucous sedge <i>Carex flacca</i> , carnation sedge <i>Carex panicea</i> , hare's-tail cotton grass, sharp-flowered rush, jointed rush, and fescues <i>Festuca spp.</i> Locally frequent species include common	14

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Target Note	Description	Photograph Ref. (Annex 3)
	heather, cross-leaved heath, bog myrtle, <i>Sphagnum papillosum</i> , and star sedge. Also noted are <i>Sphagnum capillifolium</i> , heath bedstraw, lesser spearwort <i>Ranunculus flammula</i> , common spotted orchid <i>Dactylorhiza fuchsii</i> , butterwort <i>Pinguicula vulgaris</i> , bog asphodel and lousewort <i>Pedicularis sylvatica</i> .	
TN15	Small watercourse at edge of track turning circle, in area of mature forestry. Water a few cm deep, sluggish flow, banks variable from gently sloping to vertical. In-channel vegetation includes flag iris <i>Iris pseudacorus</i> , bog pondweed, water horsetail <i>Equisetum aquatile</i> , with bankside flag iris, grasses, rushes, <i>sphagnum palustre</i> and willow scrub. Slow flow may be due to creation of gravel turning circle.	15
TN16	Steeply rising hillside outside site area to the west, as viewed from forestry track. Appears to be wet heath type vegetation, possibly forming a mosaic with acid grassland in dryer areas. Abundant deer grass, frequent soft rush, wavy hair grass, bents, bog myrtle, along with common heather patches increasing in size and frequency uphill to the west.	16
TN17	Tarf Water, similar here to TN3, with substrate of gravel and larger rocks. Banks generally glacial deposits but some vertical or collapsed peaty stretches. The valley is flat and open with similar marshy grassland to TN3, with dominant Yorkshire fog and abundant soft rush and tufted hair grass.	17
TN18	Ride in mature forestry with <i>Sphagnum capillifolium</i> hummocks.	18
TN19	Damp depression surrounded by mature Sitka spruce forestry. Likely to represent a former pond, but now completely vegetated. Dominated by sedges and sphagnum in wettest areas, drier areas with rushes, bog myrtle, sphagnums, purple moor grass, sedges, tormentil, heath bedstraw and cross-leaved heath.	No photo
TN20	Tributary stream flows through a ride in mature forestry to join Tarf Water. Tributary is 1-2m wide, with sluggish flow between vertical bare peat banks. Surrounding vegetation is dominated by purple moor grass and sphagnums. In-channel there is occasional bog pondweed, water lilies <i>Nuphar lutea</i> and water horsetail. The stream joins Tarf Water just outside the forest. Here, in contrast to downstream areas, the Tarf Water is wide (5-10m) and slow, meandering across a wide level area dominated by purple moor grass and rush. The waters are opaque and peaty with rocks or gravel evident. Very occasional emergent vegetation adjacent to the banks includes water lily and water horsetail.	19,20
TN21	Ride within mature Sitka spruce forestry. Appears to be on blanket bog with deep peat. Bog forming <i>sphagnums</i> <i>S. capillifolium</i> and <i>S. magellanicum</i> are abundant with well formed hummocks. Abundant deer grass, common heather, and frequent hare's-tail and common cotton grasses. Round leaf sundew <i>Drosera rotundifolia</i> locally frequent in more open / bare patches.	21

ANNEX 2: NVC SURVEY DATA

Tables B1-1 and B1-2 below outline DOMIN scales and scores for NVC survey results.

Table B1-1: Dominance (DOMIN) scale.

Code	Approximate percentage cover in quadrat
10	>90%
9	75 – 90%
8	51 – 75%
7	34 – 50%
6	26 – 33%
5	11 – 25%
4	5 – 10%
3	<5%, many individuals
2	<5%, a few individuals
1	<5%, one or two individuals

Table B1-2: NVC Data.

Species	Phase 1 habitat					CONSTANCY
	Wet heath	Cover				
Quadrat	1	2	3	4	5	
OS Grid Coordinates	NX 24959 64787	NX 24891 65148	NX 24767 65131	NX 24759 65150	NX 24694 65128	
<i>Juncus effusus</i>	4		1			II
<i>Erica tetralix</i>	4	5	4	4	5	V
<i>Festuca ovina</i>	4	2	3	2	3	V
<i>Molinia caerulea</i>	5	5	4	4	4	V
<i>Trichophorum cespitosum</i>	5	5	5	6	6	V
<i>Potentilla erecta</i>	4	2	1	1	3	V
<i>Hylocomium splendens</i>	5				2	II
<i>Carex panicea</i>	4	4				II
<i>Calluna vulgaris</i>	3	5	7	7	7	V
<i>Sphagnum capillifolium</i>	6	4	6	5	2	V
<i>Juncus articulatus</i>		1				I
<i>Pleurozium schreberi</i>		6	7	8	7	IV
<i>Eriophorum angustifolium</i>		3	1	1	1	IV
<i>Holcus lanatus</i>			2		2	II
<i>Vaccinium myrtillus</i>			4			I
<i>Narthecium ossifragum</i>			1	3	1	III
<i>Cladonia sp.</i>					1	I
<i>Vaccinium oxycoccus</i>					3	I
<i>Hypnum jutlandicum</i>					4	I

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Phase 1 habitat	Acid grassland					Constancy
	1	2	3	4	5	
Quadrat	1	2	3	4	5	
OS Grid Coordinates	NX 24859 64881	NX 24842 65161	NX 24780 65131	NX 24730 65125	NX 24690 65196	
Species			Cover			Constancy
<i>Carex echinata</i>	5	4	3	3	1	V
<i>Molinia caerulea</i>	4	2	5	3	3	V
<i>Potentilla erecta</i>	5	2	3	3	1	V
<i>Festuca rubra</i>	6	6	7	6	5	V
<i>Nardus stricta</i>	4	5		6	3	IV
<i>Festuca ovina</i>	3		1	4	4	IV
<i>Juncus articulatus</i>	3		2			II
<i>Holcus lanatus</i>	3		1			II
<i>Juncus squarrosus</i>	3		2	4	4	IV
<i>Deschampsia flexuosa</i>	3	2		4	4	IV
<i>Hylocomium splendens</i>	7		4		6	III
<i>Pleurozium schreberi</i>	6	8	7	8	8	V
<i>Glaucous sedge</i>		3		3	4	III
<i>Juncus acutiflorus</i>		3	3	3	3	IV
<i>Agrostis canina</i>		2				I
<i>Pedicularis sylvatica</i>			1	2	3	III
<i>Juncus effusus</i>					4	I

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Phase 1 habitat	Forest ride: blanket bog					
	1	2	3	4	5	
Quadrat						
OS Grid Coordinates	NX 22854 68753	NX 22775 68679	NX 22640 68558	NX 22712 68620	NX 22819 68716	
Species	Cover					CONSTANCY
<i>Calluna vulgaris</i>	7	8	4	5	4	
<i>Narthecium ossifragum</i>	4	5	1	5	1	
<i>Erica tetralix</i>	4	4	5	4	4	
<i>Molinia caerulea</i>	6			3	4	
<i>Eriophorum vaginatum</i>	5	4	5	7	7	
<i>Eriophorum angustifolium</i>	4	3	5	3	5	
<i>Sphagnum capillifolium</i>	6	7	9	4	5	
<i>Vaccinium myrtillus</i>	3	1	5	1	3	
<i>Polytrichum commune</i>	3					
<i>Dicranum scoparium</i>	4					
<i>Trichophorum cespitosum</i>		7		5		
<i>Hylacomium splendens</i>		3				
<i>Deschampsia flexuosa</i>			3			
<i>Pleurozium schreberi</i>			4	6		
<i>Carex echinata</i>					3	
<i>Sphagnum magellanicum</i>					5	
<i>Water</i>					6	
<i>Sphagnum cuspidatum</i>					5	
<i>Sphagnum papillosum</i>					5	

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Phase 1 habitat	Blanket Bog					
	1	2	3	4	5	
Quadrat						
OS Grid Coordinates	NX 24956 64821	NX 24955 64836	NX 24918 64819	NX 24901 64807	NX 24970 64891	
Species	Cover					CONSTANCY
<i>Eriophorum angustifolium</i>	5	4	4	8	9	
<i>Eriophorum vaginatum</i>	4	3	4	3	1	
<i>Trichophorum cespitosum</i>	7	8	7	4	4	
<i>Erica tetralix</i>	4	5	5	5	3	
<i>Molinia caerulea</i>	3	3	4	4	2	
<i>Narthecium ossifragum</i>	2	3	2	4	4	
<i>Polytrichum commune</i>	2					
<i>Sphagnum capillifolium</i>	6		4	7	6	
<i>Pleurozium schreberi</i>	6			4	4	
<i>Water</i>	4		4			
<i>Sphagnum papillosum</i>		6	4	3		
<i>Sphagnum cuspidatum</i>		5	6	3		
<i>Cladonia sp.</i>		5		4		
<i>Sphagnum fallax</i>		4			3	
<i>Calluna vulgaris</i>				5	5	

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Phase 1 habitat	Marshy grassland					CONSTANCY
	1	2	3	4	5	
Quadrat						
OS Grid Coordinates	NX 24668 67200	NX 24673 67212	NX 24663 67217	NX 24661 67208	NX 24662 67196	
Species	Cover					CONSTANCY
	4	3	4	4	3	
<i>Juncus acutiflorus</i>	4	3	4	4	3	V
<i>Potentilla palustris</i>	4			2	1	III
<i>Galium palustre</i>	4	2	3	3		IV
<i>Rumex acetosa</i>	5	5	4	1		IV
<i>Carex lasiocarpa</i>	5	6	5	4	7	V
<i>Sphagnum fallax</i>	9	8	9	9	8	V
<i>Carex rostrata</i>	4	5	3		4	IV
<i>Juncus bulbosus</i>	4	2	1			III
<i>Epilobium palustre</i>		2	1	1		III
<i>Ranunculus repens</i>		3				I
<i>Deschampsia cespitosa</i>		3		4		II
<i>Juncus effusus</i>			4			I
<i>Molinia caerulea</i>				4		I
<i>Viola palustris</i>		2		3	3	III
<i>Phragmites australis</i>				1	1	II
<i>Myrica gale</i>					6	I
<i>Festuca ovina</i>				3	3	II

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Phase 1 Habitat	Semi improved neutral grassland					CONSTANCY
	1	2	3	4	5	
Quadrat						
OS Grid Coordinates	NX 25286 66073	NX 25121 65803	none	NX 25122 65069	NX 25163 64766	
Species	Cover					CONSTANCY
	4	5	4	3	4	
<i>Juncus acutiflorus</i>	4					I
<i>Trifolium repens</i>	3	5	4	4	3	V
<i>Ranunculus repens</i>	4	4	3	2	5	V
<i>Ranunculus acris</i>	3	3	1	4		IV
<i>Cynosurus cristatus</i>	5	4	5	6		IV
<i>Rumex acetosa</i>	4	3	4	4	3	V
<i>Cardamine hirsuta</i>	1					I
<i>Poa trivialis</i>	6	7	3			III
<i>Calliergonella cuspidata</i>	6	4	2	3	5	V
<i>Bellis perennis</i>	3	1	1	1	1	V
<i>Cerastium fontanum</i>	1	4	1	4		III
<i>Holcus lanatus</i>	5	4		3	2	IV
<i>Agrostis capillaris</i>		5				I
<i>Lolium perenne</i>		3	8	4	7	IV
<i>Deschampsia flexuosa</i>	4	4	3	5	4	V
<i>Cirsium repens</i>			2	1		II
<i>Achillea millefolium</i>			3	2		II
<i>Plantago lanceolata</i>				3	1	II
<i>Taraxacum sp.</i>				1		I
<i>Poa annua</i>					3	I
<i>Cirsium vulgare</i>					4	I

Artfield Forest Wind Farm
Technical Appendix 7.1: Habitats and Vegetation

ANNEX 3: PHOTOGRAPHS

Photo	Description
	<p>Photo 1 Target Note 1</p>
	<p>Photo 2 Target note 2</p>
	<p>Photo 3 Target note 3</p>

Photo	Description
	<p>Photo 4 Target note 4</p>
	<p>Photo 5 Target note 5</p>
	<p>Photo 6 Target note 5</p>




Photo	Description
	<p>Photo 7 Target note 6</p>
	<p>Photo 8 Target note 7</p>
	<p>Photo 9 Target note 8</p>

Photo	Description
	<p>Photo 10 Target note 9</p>
	<p>Photo 11 Target note 10</p>
	<p>Photo 12 Target note 11</p>

Photo	Description
	<p>Photo 13 Target note 13</p>
	<p>Photo 14 Target note 14</p>
	<p>Photo 15 Target note 15</p>




Photo	Description
	<p>Photo 16 Target Note 16</p>
	<p>Photo 17 Target note 17</p>
	<p>Photo 18 Target Note 18</p>




Photo	Description
	<p>Photo 19 Target Note 20</p>
	<p>Photo 20 Target note 20</p>
	<p>Photo 21 Target note 21</p>




Photo	Description
	<p>Photo 22 Pond 1</p>
	<p>Photo 23 Pond 2</p>
<p>Selection of NVC habitats</p>	
	<p>Photo 24 – M15</p>

Photo	Description
	<p>Photo 25 – U4</p>
	<p>Photo 26 – M19a</p>
	<p>Photo 27 – M17b</p>

Photo	Description
	<p>Photo 28 – MG6</p>
	<p>Photo 29 – MG9</p>
	<p>Photo 30 – M23</p>