



MacArthur
Green

Blair Hill Wind Farm

National Vegetation Classification & Habitats Survey Report

Technical Appendix 8.1

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1 INTRODUCTION

MacArthur Green was commissioned by the Applicant to carry out a National Vegetation Classification (NVC) and habitats survey, with subsequent peatland condition assessment (PCA), at the proposed Blair Hill Wind Farm, near Newton Stewart, Dumfries and Galloway, (hereafter referred to as the ‘Proposed Development’).

The aim of the NVC survey is to identify and map the vegetation communities present within the Site in order to identify those areas of greatest ecological interest (i.e., Annex I habitats¹; potential Groundwater Dependent Terrestrial Ecosystems (GWDTE)²; and Scottish Biodiversity List (SBL) priority habitats³). The PCA survey aims to provide additional information and context with regards peatlands, and to identify and map the condition of peatland habitats within the Site. This information is used to inform the wind farm design process and the ecological assessment for the Blair Hill Environmental Impact Assessment Report (EIAR).

This report details the findings of the NVC and PCA surveys together with an evaluation of those communities described.

2 THE SITE AND SURVEY AREA

2.1 Overview

The Proposed Development is located approximately 2.7 km north of Newton Stewart. The Site comprises an area of approximately 681.5 hectares (ha). The Proposed Development is set within grazed open moorland and areas of commercial forestry. The elevation varies from 100 m Above Ordnance Datum (AOD) to 404 m AOD. There are several minor watercourses on and around the Site. The Proposed Development is fully described within **Chapter 2: Project Description** of the EIAR.

This Technical Appendix reports on the habitats recorded within the survey area, i.e., the entire area covered by NVC field surveys, covering a total of 1,343.6 ha. The survey area in many areas extends well beyond the Site boundary, which covers 681.5 ha; this reflects earlier and larger areas of interest which have been refined down during the iterative design process (see **Chapter 3: Design Evolution and Alternatives** of the EIAR), and also to provide sufficient survey buffers to account for the possible presence of potential GWDTE. The survey area and its juxtaposition with the Site boundary is shown in **Figure 8.3**. The appropriate scale and ‘study area’ for the assessment of effects with regards habitat loss has been deemed to be the Site boundary (as defined in **Chapter 8: Ecology** of the EIAR).

¹ As defined by the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora – the ‘Habitats Directive’.

² As per SEPA (2017a). Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3. Issue date: 11/09/2017 and SEPA (2017b). Land Use Planning System SEPA Guidance Note 4: Planning guidance on on-shore windfarm developments. Version 3. Issue date: 11/09/2017.

³ <https://www.nature.scot/scotlands-biodiversity/habitat-definitions>.

2.2 Designated Sites

There are six statutory designated sites containing habitat related, or botanical, qualifying features within 5 km of the Site boundary. The details of, and relevant qualifying features for, each designation relevant to this Technical Appendix are detailed in **Table 2-1**; see also **Figure 8.1**.

Table 2-1 Designated sites with botanical qualifying features within 5 km of the Site boundary

Designated Site	Distance from Site boundary	Qualifying Feature	Last Assessed Condition & Date
Wood of Cree Site of Special Scientific Interest (SSSI)	1.99 km	Oligotrophic loch	Favourable Maintained 17/07/2009
		Upland oak woodland	Unfavourable Recovering 17/06/2014
Galloway Oakwoods Special Area of Conservation (SAC)	1.99 km	Western acidic oak woodland	Unfavourable Declining 28/05/2009
Glentool Oakwoods SSSI	2.09 km	Bryophyte assemblage	Favourable Maintained 17/10/2012
		Lichen assemblage	Unfavourable Declining ⁴ 06/06/2014
		Upland oak woodland	Favourable Maintained 28/05/2009
Cairnsmore of Fleet SSSI	2.31 km	Blanket Bog	Unfavourable Recovering 07/10/2006
		Upland assemblage	Favourable Maintained 12/01/2005
Merrick Kells SSSI	4.02 km	Blanket Bog	Favourable Recovered 28/08/2013
Merrick Kells SAC	4.02 km	Acid peat-stained lakes and ponds	Favourable Maintained 18/07/2004
		Acidic scree	Favourable Maintained 17/09/2010
		Blanket bog	Unfavourable Recovering 17/09/2009
		Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	Favourable Maintained 18/07/2009

⁴ Management measures are in place that should, in time, improve the feature to Favourable condition (Unfavourable Recovering Due to Management).

2.3 Ancient Woodland

There are several areas of ancient woodland (as present on the Ancient Woodland Inventory (AWI)) within 5 km of the Site boundary. There are limited areas of ancient woodland within the Site boundary, these being located around the existing access track by Auchinleck (see **Figure 8.1**).

The definition of ancient woodland is land that is currently wooded and has been continually wooded at least since 1750. It is not related to the age of the trees that are currently growing there and they do not have to be ancient or elderly, as it is the historical continuity of the woodland habitat that makes a woodland ancient. The AWI holds information on the location and extent of ancient woodland within Scotland, and categorises each stand as follows:

- **Ancient Woodland (1a and 2a)** - Interpreted as semi-natural woodland from maps of 1750 (1a) or 1860 (2a) and continuously wooded to the present day. If planted with non-native species during the 20th century they are referred to as Plantations on Ancient Woodland Sites (PAWS);
- **Long-established woodlands of plantation origin (LEPO) (1b and 2b)** - Interpreted as plantation from maps of 1750 (1b) or 1860 (2b) and continuously wooded since. Many of these sites have developed semi-natural characteristics, especially the oldest stands, which may be as rich as ancient woodland; and
- **Other woodlands on Roy maps (3)** - Shown as un-wooded on the 1st Edition of the Ordnance Survey maps (produced in circa 1850) but as woodland on the Roy maps (produced in circa 1750). Such sites have, at most, had only a short break in continuity of woodland cover and may still retain features of ancient woodland.

The small area of ancient woodland within the Site and along the access track is categorised as Ancient (of semi-natural origin).

2.4 Carbon and Peatland Map 2016

The Carbon and Peatland Map 2016⁵ was consulted to determine likely peatland classes present within the Site. The map is a predictive tool that provides an indication of the likely presence of peat at a coarse scale. The Carbon and Peatland map has been developed as a high-level planning tool and identifies areas of nationally important carbon-rich soils, deep peat and priority peatland habitat⁶ as Class 1 and Class 2 peatlands.

Figure 8.2 indicates that, according to this predictive tool and map, there are small areas of Class 1 peatland within the Site in the area around Benilsa to the north-east and Tors of Glenmalloch to the south-east; there is no other Class 1 peatland within 1.5 km of the Site. There is a small area of Class 2 peatland within the Site, towards the north; there is no other Class 2 peatland within 4 km

⁵ SNH. (2016) Carbon and Peatland 2016 map. Available at: <https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map> (accessed 03 July 2024).

⁶ Priority peatland habitat is land covered by peat-forming vegetation or vegetation associated with peat formation.

of the Site. Much of the Site and surrounding area is underlain by Class 3⁷, Class 4⁸, Class 5⁹ with some Class 0¹⁰ (mineral) soils at the very eastern extent of the access track (see **Figure 8.2**).

3 METHODOLOGY

3.1 National Vegetation Classification (NVC)

The vegetation was surveyed by suitably qualified and experienced botanical surveyors using the NVC scheme (Rodwell, 1991-2000; 5 volumes) and in accordance with NVC survey guidelines (Rodwell, 2006). The NVC scheme provides a standardised system for classifying and mapping semi-natural habitats and ensures that surveys are carried out to a consistent level of detail and accuracy.

Homogeneous stands and mosaics of vegetation were identified and mapped by eye and drawn as polygons on high resolution aerial imagery field maps. These polygons were surveyed qualitatively to record dominant and constant species, sub-dominant species and other notable species present. The surveyors worked progressively across the survey area to ensure that no areas were missed, and that mapping was accurate. NVC communities were attributed to the mapped polygons using surveyor experience and matching field data against published floristic tables (Rodwell, 1991-2000). Stands were classified to sub-community level where possible, although in many cases the vegetation was mapped to community level only because the vegetation was too species-poor or patches were too small to allow meaningful sub-community determination; or because some areas exhibited features or fine-scale patterns of two or more sub-communities.

Quadrat sampling was not used in this survey because experienced NVC surveyors do not need to record quadrats in order to reliably identify NVC communities and sub-communities (Rodwell, 2006). Notes were made about the structure and flora of larger areas of vegetation in many places (such as the abundance and frequency of species, and in some cases condition and evident anthropogenic impacts). It can be better to record several larger scale qualitative samples than one or two smaller quantitative samples; furthermore, qualitative information from several sample locations can be vital for understanding the dynamics and trends in local (survey area/study area) vegetation patterns (Rodwell, 2006).

Due to small scale vegetation and habitat variability and numerous zones of habitat transitional between similar NVC communities, many polygons can represent complex mosaics of two or more NVC communities. Where polygons have been mapped as mosaics an approximate percentage cover of each NVC community within the polygon is given so that the dominant community and character of the vegetation could still be ascertained.

⁷ Class 3 - Dominant vegetation cover is not priority peatland habitat but is associated with wet and acidic type. Occasional peatland habitats can be found. Most soils are carbon-rich soils, with some areas of deep peat. Indicative soil = Predominantly peaty soil with some peat soil. Indicative vegetation = Peatland with some heath.

⁸ Class 4 - Area unlikely to be associated with peatland habitats or wet and acidic type. Area unlikely to include carbon-rich soil. Indicative soil = Predominantly mineral soil with some peat soil. Indicative vegetation = Heath with some peatland.

⁹ Class 5 - Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat. Indicative soil = Peat soil. Indicative vegetation = No peatland vegetation.

¹⁰ Class 0 - Mineral soil - Peatland habitats are not typically found on such soils. No peatland vegetation.

3.2 Phase 1 Habitat Characterisation

The NVC and mapping data was also correlated to their equivalent habitats according to the Phase 1 habitat classification (JNCC, 2010), considering the species composition and habitat quality. The Phase 1 characterisation has been utilised to allow a broader visual representation of the habitats within the survey area. Polygons or areas where there are mosaic NVC communities have generally been assigned a single Phase 1 classification based on the dominant NVC type (despite some polygons containing multiple Phase 1 types, often in low percentages). Therefore, the Phase 1 characterisation is generally a broader overview, and the NVC data should be referred to for further detail in any specific area.

Botanical nomenclature in this report follows that of Stace (2019) for vascular plants, Atherton *et al.* (2010) for bryophytes and Smith *et al.* (2009) for lichens.

4 SURVEY DETAILS & LIMITATIONS

NVC and habitat surveys were undertaken within the NVC survey area as follows:

- October 2022 and July 2023 (within the main Site); and
- October 2023 and May 2024 (along the access track corridor).

Surveys were therefore carried out during the optimal seasons for habitat surveys. The weather conditions were amenable to survey on each survey day; bright, with broken cloud and relatively light to moderate winds, and with infrequent light showers. The majority of the survey area was accessible, except for some stands of woodland along the access track. These were surveyed from a suitable vantage point; however, these constraints are not considered to affect the validity of the survey results, or the robustness of any assessments made from these data.

Following a late revision to the Site boundary to include some further small areas of conifer plantation, the habitat mapping was updated in these areas from a desk-based review of the area using surveyor knowledge, aerial imagery, and the extrapolation of relevant adjoining mapped habitat polygons. This is not considered a notable limitation as the areas involved are commercial conifer plantation and are also not subject to the siting of Proposed Development infrastructure.

The NVC system does not cover all possible semi-natural vegetation or habitat types that may be found. Since the NVC was adopted for use in Britain in the 1980's further survey work and an increased knowledge of vegetation communities has led to additional communities being described that do not fall within the NVC system (e.g., see Rodwell *et al.*, 2000; Averis *et al.*, 2004; Mountford, 2011; and Averis and Averis, 2020). Where such communities are found and recorded, they are given a non-NVC community code and are described.

It should be noted that the results from this survey, and the matches made in describing communities, represent a current community evaluation at the time of survey (as opposed to one seeking to describe what the community was before any human interference, or what it might become in the future). In light of this, a clear constraint of the vegetation survey and evaluation process as used in this and other surveys is that it offers only a snapshot of the vegetation communities present and should not be interpreted as a static long-term reference.

Ecological surveys are limited by factors which affect the presence of plants such as the time of year and weather. The ecological surveys undertaken to inform this project have not therefore produced a complete list of plants and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, the results of these surveys have been reviewed and are considered to be sufficient to undertake the assessment.

5 RESULTS

5.1 Summary of Habitat Types & NVC Communities

Thirty-seven NVC communities and 11 non-NVC communities were recorded within the survey area, and these corresponded to 27 Phase 1 habitat types. These communities and habitat types, and their respective Site-specific correlations are summarised below in **Table 5-1**.

Table 5-1 Phase 1 habitat type equivalents of NVC communities and other habitats recorded

Phase 1 Habitats	NVC Communities & Other Non-NVC Habitats/Features Recorded
A1.1.1 Broadleaved Semi-Natural Woodland	W4 <i>Betula pubescens</i> – <i>Molinia caerulea</i> woodland W6 <i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland W7 <i>Alnus glutinosa</i> – <i>Fraxinus excelsior</i> – <i>Lysimachia nemoreum</i> woodland W9 <i>Fraxinus excelsior</i> - <i>Sorbus aucuparia</i> - <i>Mercurialis perennis</i> woodland W10 <i>Quercus robur</i> – <i>Pteridium aquilinum</i> - <i>Rubus fruticosus</i> woodland W11 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland W17 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Dicranum majus</i> woodland
A1.1.2 Broadleaved Plantation Woodland	BP Broadleaved Plantation (non-NVC type)
A1.2.2 Coniferous Plantation Woodland	CP Coniferous Plantation (non-NVC type) YCP Young Coniferous Plantation (non-NVC type)
A2.1 Scrub – Dense/Continuous	W23 <i>Ulex europaeus</i> – <i>Rubus fruticosus</i> scrub
A3.1 Scattered Broadleaved Trees	SBT (non-NVC type)
A3.2 Scattered Conifer Trees	SCT (non-NVC type)
A4.2 Recently-Felled Coniferous Woodland	CF Clear-Felled Woodland (non-NVC type)
B1.1 Unimproved Acid Grassland	U4 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland U5 <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland U6 <i>Juncus squarrosus</i> – <i>Festuca ovina</i> grassland
B1.2 Semi-Improved Acid Grassland	U4b <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland <i>Holcus lanatus</i> – <i>Trifolium repens</i> sub-community
B2.12 Unimproved Neutral Grassland	MG1 <i>Arrhenatherum elatius</i> grassland MG9 <i>Holcus lanatus</i> – <i>Deschampsia cespitosa</i> grassland

Phase 1 Habitats	NVC Communities & Other Non-NVC Habitats/Features Recorded
B3.1 Unimproved Calcareous Grassland	CG10 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Thymus polytrichus</i> grassland
B4 Improved Grassland	MG6 <i>Lolium perenne</i> – <i>Cynosurus cristatus</i> grassland
B5 Marsh/Marshy Grassland	MG10 <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush-pasture M23 <i>Juncus effusus/acuteiflorus</i> – <i>Galium palustre</i> rush-pasture M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire M27 <i>Filipendula ulmaria</i> – <i>Angelica sylvestris</i> mire Je <i>Juncus effusus</i> acid grassland community (non-NVC type) Ja <i>Juncus acuteiflorus</i> acid grassland community (non-NVC type)
C1.1/C1.2 Bracken – Continuous/Scattered	U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> community W25 <i>Pteridium aquilinum</i> – <i>Rubus fruticosus</i> underscrub
C3.1 Tall Herb & Fern: Tall Ruderal	OV24 <i>Urtica dioica</i> – <i>Galium aparine</i> community OV25 <i>Urtica dioica</i> - <i>Cirsium arvense</i> community W24 <i>Rubus fruticosus</i> – <i>Holcus lanatus</i> underscrub
D1.1 Dry Dwarf Shrub Heath - Acid	H9 <i>Calluna vulgaris</i> – <i>Deschampsia flexuosa</i> heath H10 <i>Calluna vulgaris</i> – <i>Erica cinerea</i> heath H12 <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath H21 <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath H9-H12 intermediate (intermediate-NVC type)
D2 Wet Dwarf Shrub Heath	M15 <i>Trichophorum germanicum</i> – <i>Erica tetralix</i> wet heath
D5 Dry Heath/Acid Grassland Mosaic	Mosaics of D1 and B1 communities
D6 Wet Heath/Acid Grassland Mosaic	Mosaics of D2 and B1 communities
E1.6.1 Blanket Bog	M2 <i>Sphagnum cuspidatum/fallax</i> bog pool community M17 <i>Trichophorum germanicum</i> – <i>Eriophorum vaginatum</i> blanket mire M19 <i>Calluna vulgaris</i> – <i>Eriophorum vaginatum</i> blanket mire
E1.7 Wet Modified Bog	M20 <i>Eriophorum vaginatum</i> blanket mire M25a^ <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire <i>Erica tetralix</i> sub-community
E2.1 Acid/Neutral Flush/Spring	M4 <i>Carex rostrata</i> - <i>Sphagnum fallax</i> mire M6 <i>Carex echinata</i> - <i>Sphagnum fallax/denticulatum</i> mire
E2.2 Basic Flush/Spring	M10 <i>Carex dioica</i> - <i>Pinguicula vulgaris</i> mire
G1 Open Water	SW Standing Water (non-NVC type)
G2 Running Water	RW Running Water (non-NVC type)
J3.6 Buildings	BD Buildings (non-NVC type)
J4 Bare Ground	BG Bare Ground, Tracks, Hardstandings etc (non-NVC type)

The following sections describe each of these Phase 1 habitat types and the communities underpinning these within the survey area. Habitats are described in the order they appear within

the Phase 1 classification. The survey results are displayed in **Figure 8.3** which combines Phase 1 symbology with NVC data.

A number of target notes (TNs) were also made during surveys, often to pinpoint areas or species of interest. These target notes are shown in **Figure 8.3** and detailed within **Annex A**, target note photographs are included within **Annex B**. Further photographs of a number of the typical habitat types found within the survey area are provided within **Annex C**.

5.2 Woodland & Scrub

5.2.1 A1.1.1 Broadleaved Semi-Natural Woodland & A3.1 Scattered Broadleaved Trees

Semi-natural broadleaved woodland is relatively uncommon within the survey area, being restricted to a few main relatively small areas generally around the access tracks and the west of the survey area (outwith the Site boundary). The largest and most continuous stands are associated with Auchinleck, Benera and along the Cordorcan Burn in the west. Several of the stands of woodland described around Auchinleck are also ancient woodland (see **Section 2.3**, **Annex A** and **Figure 8.1**).

The majority of woodland recorded in the survey area and also within the Site is a mix of W4 *Betula pubescens* – *Molinia caerulea* woodland, W7 *Alnus glutinosa* – *Fraxinus excelsior* – *Lysimachia nemoreum* woodland, W10 *Quercus robur* – *Pteridium aquilinum* - *Rubus fruticosus* woodland, W11 *Quercus petraea* – *Betula pubescens* – *Oxalis acetosella* woodland and W17 *Quercus petraea* – *Betula pubescens* – *Dicranum majus* woodland. Some very small patches of W9 *Fraxinus excelsior* - *Sorbus aucuparia* - *Mercurialis perennis* woodland were recorded in woodland mosaics along the access track, and a small area of W6 – *Alnus glutinosa* – *Urtica dioica* woodland was recorded in the survey area, but not the Site.

The W11 is comprised of *Quercus petraea*, *Betula pendula* and *Sorbus aucuparia*, the ground flora contains a typical acid grassland flora reflecting U4 grassland compositions. Other small patches of W11 also had additional records of *Salix* spp. and *Crataegus monogyna*.

The areas of W4 consisted of *Betula* spp., *Salix* spp., *Quercus* spp., and scattered *Alnus glutinosa* over a *Molinia caerulea*, *Juncus effusus* and mire species dominated field layer.

The stands of W17 recorded, along with the sub community W17b as part of mosaics, were generally comprised of young patches of *Betula* spp. and occasional *Sorbus aucuparia* and *Corylus avellana* growing in a narrow strip alongside the access track and often bordering stands of conifer plantation, with a heathy field layer including *Calluna vulgaris*, *Vaccinium myrtillus* and ferns.

The W7 recorded often comprised *Betula* spp., *Alnus glutinosa*, *Sorbus aucuparia* and *Salix cinerea*, with occasional *Crataegus monogyna* over a *Juncus* spp. dominated field layer with occasional to frequent *Deschampsia cespitosa*. The sub-community W7c field layer was dominated by *D. cespitosa*, *Blechnum spicant*, *Oxalis acetosella*, *Rubus fruticosus*, *P. aquilinum* and *Thuidium tamariscinum*.

Patches of W10 recorded was usually dominated by a mix of *Quercus* spp., *Betula* spp., *Corylus avellana*, *Salix* spp., and *Crataegus monogyna*. The understorey and field flora often included *Dactylis glomerata*, *Urtica dioica*, *Rubus fruticosus* and some *Juncus effusus*. Two patches were not able to be ground-truthed in detail due to restricted access. These were surveyed along the edges on the areas and using binoculars. The field layer was neutral grassland with a canopy of *Corylus avellana*, *Fraxinus excelsior* and *Crataegus monogyna*.

A couple of very small patches of W9 were recorded along the access track within woodland mosaics, the presence of W9 indicated by a dense ground cover of *Mercurialis perennis*.

One small stand of W6 was recorded in the west of the survey area but outwith the Site, towards Drannadow Farm, characterised by a canopy of *Salix cinerea* over *Urtica dioica* and neutral grasses.

Occasionally some habitats have individual or low numbers of scattered broadleaved trees (SBT) that would not constitute a woodland community, these scattered trees often tend to be *Betula* sp., *Sorbus aucuparia* or *Crataegus monogyna*.

5.2.2 A1.1.2 Broadleaved Plantation Woodland

There is one small patch of broadleaved plantation (BP) along the access track close to Auchinleck Bridge. The character of this plantation contains *Fagus sylvatica* and a very species-poor understorey.

5.2.3 A1.2.2 Coniferous Plantation Woodland & A3.2 Scattered Conifer Trees

The survey area includes several large areas of planted commercial young and mature coniferous plantation woodland (YCP and CP), which are mainly located in the eastern part of the Site, with the access track also largely flanked by commercial plantation. These plantation woodlands are mostly dominated by *Picea sitchensis*.

When mature, these types of typically dense plantation woodlands are of negligible botanical and ecological value due to over-shading and loss of the field flora; patchy areas of *Pteridium aquilinum* and/or *Molinia caerulea* is therefore generally all that persists here beneath the deep shade and the litter shed amongst the conifers.

Occasionally some habitats and areas, particularly those in the south around Glenmalloch, have individual or low numbers of scattered conifer trees (SCT) that would not constitute a woodland community, these scattered trees tend to be self-seeded *Picea sitchensis* encroaching from the neighbouring conifer plantations.

5.2.4 A2.1/A2.2 Dense/Continuous & Scattered Scrub

Scrub is sparse and of low cover within the survey area and Site, with the main but small stand found in the lower reaches of Washing Burn, north-east of Drannadow Farm.

The scrub present is dense patches of W23 *Ulex europaeus* – *Rubus fruticosus* scrub, and it is characteristically dominated by *Ulex europaeus*.

5.2.5 A4.2 Recently Felled Coniferous Woodland

An area within the Site, towards the south was recorded as recently felled conifer plantation. A single small area of recently felled conifer plantation was also recorded in the survey area but outwith the Site boundary just to the south-east of the Site entrance.

5.3 Grasslands & Marsh

5.3.1 B1.1/B1.2 Unimproved & Semi-Improved Acid Grassland

Unimproved acid grassland was found widely scattered throughout the survey area with the largest stands found on thin mineral soils and often intensively grazed and sloping ground in the west of the Site. Outwith this core area of acid grassland, it tends to be found in small, fragmented patches scattered across the Site.

The majority of unimproved acid grassland in the survey area is U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland, often of the U4a Typical sub-community. There are also some smaller patches of U5 *Nardus stricta* – *Galium saxatile* grassland and U6 *Juncus squarrosus* – *Festuca ovina* grassland scattered through the survey area.

The U4 community often contained a variable mix of *Agrostis capillaris*, *Festuca ovina* and *Anthoxanthum odoratum*. The herbs *Potentilla erecta* and *Galium saxatile* are common and in some stands, there can also be smaller quantities of other vascular species such as *Holcus lanatus*, *Nardus stricta*, *Avenella flexuosa*, *Cynosurus cristatus*, *Juncus squarrosus*, *Prunella vulgaris*, *Ranunculus repens*, *Cerastium fontanum*, *Achillea millefolium*, *Trifolium repens*, *Luzula* spp., and *Cirsium* sp. Mosses are frequent, especially *Pleurozium schreberi* and *Rhytidiadelphus squarrosus*.

Many of the grassland species found within the U5 and U6 communities replicate many of the species found within U4 as described above, but with *Nardus stricta* (U5) and *Juncus squarrosus* (U6) being obviously the dominant and most characteristic species.

Areas of semi-improved acid grassland are characterised by the U4b *Holcus lanatus* - *Trifolium repens* sub-community only. Several fields in the east of the survey areas, but outwith the Site, are characterised by U4b where there has been more agricultural improvement over time.

The areas of U4b are generally intensively grazed with a very short sward and only occasional and more sparse acid indicator species. The sward is mainly comprised of *Holcus lanatus*, *Agrostis* spp., *Festuca* spp., *Cynosurus cristatus* and *Trifolium repens* with the more occasional to rare species including *Anthoxanthum odoratum*, *Juncus effusus*, *Plantago lanceolata*, and *Cirsium* sp. The moss *Rhytidiadelphus squarrosus* is scattered in patches.

5.3.2 B2.1 Unimproved Neutral Grassland

Unimproved neutral grasslands are very uncommon within the survey area and of low total cover, being mainly found along the existing access track. These neutral grasslands were comprised of small patches of the MG1 *Arrhenatherum elatius* grassland community and the MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland community.

5.3.3 B3.1 Unimproved Calcareous Grassland

Unimproved calcareous grassland is not present within the Site, but two small areas were found in the wider survey area.

These grassland patches were in habitat mosaics and comprised of the CG10 *Festuca ovina* – *Agrostis capillaris* – *Thymus polytrichus* grassland community.

5.3.4 B4 Improved Grassland

Improved grasslands are found mostly in the Drannandow Farm area to the west of the survey area and outwith the Site, with many of the enclosed and improved fields used for livestock grazing. These areas are characterised by MG6 *Lolium perenne* – *Cynosurus cristatus* grassland.

These fields and communities are all dominated by *Lolium perenne*. Where other species appear scattered through the *Lolium perenne* sward these include *Cynosurus cristatus*, *Holcus lanatus*, *Poa annua*, *Bellis perennis*, *Ranunculus repens*, *Trifolium repens*, *Plantago lanceolata* and *Cerastium fontanum*.

5.3.5 B5 Marsh/Marshy Grassland

Marshy grassland is habitat that includes several different sward types in which *Molinia caerulea*, *Juncus* spp. and/or *Carex* spp. can be prominent. This habitat type is common and in places extensive within the survey area but more scattered within the Site and access track, with the largest areas concentrated in the south-west and outwith the Site.

Within the survey area, the M23 (a & b), M25, M25a, M25b, MG10, MG10a and M27 NVC communities are included within its limits along with the non-NVC communities 'Je' and 'Ja'. In the Phase 1 methodology MG10 can fall within either marshy grassland or neutral grassland classifications, however here due to the abundance of *Juncus* spp. it has been included within marshy grassland. These communities also commonly form mosaics and transitional areas with each other, in particular the rushy areas, and also with adjoining grassland and mire communities.

The rush dominated communities present are M23a *Juncus effusus/acutiflorus* – *Galium palustre* rush-pasture, *Juncus acutiflorus* sub-community, M23b *Juncus effusus/acutiflorus* – *Galium palustre* rush-pasture, *Juncus effusus* sub-community, MG10a *Holcus lanatus* – *Juncus effusus* rush-pasture, typical sub-community and the non-NVC types *Juncus acutiflorus* acid grassland (Ja) and *Juncus effusus* acid grassland (Je).

The areas of M23 are often species poor with *Juncus* spp. being the dominant species, and it regularly grades in and out of MG10, Ja or Je (see below). Generally, areas of M23 are dominated by mixtures of *Juncus acutiflorus* and/or *Juncus effusus* with patches of a low diversity of grasses such as *Holcus lanatus*, *Anthoxanthum odoratum*, *Molinia caerulea* and *Agrostis* spp. Within the sward, a variety of other graminoids and herbs are more occasional to rare and included *Cirsium palustre*, *Rumex acetosa*, *Ranunculus repens*, *Potentilla erecta* and *Carex* spp. Occasional *Nardus stricta* and *Calluna vulgaris* were recorded. Wefts of mosses are also common in M23 between these species, including *Calliergonella cuspidata*, *Kindbergia praelonga* and *Rhytidiadelphus squarrosus*.

The M25 NVC community was classified as marsh/marshy grassland where it was present at the community level and the M25a *Erica tetralix* (when likely on shallow peaty soil) and M25b *Anthoxanthum odoratum* sub-communities. These were areas either wholly dominated by *Molinia caerulea* (M25) or where *Molinia caerulea* was accompanied by a mixture of heath species (M25a) or grassland species (M25b). Where M25a was not dominated by *Molinia caerulea*, other species co-dominated, such as *Myrica gale*. Other species recorded in M25a included lesser amounts of *Trichophorum germanicum*, *Erica tetralix*, *Calluna vulgaris*, *Narthecium ossifragum*, *Potentilla erecta*, *Galium saxatile* and *Vaccinium myrtillus*; the basal layer often included *Sphagnum fallax*, *S. capillifolium*, *Polytrichum commune* and *Pleurozium schreberi*. The M25b was dominated by *Molinia caerulea* in at times a tussocky sward and was found to form mosaics with the other marshy grassland and acid grassland communities. In some places where the *Molinia caerulea* was not purely dominant, species included variable abundances of *Potentilla erecta*, *Galium saxatile*, *Anthoxanthum odoratum*, *Holcus lanatus*, *Rumex acetosa*, *Agrostis capillaris*, *Juncus squarrosus*, *Juncus effusus* and *Juncus acutiflorus*; the mosses *Hylocomium splendens*, *Polytrichum commune* and *Pleurozium schreberi* are also common. M25, M25a and M25b areas tend to be found on shallow peaty/organo-mineral soils.

MG10 is less common in the survey area than the other marshy grassland communities, and where it is present it is typical of the MG10a Typical sub-community and is characterised by a sward of *Juncus effusus* and *Holcus lanatus* with some scattered *Rumex acetosa* and *Ranunculus repens*.

A single small patch of M27 *Filipendula ulmaria* – *Angelica sylvestris* mire was recorded, and is as typical, is dominated by a sward of *Filipendula ulmaria*.

The ‘Ja’ and ‘Je’ non-NVC grassland communities are present here as patches of a *Juncus* spp. dominated calcifuge grassland, at times found as extensive areas or as a small component of a wider mosaic with other grassland and mire communities. This is vegetation in which dominant and tall *Juncus effusus* or *Juncus acutiflorus* grow abundantly among a few shorter ‘acid grassland’ swards including frequent to occasional *Agrostis capillaris*, *Holcus lanatus*, *Rumex acetosa*, *Potentilla erecta* and *Galium saxatile*. Other occasional species include *Carex nigra*, *Molinia caerulea* and *Ranunculus repens*. Mosses typical of acid communities are also abundant, the most common mosses are *Hylocomium splendens*, *Pleurozium schreberi*, *Polytrichum commune*, *Pseudoscleropodium purum* and *Rhytidiadelphus squarrosus*. This vegetation does not fit into any NVC community as it lacks the wetland element and key indicators of M6 and M23 *Juncus* spp. mires and has a more acidophilous flora than MG10 *Juncus effusus* rush-pasture; it is therefore classed separately.

5.4 Tall Herb & Fern

5.4.1 C1.1/C1.2 Bracken: Continuous & Scattered

Areas of bracken are common and at times relatively extensive across the Site, particularly in the south around Glenmalloch. The habitat was recorded as the U20 *Pteridium aquilinum* – *Galium saxatile* NVC community and where a sub-community was assigned this was generally the U20a *Anthoxanthum odoratum* sub-community, U20b *Vaccinium myrtillus*-*Dicranum scoparium*, however the U20c species-poor sub-community was also recorded. *Pteridium aquilinum* dominates entirely with few other species being present. Within the U20a sub-community the *P. aquilinum* is

accompanied by a grassland species assemblage reflecting close affinities to the U4 grassland (see Section 5.3.1).

A few areas of scattered W25 *Pteridium aquilinum* – *Rubus fruticosus* underscrub was recorded, with several patches along the access track.

5.4.2 C3.1 Tall Ruderal

This habitat type within the survey area covers a very small total area, being made up of OV24 *Urtica dioica* – *Galium aparine* community and OV25 *Urtica dioica* – *Cirsium arvense* community, usually associated with patches of waste or neglected ground or as part of trackside verges and comprising their characteristic community dominants. W24 *Rubus fruticosus* – *Holcus lanatus* underscrub was also recorded in small patches, which lacks the *Pteridium aquilinum* of W25.

5.5 Heathland

5.5.1 D1.1 Dry Dwarf Shrub Heath – Acid

Acid dry dwarf shrub heath is very sparse and of low total cover within the survey area. The majority of these small patches are along the access track.

The majority of dry heath present is H10 *Calluna vulgaris*-*Erica cinerea* heath and H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath. There are some smaller patches of H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath, H21 *Calluna vulgaris* - *Vaccinium myrtillus* - *Sphagnum capillifolium* heath, and there is some heath classified as a H9-H12 intermediate heath. H12 has the typical species assemblage of *Calluna vulgaris* with frequent *Vaccinium myrtillus*, with the sward also containing frequent to occasional *Potentilla erecta*, *Galium saxatile*, *Agrostis capillaris*, *Anthoxanthum odoratum*, *Nardus stricta*, *Festuca ovina*, *Avenella flexuosa*, *Blechnum spicant*, *Polystichum* sp., *Empetrum nigrum* and the mosses *Hylocomium splendens*, *Rhytidiadelphus loreus*, *Rhytidiadelphus squarrosus*, *Pleurozium schreberi* and *Hypnum jutlandicum*. The H12a *Calluna vulgaris* sub-community and H12b *Vaccinium vitis-idaea*-*Cladonia impexa* sub-community were recorded as present.

The H10 *Calluna vulgaris*-*Erica cinerea* heath here includes the H10a typical sub-community and the H10c *Festuca ovina*-*Anthoxanthum odoratum* sub-community. H10 has the typical species assemblage of being co-dominated by *Calluna vulgaris* and *Erica cinerea*, with other associates as for H12 above.

Small areas contain H9 *Calluna vulgaris*-*Deschampsia flexuosa* heath, with the species-poor sub-community H9c. Commonly species include *Calluna vulgaris*, *Deschampsia flexuosa* and *Pohlia nutans*. These areas were found over old clearfell.

The small areas of H21 along the access track are a typical assemblage of *Calluna vulgaris* and *Vaccinium myrtillus* with some ferns over a moss layer with abundant *Sphagnum capillifolium*.

The H9-H12 intermediate classification was recorded on one occasion, the categorisation arises from the similarity of the vegetation both H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath and H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath but the vegetation does not allow the true classification of either. The canopy resembles that of H9 in being dominated by *C. vulgaris* with no accompanying

dwarf shrub species, but the moss carpets are of the H12 type which is more developed and more diverse than in H9.

5.5.2 D2 Wet Dwarf Shrub Heath

Wet heath within the Site and survey area is all the M15 *Trichophorum germanicum* – *Erica tetralix* wet heath community. Nearly all wet heath present is of the M15d *Vaccinium myrtillus* sub-community, with only a small area of the M15b Typical sub-community recorded.

The wet heath in the Site is predominantly concentrated in the north (north of Benailsa) and south (albeit more patchily and around Glenmalloch) of the Site. The wet heath present is generally at the drier end of the spectrum, has a very short sward created and maintained by grazing, and is considered to be in a fairly poor and degraded condition, and frequently mosaics and transitions in and out of acid grassland. The M15d assemblage here contains a sward with a dominance of *Trichophorum germanicum* with heavily grazed *Calluna vulgaris* and *Vaccinium myrtillus*. Occasional *Erica tetralix*, *Molinia caerulea*, *Narthecium ossifragum*, *Agrostis capillaris*, *Nardus stricta*, *Empetrum nigrum*, *Juncus squarrosus*, *Galium saxatile* and *Potentilla erecta* make up much of the remainder of the sward. Sphagna are only occasional in small patches and tend to be *Sphagnum capillifolium*. Mosses are predominantly pleurocarpous with *Pleurozium schreberi*, *Rhytidiadelphus* spp. and *Hylocomium splendens* common. The areas of M15b were generally a ranker and co-dominant mixture of *Calluna vulgaris*, *Erica tetralix* and *Molinia caerulea* with very little *Myrica gale* or *Trichophorum germanicum*.

5.5.3 D5 Dry Heath/Acid Grassland Mosaic

Mapped mosaics of D1 (Section 5.5.1) and B1.1 (Section 5.3.1) communities.

5.5.4 D6 Wet Heath/Acid Grassland Mosaic

Mapped mosaics of D2 (Section 5.5.2) and B1.1 (Section 5.3.1) communities.

5.6 Mire

5.6.1 E1.6.1 Blanket Bog

Blanket bog is fragmented and patchy within the open parts of the Site; see **Figure 8.3**.

Much of the blanket bog present is M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire as well as some areas of M17 *Trichophorum germanicum* – *Eriophorum vaginatum* blanket mire. Occasionally, there are small M2 *Sphagnum cuspidatum/fallax* bog pools within areas of blanket bog. In some areas M19 and M17 form mosaics and transitional areas with overlap between each other, and with wet modified bog (Section 5.6.2).

The M19 community is the most frequently found community within this blanket bog habitat, occurring on peat-covered level to gently sloping ground. The community is generally distinctive with the bulk of the vegetation consisting of a mixture of *Calluna vulgaris* and *Eriophorum vaginatum*. There is commonly at least frequent to occasional *Erica tetralix*, *Eriophorum angustifolium*, *Narthecium ossifragum*, *Trichophorum germanicum*, *Vaccinium myrtillus*, *Potentilla erecta* and *Deschampsia flexuosa*. The mosses *Hylocomium splendens*, *Aulacomnium palustre*, *Polytrichum commune*, *Pleurozium schreberi*, *Hypnum jutlandicum*, *Sphagnum fallax* and *S.*

capillifolium are collectively abundant, with *S. papillosum* and *S. palustre* occasional. *Cladonia* spp. (lichens) are also present.

Within M17, overall, there is a mix of *Trichophorum germanicum* and *Eriophorum vaginatum*, although the densities can be variable in places. The sward also contains a mix of other species ranging from frequent and occasional, to locally abundant, species present include *Erica tetralix*, *Eriophorum angustifolium*, *Molinia caerulea* and *Calluna vulgaris*. The basal layer includes *Sphagnum papillosum*, *S. medium* (rare), *S. fallax*, *S. palustre*, and *S. capillifolium* as well as typical pleurocarpous mosses.

The areas of M2 recorded were found as minor components within more extensive peatland communities, usually present as a small pool or in an occluded hollow or part of ditch. This community is represented by the abundance of *S. fallax* and *S. cuspidatum*.

Following completion of NVC surveys and the identification of priority peatland habitats on-site, according to NatureScot Guidance¹¹, further peatland condition surveys were undertaken for the Proposed Development – these are fully detailed and discussed within **Annex D**.

5.6.2 E1.7 Wet Modified Bog

Wet modified bog is scattered throughout mainly the north of the Site and survey area and is mostly represented by the M20 *Eriophorum vaginatum* blanket mire community, with smaller areas of the M25a[^] *Molinia caerulea* – *Potentilla erecta* mire *Erica tetralix* sub-community. M25a being classified as wet modified bog and not marshy grassland here due to generally appearing on peat of greater than 0.5 m in depth (c.f. Section 5.3.5). In these circumstances, the M25a is denoted with a caret (i.e., M25a[^]).

The M25a[^] areas were identified due to *Molinia* overwhelmingly dominating the sward but with an associated flora containing some mire species. The majority of the subordinate and associate species found within this M25a[^] assemblage were occasional *Calluna vulgaris*, *Erica tetralix*, *Vaccinium myrtillus*, *Eriophorum vaginatum*, *Myrica gale* and occasional patches of *Sphagna*.

M20 *Eriophorum vaginatum* blanket mire areas were recorded both at community level and in places as the M20b and *Calluna vulgaris* – *Cladonia* species sub-community. The species assemblage can be identified by the dominant tussocks of *Eriophorum vaginatum*, along with some *Vaccinium myrtillus* and *Empetrum nigrum*. Grasses found include *Anthoxanthum odoratum*, *Agrostis capillaris*, *Nardus stricta* and *Deschampsia flexuosa*. The basal layer in these areas generally lacks abundant *Sphagna* although often some wetter patches contain *Sphagnum capillifolium* and *S. fallax*, however overall, the basal layer is dominated by pleurocarpous and hypnoid mosses.

5.6.3 E2.1 Acid/Neutral Flush/Spring

Acid/neutral flushes appear in several areas across the survey area, tending to be relatively small patches of habitat and usually following the route of watercourses. The majority of this habitat is represented by M6 *Carex echinata* – *Sphagnum fallax/denticulatum* mire. The M6 on-site is predominately of the M6d *Juncus acutiflorus* sub-community, however there are frequent patches

¹¹ <https://www.nature.scot/doc/advising-peatland-carbon-rich-soils-and-priority-peatland-habitats-development-management> (accessed 04 July 2024).

but lesser amounts of the M6c *Carex echinata* – *Sphagnum fallax/denticulatum* mire, *Juncus effusus* sub-community. There are also very small extents of the M6a *Carex echinata* sub-community and M6b *Carex nigra*-*Nardus stricta* sub-community. The M4 *Carex rostrata* - *Sphagnum fallax* mire community was also recorded once in the survey area.

The M6c and M6d communities are rush mires on wet ground, often following the lines of watercourses. A tall sward of *J. effusus* over a species-poor lawn of *Sphagnum fallax*, *S. palustre* and *Polytrichum commune* indicates the M6c sub-community; *J. acutiflorus* dominates in M6d. In many stands its extent encompasses little more than these species listed. Where other species were recorded, they tended to be of very low cover, and included typical species such as *Rumex acetosa*, *Molinia caerulea*, *Myosotis secunda*, *Ranunculus repens*, *Cirsium palustre* and *Carex* spp. The small extent of M6a lacks the *Juncus* spp. of M6c and M6d, and instead contains abundant *Carex echinata* over a similar basal layer. M6b is included in a small parcel and the sward is commonly made up of *Carex nigra*, *C. panicea*, *Eriophorum angustifolium*, *Juncus squarrosus* and *Nardus stricta*.

The small patch of M4 was characterised by *Carex rostrata* with a basal layer composed of *Sphagnum fallax*.

5.6.4 E2.2 Basic Flush/Spring

Four basic stony flushes were found within the survey area and recorded as target notes (see **Annex A**). These flushes are represented by the M10 *Carex dioica* – *Pinguicula vulgaris* mire community and M10a *Carex viridula* ssp. *oedocarpa* – *Juncus bulbosus* sub-community.

The M10 vegetation present includes a sward of small *Carex* spp. with *Pinguicula vulgaris*, *Narthecium ossifragum*, *Drosera rotundifolia*, *Eriophorum angustifolium*, *Trichophorum germanicum* and the community characteristic ‘brown mosses’.

5.7 Open Water

5.7.1 G1 Standing Water

Standing waterbodies (SW) within the survey area comprise of two small ponds.

5.7.2 G2 Running Water

Several watercourses (RW) are present within the within the survey area and surrounding area, including many named burns, the largest of which is Cordorcan Burn in the north-west.

5.8 Miscellaneous

5.8.1 J3.6 Buildings

Buildings (BD) is a non-NVC community to identify buildings or built-up structures within the survey area, both inhabited and vacant, such as private dwelling houses and outbuildings/sheds.

5.8.2 J4 Bare Ground

Bare ground (BG) is a non-NVC community within the survey area and includes existing tracks, hardstandings and roads. Any areas that were devoid of vegetation and that could not be classified as any other habitat are also included here.

5.9 Invasive Non-Native Species

No Invasive Non-Native Species (INNS) were incidentally recorded during the habitat surveys; however, this does not preclude their presence from the study area.

5.10 Notable Species

No notable or rare species were incidentally recorded during the habitat surveys; however, this does not preclude their presence from the study area.

6 EVALUATION OF BOTANICAL INTEREST

6.1 Overview

NVC communities can be compared with several habitat classifications in order to help in the assessment of the sensitivity and conservation interest of certain areas. The following sections compare the survey results and the NVC communities identified against three classifications:

- SEPA guidance on GWDTEs;
- Habitats Directive (92/43/EEC) Annex I habitats; and
- Scottish Biodiversity List (SBL) priority habitats.

6.2 Groundwater Dependent Terrestrial Ecosystems (GWDTE)

SEPA has classified a number of NVC communities as potentially dependent on groundwater (SEPA, 2017a & 2017b). Wetlands or habitats containing these particular NVC communities are to be considered GWDTE unless further information can be provided to demonstrate this is not the case. Many of the NVC communities on the list are very common habitat types across Scotland, and some are otherwise generally of low ecological value. Furthermore, some of the NVC communities may be considered GWDTE only in certain hydrogeological settings.

Designation as a potential GWDTE does not therefore infer an intrinsic biodiversity value, and GWDTE status has not been used as criteria to determine a habitats respective conservation importance. There is however a statutory requirement to consider GWDTEs and the data gathered during the NVC surveys has been used to inform this assessment (see **Chapter 10: Geology, Hydrology and Peat Assessment**).

Using SEPA's guidance, **Table 6-1** shows which communities recorded within the survey area may be considered GWDTE. Those communities which may have limited (moderate) dependency on groundwater in certain settings are marked in yellow and NVC communities recorded that are likely to be considered high, or sensitive GWDTE in certain hydrogeological settings are highlighted in red.

Table 6-1 Communities within the survey area which may potentially be classified as GWDTE

NVC Code	NVC Community Name
W6	<i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland

NVC Code	NVC Community Name
M15	<i>Trichophorum germanicum</i> – <i>Erica tetralix</i> wet heath
M25	<i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire
M27	<i>Filipendula ulmaria</i> – <i>Angelica sylvestris</i> mire
U6	<i>Juncus squarrosus</i> – <i>Festuca ovina</i> grassland
MG9	<i>Holcus lanatus</i> – <i>Deschampsia cespitosa</i> grassland
MG10	<i>Holcus lanatus</i> – <i>Juncus effusus</i> rush pasture
Je/Ja ¹²	<i>Juncus effusus</i> acid grassland
W4	<i>Betula pubescens</i> – <i>Molinia caerulea</i> woodland
W7	<i>Alnus glutinosa</i> – <i>Fraxinus excelsior</i> – <i>Lysimachia nemoreum</i> woodland
M6	<i>Carex echinata</i> – <i>Sphagnum fallax/denticulatum</i> mire
M10	<i>Carex dioica</i> - <i>Pinguicula vulgaris</i> mire
M23	<i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture
CG10	<i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Thymus polytrichus</i> grassland

The location and extent of all identified potential GWDTE are provided on an appropriate NVC map; see **Figure 8.4**.

Within **Figure 8.4** the potential GWDTE sensitivity of each polygon containing a potential GWDTE is classified on a four-tier approach as follows:

- ‘Highly – dominant’ where potential high GWDTE(s) dominate the polygon;
- ‘Highly - sub-dominant’ where potential high GWDTE(s) make up a sub-dominant percentage cover of the polygon;
- ‘Moderately – dominant’ where potential moderate GWDTE(s) dominate the polygon and no potential high GWDTEs are present; and
- ‘Moderately - sub-dominant’ where potential moderate GWDTE(s) make up a sub-dominant percentage cover of the polygon and no potential high GWDTEs are present.

Where a potential high GWDTE exists in a polygon it outranks any potential moderate GWDTE communities within that same polygon.

GWDTE sensitivity has been assigned solely on the SEPA listings (SEPA, 2017a & 2017b). However, depending on a number of factors such as geology, superficial geology, presence of peat and topography, many of the potential GWDTE communities recorded may in fact be only partially groundwater fed or not dependant on groundwater. Determining the actual groundwater dependency of particular areas or habitat requires further assessment (see **Chapter 10: Geology, Hydrology and Peat Assessment**).

¹² In light of the SEPA classification on potential GWDTEs the non NVC type ‘Je’ should also qualify for potential GWDTE status. The classification of moderate sensitivity is keeping in line with other similar *Juncus* spp. dominated grassland communities (e.g. MG10).

6.3 Annex I Habitats

6.3.1 Overview

A number of NVC communities can also correlate to various Annex I habitat types. However, the fact that an NVC community can be attributed to an Annex I type does not necessarily mean all instances of that NVC community constitute Annex I habitat. Its Annex I status can depend on various factors such as quality, extent, species assemblages, geographical setting and substrates.

Using Joint Nature Conservation Committee (JNCC) Annex I habitat listings and descriptions¹³, which have then been compared with survey results and field observations, the following NVC communities within the survey area which may constitute Annex I habitat are shown in **Table 6-2**.

Table 6-2 Annex I habitats and corresponding NVC communities

Annex I Habitat	Corresponding NVC Communities & Other Non-NVC Habitats/Features Recorded
4010 North Atlantic wet heaths with <i>Erica tetralix</i>	M15 <i>Trichophorum germanicum</i> – <i>Erica tetralix</i> wet heath
4030 European dry heaths	H9 <i>Calluna vulgaris</i> – <i>Deschampsia flexuosa</i> heath H10 <i>Calluna vulgaris</i> - <i>Erica cinerea</i> heath H12 <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath H9-H12 intermediate heath H21 <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath
6230 Species-rich <i>Nardus</i> grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe)	CG10 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Thymus polytrichus</i> grassland
7130 Blanket bog	M2 <i>Sphagnum cuspidatum/fallax</i> bog pool community M17 <i>Trichophorum germanicum</i> – <i>Eriophorum vaginatum</i> blanket mire M19 <i>Calluna vulgaris</i> – <i>Eriophorum vaginatum</i> blanket mire M20 <i>Eriophorum vaginatum</i> blanket mire M25a^ <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire
7140 Transition mires and quaking bogs	M4 <i>Carex rostrata</i> - <i>Sphagnum fallax</i> mire
7230 Alkaline fens	M10 <i>Carex dioica</i> - <i>Pinguicula vulgaris</i> mire

Further details on the inclusion or omission of certain NVC communities/sub-communities and/or Annex I types are also provided below.

6.3.2 7130 Blanket bog

The blanketing of the ground with a variable depth of peat gives the habitat type its name and results in the various morphological types according to their topographical position. Blanket bogs show a complex pattern of variation related to climatic factors, particularly illustrated by the

¹³ <https://sac.jncc.gov.uk/habitat/>

variety of patterning of the bog surface in different parts of the UK. Such climatic factors also influence the floristic composition of bog vegetation.

‘Active’ bogs are defined as supporting a significant area of vegetation that is normally peat-forming. Typical species include the important peat-forming species, such as *Sphagnum* spp. and *Eriophorum* spp., or *Molinia caerulea* in certain circumstances, together with *Calluna vulgaris* and other ericaceous species. The most abundant NVC blanket bog types are M17, M18, M19, M20 and M25.

Annex I type 7130 Blanket bog therefore correlates directly with a number of NVC communities within the survey area such as the M17, M19 and M20 mires. However, 7130 Blanket bog can also include bog pool communities (M1-M3) where these occur within blanket mires such as M17-M20. As such M2 within the survey area are also assigned to the blanket bog Annex I type, as they are often associated with areas of M17, M19 and M20 mire.

As noted above, M25 mire can also fall within the blanket bog Annex I type, usually where the underlying peat depth is greater than 0.5 m and the habitat is wet and contains peat forming species. These areas (denoted here as M25a[^] - see Section 5.6.2) have also been classified as potential Annex I blanket bog, to represent a worst-case scenario.

Further surveys of the peatland and a peatland condition assessment were also carried out for the Proposed Development – see **Annex D**.

6.3.3 7140 Transition mires and quaking bogs

All examples of M4 *Carex rostrata* - *Sphagnum fallax* mire within the survey area were assigned to the Annex I type Transition mires and quaking bogs. The term ‘transition mire’ relates to vegetation that in floristic composition and general ecological characteristics is intermediate between acid bog and alkaline fen.

6.3.4 7230 Alkaline fens

Alkaline fens consist of a complex assemblage of vegetation types characteristic of sites where there is tufa and/or peat formation with an elevated water table and a calcareous base-rich water supply. The core vegetation is short sedge mire. All examples of M10 mire in the survey area fall within this Annex I habitat type.

6.3.5 4010 Northern Atlantic wet heaths with *Erica tetralix*

Wet heath usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. The vegetation is typically dominated by mixtures *Erica tetralix*, *Calluna vulgaris*, grasses, sedges and *Sphagnum* bog-mosses. All examples of M15 wet heath were included within the 4010 Northern Atlantic wet heaths category.

6.3.6 4030 European dry heaths

European dry heaths typically occur on freely-draining, acidic to circumneutral soils with generally low nutrient content. Ericaceous dwarf shrubs dominate the vegetation. The most common dwarf shrub is *Calluna vulgaris*.

The dry heath communities recorded – H10, H12 H9-H12, and H21 – all fall within this Annex I type. These NVC types can also be included within the Annex I type H4060 Alpine and Boreal heaths, but only where they are at higher altitudes and include arctic-alpine floristic elements. These communities within the survey area are lower altitudinal examples so they all fall under the 4030 European dry heaths Annex I type.

The most common forms of dry heath in the survey area, as noted in the community descriptions above, are species-poor, relatively botanically impoverished forms of *Calluna* dominated heath.

6.3.7 6230 Species-rich *Nardus* grassland, on siliceous substrates in mountain areas

Species-rich *Nardus* grasslands on siliceous substrates in mountain areas (and submountain areas in continental Europe) tend to develop where there is flushing through base-rich strata on siliceous bedrock. These may include moderately base-rich metamorphic and igneous rocks. Species-rich *Nardus* grasslands on limestone are excluded from the definition of this Annex I habitat because limestone lacks silica. CG10 *Festuca ovina* – *Agrostis capillaris* – *Thymus polytrichus* grassland belongs within the species-rich *Nardus* grassland Annex I habitat that occurs in the UK. This Annex I type is of very low and restricted cover within the survey area and is accounted for by some very small areas of CG10 (see Section 5.3.3 above).

6.4 Scottish Biodiversity List Priority Habitats

The SBL is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. The SBL was published in 2005 to satisfy the requirement under Section 2(4) of The Nature Conservation (Scotland) Act 2004.

The SBL identifies habitats which are the highest priority for biodiversity conservation in Scotland: these are termed ‘priority habitats’. Some of these priority habitats are quite broad and can correlate to many NVC types.

The relevant SBL priority habitat types (full descriptions of which can be found on the NatureScot website¹⁴), and associated NVC types recorded within the survey area are as follows:

- Wet woodland: W6, W7;
- Upland oakwoods: W11 and W17 (where oak forms >30% of canopy cover);
- Lowland mixed deciduous woodland: W10;
- Blanket bog: M17, M19, M20, and M2 (M2 where associated with M17-M20), and M25a^ where peat depth is greater than 0.5m;
- Upland flushes, fens and swamps: M4, M6, M10, M23a and M27;
- Upland heathland: M15, H9, H9-H12, H10, H12 and H21; and
- Upland calcareous grassland: CG10.

These SBL priority habitats correspond with UK Biodiversity Action Plan (BAP) Priority Habitats¹⁵.

¹⁴ <https://www.nature.scot/scotlands-biodiversity/habitat-definitions>

¹⁵ <http://jncc.defra.gov.uk/page-5718>

6.5 Sensitivity Summary

Table 6-3 provides a summary of all the NVC communities and non-NVC types recorded within the survey area and any associated habitat sensitivities as described in the sections above.

Table 6-3 Summary of study area communities and sensitivities

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat Type
Mires & Wet Heath			
M2	-	7130 Blanket bogs (examples associated with M17-M20)	Blanket bog
M4	-	7140 Transition mires and quaking bogs	Upland flushes, fens and swamps
M6a, M6b, M6c, M6d	High	-	Upland flushes, fens and swamps
M15b, M15d	Moderate	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	Upland heathland
M17	-	7130 Blanket bogs	Blanket bog
M19	-	7130 Blanket bogs	Blanket bog
M20, M20b	-	7130 Blanket bogs	Blanket bog
M23, M23a, M23b	High	-	Upland flushes, fens and swamps (applies to M23a only)
M25, M25a, M25a^,	Moderate	7130 Blanket bogs (applies to M25a^ where peat depth >0.5 m)	Blanket bogs (applies to M25a^ where peat depth >0.5 m)
M27	Moderate	-	Upland flushes, fens and swamps
Dry Heaths			
H9, H9c	-	4030 European dry heaths	Upland heathland
H10, H10a, H10c	-	4030 European dry heaths	Upland heathland
H12, H12a, H12b	-	4030 European dry heaths	Upland heathland
H21	-	4030 European dry heaths	Upland heathland
H9 – H12	-	4030 European dry heaths	Upland heathland
Calcifugous Grasslands			
CG10	-	6230 Species-rich <i>Nardus</i> grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe)	Upland calcareous grassland
U4, U4a, U4b	-	-	-
U5, U5a	-	-	-

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat Type
U6	Moderate	-	-
U20, U20a, U20b, U20c	-	-	-
Mesotrophic Grasslands			
MG1	-	-	-
MG6, MG6a	-	-	-
MG9a	Moderate	-	-
MG10, MG10a	Moderate	-	-
Woodland & Scrub			
W4, W4c	-	-	-
W6	Moderate	-	Wet woodland
W7, W7c	High	-	Wet woodland
W9	-	-	-
W10	-	-	Lowland mixed deciduous woodland
W11	-	-	Upland oakwoods ¹⁶
W17, W17b	-	-	Upland oakwoods ¹⁶
W23	-	-	-
W24	-	-	-
W25	-	-	-
Vegetation of Open Habitats			
OV24	-	-	-
OV25	-	-	-
Non-NVC Types			
BD	-	-	-
BG	-	-	-
BP	-	-	-
CF	-	-	-
CP	-	-	-
Je	Moderate	-	-
Ja	Moderate	-	-
RW	-	-	-
SBT	-	-	-
SCT	-	-	-

¹⁶ where oak forms >30% of canopy cover.

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat Type
SW	-	-	-
YCP	-	-	-

7 SUMMARY

MacArthur Green carried out NVC and habitat surveys within the survey area from 10th to 13th October 2022, 11th to 14th July 2023, 31st October 2023, 1st to 2nd November 2023 and 7th May 2024 in order to identify those areas of vegetation communities with the greatest ecological or conservation interest.

In total 37 NVC communities were recorded within the respective survey area along with various associated sub-communities; several non-NVC habitat types are also present, in particular coniferous plantation woodland, which is extensive.

Outwith the coniferous plantation areas, the survey area is mainly open upland habitats, the most common and widespread making up the bulk of the landscape are marsh/marshy grassland wet modified bog and bracken. Throughout these common habitat types are patches and pockets of several other habitat types such as woodland, acid grassland, neutral grassland, wet and dry heath, flushes, and blanket bog.

Although some large relatively homogeneous stands of vegetation occur, most of the communities often form complex mosaics and transitional areas across the survey area.

The survey results have also been compared to a number of sensitivity classifications, indicating the presence of Annex I, SBL and potential GWDTE habitats, as summarised in **Table 6-3**.

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ANNEX A. NVC TARGET NOTES

A number of target notes were also made during surveys, often to pinpoint springs/flushes, or an area or species of interest, these target notes are shown on **Figure 8.3** and detailed within Table A-1 below. A representative sample of corresponding target note photographs is provided in **Annex B**.

Table A-1 Survey area target notes

Target Note ID	Easting	Northing	NVC Community	Description	Photo Reference
1	242674	574021	M2	Bog pool containing <i>Sphagnum cuspidatum</i> and <i>Sphagnum fallax</i> .	B-1
2	242633	574591	M2	Small bog pool containing <i>Sphagnum fallax</i> .	
3	240752	572147	M6d	Small flush (2x5 m) dominated by <i>Juncus acutiflorus</i> and <i>Myrica gale</i> . <i>Sphagnum</i> abundant. <i>Molinia caerulea</i> present.	
4	241758	571606	M2	Bog pool beside lochan containing <i>Sphagnum cuspidatum</i> and <i>Sphagnum fallax</i> .	
5	242351	573515	M10a	Flush with <i>Narthecium ossifragum</i> , small <i>Carex</i> spp., <i>Pinguicula vulgaris</i> , <i>Drosera rotundifolia</i> and 'brown mosses'.	B-2
6	242301	573552	M10a	Flush with <i>Narthecium ossifragum</i> , small <i>Carex</i> spp., <i>Pinguicula vulgaris</i> , <i>Drosera rotundifolia</i> and 'brown mosses'.	
7	240903	572027	M10a	Flush with small <i>Carex</i> spp. and <i>Pinguicula vulgaris</i> .	
8	240863	571532	M2	<i>Sphagnum fallax</i> filled bog pool.	
9	241996	570559	M2	Bog pool containing <i>Sphagnum fallax</i> , approximately 8x4 m.	
10	241643	570314	M10	Flush containing <i>Pinguicula vulgaris</i> , <i>Eriophorum angustifolium</i> , <i>Drosera rotundifolia</i> and <i>Trichophorum germanicum</i> . Approximately 1x5 m.	
11	243688	570565	n/a	Mature <i>Sorbus aucuparia</i> close to track edge.	

ANNEX B. TARGET NOTE PHOTOGRAPHS

The following photographs correlate to the target notes described within **Annex A, Table A-1**. Photographs are not provided here for all target notes, due to the similarity in many photographs.

Photo B-1 Target Note 1 – M2 Bog Pool



Photo B- 2 Target Note 5 – M10a Flush



ANNEX C. GENERAL COMMUNITY PHOTOGRAPHS

The following selected photographs are provided to give a visual representation to several of the community types present within the survey area.

Photo C-1 M20 mire typical of the survey area



Photo C-2 Mosaic of M15 and M25 with abundant self-seeded conifers



Photo C-3 Extensiveness of self-seeded conifers in south of the Site



Photo C-4 Lightly grazed M15 wet heath in south of the Site



Photo C-5 Heavily grazed M15 in north of the Site



Photo C-6 U5 grassland



Photo C-7 M23 rush mire



Photo C-8 M6d flush



Photo C-9 Wet heath – acid grassland mosaic



Photo C-10 MG10 rush pasture



Photo C-11 M25a^ *Molinia mire*



Photo C-12 M19 bog



ANNEX D. PEATLAND CONDITION ASSESSMENT

Introduction

Following completion of NVC surveys and the identification of priority peatland communities on-site, according to NatureScot Guidance¹⁷, further peatland condition assessment (PCA) surveys were undertaken for the Proposed Development.

Study Area

The PCA study area covered areas within the Site mapped from the habitat surveys as E1.6.1 blanket bog, E1.7 wet modified bog, D2 wet dwarf shrub heath, and mosaics containing these same habitat types (**Figure 8.5**).

Sampling Strategy

Sampling and survey locations were distributed as follows:

- on a 200 m grid across the PCA study area;
- a sample at each turbine location, borrow pit, or other compounds regardless of prevailing habitat type (but excluding areas of conifer plantation); and
- a sample every 250 m along proposed new tracks within the PCA study area.

However, due to the quite fragmented and patchy nature of the peatland habitats within the Site (as per **Figure 8.3**), the above sampling strategy did not fully cover all peatland habitat parcels within the Site. Therefore, several additional sample locations were determined from a desk-based review to cover such areas. This resulted in the generation of a total of 112 PCA sample locations, as shown on **Figure 8.5**.

Survey Methodology

MacArthur Green has developed a bespoke PCA methodology to gather a range of pertinent data relating to peatland condition, taking cognisance of NatureScot's relevant guidance and template for assessment of peatlands¹⁷, Peatland Action condition criteria and guidance¹⁷, JNCC guidelines on the selection of biological SSSIs¹⁸, and other likely relevant variables from professional judgement and experience.

At each sample location the following data was collected:

1. The most applicable or best-fit category of the ten Peatland Action Peatland Condition Categories¹⁷;
2. In a 30 m sample area around the survey location the following data was collected:
 - a. Presence/absence of manmade drains, if present then:
 - i. Whether they are open or occluded; and
 - ii. If they have eroded through to the underlying substrate.

¹⁷ <https://www.nature.scot/doc/peatland-action-peat-depth-and-peat-condition-survey-guidance-and-recording-form-guidance> (accessed July 2024).

¹⁸ JNCC (1994). Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 8 Bogs. JNCC, Peterborough <https://hub.jncc.gov.uk/assets/20534790-bb45-4f33-9a6c-2fe795fb48ce>

- b. Presence/absence of peat cutting;
 - c. Presence/absence of a natural surface pattern;
 - d. Presence/absence of wood/scrub invasion;
 - e. Presence/absence of Sphagna-rich ridges, if present then:
 - i. DAFOR¹⁹ scale to indicate abundance.
 - f. Presence/absence of *Sphagnum-Betula nana* ridges;
 - g. Presence/absence of *Sphagnum fuscum* / *S. austinii* hummocks;
 - h. Presence/absence of peat mounds;
 - i. Presence/absence of *Rhynchospora fusca*;
 - j. Presence/absence of bog pools;
 - k. Presence/absence of muirburn, if present then:
 - i. Severity of muirburn – High, Moderate or Low.
 - l. Presence of bare peat in m² (0, 0-0.5, 0.5-2, or >2);
 - m. Presence/absence of peat hags and/or gullies, if present then:
 - i. Is there erosion through to the underlying substrates.
 - n. Presence/absence of peat pans;
 - o. Evidence of large herbivore grazing, trampling or ground poaching;
 - p. Impact level of any *Calluna vulgaris*/other dwarf shrub browsing – High, Moderate or Low.
3. To determine the cover of peat forming species, or other particular indicator species, at each sample a 2 m x 2 m quadrat was sampled to determine the following:
- a. Approximate percentage cover of the following species – *Calluna vulgaris*, *Eriophorum vaginatum*, *Eriophorum angustifolium*, *Trichophorum germanicum*, *Molinia caerulea*, *Vaccinium myrtillus*, *Juncus* spp., and grasses;
 - b. The presence/absence of *Erica tetralix*, *Empetrum nigrum*, *Vaccinium vitis-idaea*, *Vaccinium oxycoccos*, *Drosera* spp., *Rubus chamaemorus* and *Betula nana*;
 - c. In the basal layer the approximate percentage cover of the following – bare ground/peat, *Sphagna*, *Cladonia* spp. lichens, *Racomitrium lanuginosum*, *Polytrichum commune*, and Other non-*Sphagnum* mosses; and
 - d. *Sphagnum* spp. present.
4. Notes – any further notes or sample location specific information relevant to peatland condition.

Survey Dates

PCA surveys were undertaken from 06 May 2024 to 08 May 2024 inclusive.

¹⁹ DAFOR = Dominant, Abundant, Frequent, Occasional, Rare.

Results and Discussion

Peatland Action Peatland Condition

Table D-1 details the number of survey samples that fell within each Peatland Action Condition Category recorded during surveys (N.B. only categories that were recorded are shown). The results are also displayed on **Figure 8.5**.

Table D-2 Peatland Action Condition Category

Peatland Action Condition Category	Number of Samples	% of Samples
Actively Eroding: Hagg/Gully	1	0.9
Drained: Artificial	5	4.5
Drained: Hagg/Gully	2	1.8
Modified	96	85.7
N/A (not peatland)	8	7.1
TOTAL	112	100

As can be seen from **Table D-1**, most of the peatland within the Site would be considered ‘Modified’, with no ‘Near-natural’ peatland recorded. Further information on the nature of the peatland present, particularly the prevalence of Modified peatland is discussed in the following sections.

Peatland Condition Variables

Of the 112 survey locations sampled in the PCA survey eight were not regarded as being present on peatland and are therefore excluded from the following analyses. Of the 104 peatland samples the following summary information has been gathered from the data:

- Manmade drains were recorded at just five sample locations and were widely scattered, mostly in the north-central part of the Site, with no obvious or systematic intensive historic moor grip drainage evident. Of these five drains, three were considered open and two were occluded. Two of the three open drains were cut through to the underlying substrates.
- There is no evidence of peat cutting within the Site.
- No areas were considered to have a natural surface pattern (as per JNCC, (1994)).
- Woodland and scrub invasion is commonplace across the southern section of the Site, nearly all samples recorded as having woodland/scrub invasion or encroachment onto peatland (see **Figure 8.6**). This is mostly a result of self-seeded non-native conifers colonising the peatland due to the abundant nearby seed source presented by the surrounding conifer plantation areas. The proliferation of self-seeded conifers can be seen in **Annex C, Photos C-2, C-3, C-4, C-11 and C-12**.
- Sphagna-rich ridges were considered present at 62 of the 104 peatland samples. However, when present were not abundant nor extensive, and also were often comprised of a single common species (see further analysis below regarding *Sphagnum* spp.). In terms of abundance the following additional data was recorded at each relevant sample location using the DAFOR scale, indicating the lack of abundant Sphagna-rich ridges:

- Dominant – 0 samples;
 - Abundant – 0 samples;
 - Frequent – 0 samples;
 - Occasional – 19 samples; and
 - Rare – 43 samples.
- None of the following were recorded at sample locations or incidentally throughout the Site - *Sphagnum-Betula nana* ridges, *Sphagnum fuscum* / *S. austinii* hummocks, peat mounds, or *Rhynchospora fusca*.
 - Bog pools were not recorded at any sample locations, however as noted in Section 5.6.1 above, rarely some isolated M2 bog pools were recorded during the NVC surveys.
 - There is no evidence of muirburn at the Site.
 - Bare peat was recorded at 11 sample locations (eight samples of 0-0.5 m² and three samples 0.5-2 m²).
 - Peat hags and/or gully was recorded at three sample locations (none through to underlying substrate).
 - No peat pans recorded.
 - Evidence of grazing, trampling or poaching by large herbivores was present throughout the Site, with this recorded at all 104 peatland sample locations. Where *Calluna vulgaris* or other dwarf shrubs were present at a sample location (n = 96) an assessment was made as to the level of browsing impact (using several criteria contained within MacDonald *et al.* (1998)). The results indicated that grazing impact was **High** at 34 samples, **Moderate** at 26 samples and **Low** at 36 samples. Higher browsing impact appears in the north of the Site which is more intensively grazed by sheep, and this would appear to be the case historically too, as many of the peatland samples here that contained no dwarf shrubs were present on the M20 NVC community (see Section 5.6.2) where a long history of grazing has removed the sub-shrub component of the vegetation and which has resulted in a mire dominated by a sward of *Eriophorum vaginatum*. The distribution of grazing impact levels is shown on **Figure 8.7**.

Peat Forming Vegetation & Indicator Species

Table D-2 below presents the data on certain species abundance and cover as per part 3a of the survey methodology described above; **Table D-3** summarises the data collected as part of 3b, **Table D-4** presents the information gathered as part of 3c, and **Table D-5** summarises the data collected as part of 3d of the above methodology.

The abundance and distribution of some of the key and most common peatland foliar species, i.e., *Calluna vulgaris*, *Eriophorum vaginatum* and *Molinia caerulea* is shown in **Table D-2**. *Calluna vulgaris* is generally of low abundance and cover within the Site. It was recorded at 74 of 104 quadrats, although only three quadrats recorded 50% cover or more; these were located in the south of the Site and generally correlated with less grazed areas of M15/M25a communities. *Eriophorum vaginatum* was recorded at 81 of 104 quadrats, again cover was often relatively low, with just 19 quadrats with an estimated cover of 30% or more. All 19 of these quadrats were located in the more grazed north of the Site, and generally correspond to the areas of M20 mire. *Molinia caerulea* was

recorded at 82 of 104 quadrats, with the higher coverage recorded in the south of the Site and correlating to areas of M15 and M25. The north of the Site only contained small amounts of *Molinia caerulea*. Other typical mire species such as *Trichophorum germanicum* and *Eriophorum angustifolium* were generally only occasionally present and in very low cover, whereas grasses were common within quadrats in the north of the Site (**Table D-2**).

As per **Table D-3**, *Vaccinium vitis-idaea*, *Vaccinium oxycoccos*, *Drosera* spp., *Rubus chamaemorus* and *Betula nana* were not recorded at the Site. *Erica tetralix* was recorded at 52% of samples, and *Empetrum nigrum* at 25% of samples.

Figure 8.8 show the distribution and abundance of Sphagna. Sphagna were recorded at 76 (73.1%) of sample locations, with the most common species being *S. capillifolium*, *S. fallax* and *S. papillosum* (**Table D-5**). Sphagna abundance was generally low, with just 25 quadrats with a 20% or more basal coverage of Sphagna. As per **Figure 8.8**, Sphagna abundance is low throughout the south of the Site and is generally low in the north of the Site, with areas of relatively higher *Sphagnum* spp. cover being found along the plateau peatland ridge around Sheucanower, Benailsa and down towards Black Burn.

Polytrichum commune was recorded at 43 sample locations, occasionally in relatively high cover (**Table D-4**). *Polytrichum commune* is often associated with some of disturbance and negative influences on mire vegetation, e.g., trampling. The cover of other non-*Sphagnum* mosses is also generally high across the Site (**Table D-4**), indicating the relatively dry nature of the mire present.

Summary

PCA surveys undertaken for the Proposed Development have shown the peatland within the Site to comprise predominately of Modified bog (**Figure 8.5**).

The various data collected, and summarised above, generally indicates the peatland on-site lacks the key positive or desirable indicators that would suggest the priority peatland communities present are of national interest, as per NatureScot's template for assessment of peatland provided in the respective guidance¹¹. Whilst there are variable amounts of peatland with peat forming species present, there are various indicators of negative impact as well, for instance the amount of wood/scrub invasion on peatland (**Figure 8.6**) and the levels of grazing impact (**Figure 8.7**). The PCA data collected, and the consideration of peatland condition, influencing factors, and distribution has indicated there is potential for peatland restoration measures at the Site, and the PCA has helped to inform certain proposals and prescriptions within the Outline Biodiversity Enhancement and Management Plan (OBEMP) (see **Technical Appendix 8.6**).

Table D-2 Foliar Cover

Sample ID ²⁰	Sample Type ²¹	<i>C. vulgaris</i>	<i>E. vaginatum</i>	<i>E. angustifolium</i>	<i>T. germanicum</i>	<i>M. caerulea</i>	<i>V. myrtillus</i>	<i>Juncus</i> spp.	Grasses
001	Grid/general study area	3	2	0	3	2	4	0	75
002	Grid/general study area	2	2	0	15	2	5	1	60
003	Grid/general study area	0	5	0	0	0	1	0	10
004	Grid/general study area	3	20	1	5	0	2	8	35
006	Grid/general study area	0	40	0	1	0	2	25	5
007	Grid/general study area	1	15	1	10	2	2	5	15
008	Turbine	1	5	0	8	3	8	15	20
009	Grid/general study area	0	2	0	0	1	0	70	5
010	Grid/general study area	0	10	1	2	5	15	1	2
011	Track	10	15	1	12	5	4	5	50
012	Grid/general study area	0	5	0	0	1	2	10	0
013	Grid/general study area	0	2	0	1	70	0	5	2
014	Track	5	5	2	8	15	2	2	15
015	Grid/general study area	5	12	1	8	5	1	2	60
016	Track	0	5	0	10	5	6	5	60
017	Track	0	10	0	0	30	0	5	1
018	Grid/general study area	1	10	0	5	0	1	1	5
019	Grid/general study area	3	5	0	4	2	4	2	80
020	Grid/general study area	0	15	0	5	10	8	5	5
021	Grid/general study area	10	20	2	3	0	5	3	0
022	Grid/general study area	10	20	0	2	0	10	0	0
023	Grid/general study area	1	2	0	10	0	3	0	0
024	Grid/general study area	0	0	0	0	2	0	50	20
025	Grid/general study area	5	5	1	2	0	1	5	2
026	Grid/general study area	2	0	0	1	30	0	10	5
027	Grid/general study area	2	15	0	1	0	0	20	2
028	Grid/general study area	15	10	1	5	2	5	0	20
029	Turbine	25	20	2	8	1	2	0	1
030	Track	10	20	1	2	10	0	1	5
031	Grid/general study area	1	45	0	0	2	15	20	0
032	Grid/general study area	5	5	0	0	0	10	1	5
033	Grid/general study area	25	45	1	1	10	2	0	0
035	Grid/general study area	2	60	0	1	0	10	5	1
036	Grid/general study area	30	10	1	2	5	2	1	2

²⁰ Sample ID can be cross-referenced to **Figure 8.5** for location.

²¹ The sample type refers to whether the survey location was a grid/general study area sample or specific to an infrastructure location, such as turbine, track, or other ancillary infrastructure.

Sample ID ²⁰	Sample Type ²¹	<i>C. vulgaris</i>	<i>E. vaginatum</i>	<i>E. angustifolium</i>	<i>T. germanicum</i>	<i>M. caerulea</i>	<i>V. myrtillus</i>	<i>Juncus</i> spp.	Grasses
037	Grid/general study area	0	5	0	0	10	2	15	50
038	Grid/general study area	20	55	2	2	0	25	2	0
039	Track	5	70	1	2	0	2	0	2
040	Grid/general study area	30	25	0	3	2	10	0	0
041	Borrow pit	3	50	0	2	1	10	2	5
043	Grid/general study area	1	0	0	25	2	5	0	20
044	Grid/general study area	30	15	0	5	15	5	0	0
045	Grid/general study area	0	20	0	0	0	15	5	25
046	Grid/general study area	5	55	0	2	0	20	0	2
047	Grid/general study area	1	55	0	5	1	15	1	5
048	Grid/general study area	10	0	0	5	10	0	5	70
049	Grid/general study area	2	10	1	0	3	3	0	1
050	Track	0	10	0	1	0	2	15	60
051	Turbine	5	2	0	10	0	2	0	50
052	Grid/general study area	5	20	1	0	2	20	0	15
053	Grid/general study area	2	20	0	0	5	3	5	0
054	Grid/general study area	0	1	0	0	30	0	10	2
055	Grid/general study area	0	40	0	0	0	35	0	5
056	Grid/general study area	0	0	0	0	0	0	85	1
057	Grid/general study area	0	0	0	0	1	0	80	2
058	Grid/general study area	1	5	0	0	15	3	2	0
059	Grid/general study area	10	2	0	0	95	0	2	0
060	Grid/general study area	0	20	0	0	5	15	2	30
061	Grid/general study area	5	5	0	4	10	10	1	20
062	Track	0	2	0	5	2	3	1	0
063	Turbine	0	10	0	0	10	5	0	0
064	Grid/general study area	5	15	1	0	2	2	0	0
065	Grid/general study area	3	20	0	2	1	30	0	0
066	Grid/general study area	0	1	0	0	4	0	35	10
067	Grid/general study area	2	1	20	1	2	5	0	0
068	Grid/general study area	5	10	0	0	2	5	0	0
069	Grid/general study area	5	10	0	0	10	20	5	20
070	Grid/general study area	0	15	0	2	5	5	0	20
071	Grid/general study area	5	60	1	3	3	4	0	5
072	Grid/general study area	0	30	0	1	5	2	10	0
073	Grid/general study area	10	12	0	5	5	3	3	10
075	Grid/general study area	12	30	0	0	3	3	0	0
076	Track	10	65	0	15	1	5	0	0
077	Turbine	15	35	0	30	2	5	4	5

Sample ID ²⁰	Sample Type ²¹	<i>C. vulgaris</i>	<i>E. vaginatum</i>	<i>E. angustifolium</i>	<i>T. germanicum</i>	<i>M. caerulea</i>	<i>V. myrtillus</i>	<i>Juncus</i> spp.	Grasses
078	Grid/general study area	35	1	1	15	15	3	1	20
079	Grid/general study area	0	40	1	0	2	6	1	0
080	Grid/general study area	1	25	1	4	10	1	0	0
081	Grid/general study area	15	30	1	1	0	3	2	0
082	Grid/general study area	10	65	1	2	0	1	0	0
084	Grid/general study area	15	25	1	1	0	1	0	0
085	Grid/general study area	2	0	0	0	35	0	25	25
087	Grid/general study area	0	55	1	3	2	2	0	5
089	Grid/general study area	0	2	0	0	70	3	4	15
090	Grid/general study area	0	0	0	0	85	2	0	0
091	Track	45	0	0	0	90	0	0	0
092	Grid/general study area	0	0	0	0	90	2	3	2
093	Grid/general study area	20	5	0	0	30	65	0	0
094	Grid/general study area	10	0	0	0	40	70	0	0
095	Grid/general study area	75	25	0	0	5	2	0	0
096	Grid/general study area	0	5	0	0	20	75	0	0
097	Grid/general study area	25	2	0	0	65	0	5	2
098	Grid/general study area	15	0	0	0	90	20	0	0
100	Track	5	0	0	0	95	0	3	0
101	Grid/general study area	5	5	0	0	20	25	0	0
102	Turbine	25	0	0	0	70	5	3	0
103	Grid/general study area	15	0	0	0	90	2	0	0
104	Grid/general study area	0	0	0	0	25	65	0	0
105	Grid/general study area	50	0	0	0	85	2	3	0
106	Grid/general study area	10	5	0	0	80	15	0	0
107	Grid/general study area	10	0	0	0	75	15	2	0
108	Grid/general study area	5	0	0	2	25	15	0	25
109	Turbine	5	0	0	0	75	10	0	0
110	Track	20	0	0	0	40	30	0	0
111	Grid/general study area	80	0	0	1	10	0	0	0
112	Grid/general study area	30	0	0	0	50	10	2	0

Table D-3 Other Peatland Species Presence/Absence

Species	No. Samples Present	No. Samples Absent
<i>Erica tetralix</i>	54	50
<i>Empetrum nigrum</i>	26	78
<i>Vaccinium vitis-idaea</i>	0	104
<i>Vaccinium oxycoccos</i>	0	104
<i>Drosera</i> spp.	0	104
<i>Rubus chamaemorus</i>	0	104
<i>Betula nana</i>	0	104

Table D-4 Basal Cover

Sample ID ²⁰	Sample Type ²¹	Bare ground /peat	Sphagna	<i>Cladonia</i> spp. lichens	<i>Racomitrium lanuginosum</i>	<i>Polytrichum commune</i>	Other Non-Sphagnum mosses
001	Grid/general study area	0	0	0	0	0	80
002	Grid/general study area	2	3	0	0	0	0
003	Grid/general study area	0	50	0	0	45	2
004	Grid/general study area	0	15	0	5	0	65
006	Grid/general study area	0	30	0	0	10	15
007	Grid/general study area	0	20	0	0	12	50
008	Turbine	0	2	0	0	0	0
009	Grid/general study area	0	10	0	0	3	10
010	Grid/general study area	0	5	0	0	2	30
011	Track	0	0	0	0	0	40
012	Grid/general study area	0	2	0	0	0	60
013	Grid/general study area	0	1	0	0	1	10
014	Track	1	0	0	0	0	70
015	Grid/general study area	0	0	0	10	0	50
016	Track	0	0	0	0	0	80
017	Track	0	0	0	0	0	90
018	Grid/general study area	0	1	0	0	0	2
019	Grid/general study area	0	0	0	2	0	70
020	Grid/general study area	0	0	0	0	0	70
021	Grid/general study area	0	55	0	0	0	30
022	Grid/general study area	0	5	0	0	0	15

Sample ID ²⁰	Sample Type ²¹	Bare ground /peat	Sphagna	Cladonia spp. lichens	Racomitrium lanuginosum	Polytrichum commune	Other Non-Sphagnum mosses
023	Grid/general study area	0	5	0	0	0	1
024	Grid/general study area	0	70	0	0	15	5
025	Grid/general study area	0	3	0	0	0	20
026	Grid/general study area	0	1	0	0	0	1
027	Grid/general study area	0	3	0	0	0	5
028	Grid/general study area	0	0	0	0	0	60
029	Turbine	0	85	1	0	0	10
030	Track	1	40	0	0	0	40
031	Grid/general study area	0	20	0	0	5	5
032	Grid/general study area	0	5	0	0	3	10
033	Grid/general study area	0	15	0	0	5	45
035	Grid/general study area	0	1	0	0	0	10
036	Grid/general study area	0	60	0	0	0	30
037	Grid/general study area	0	0	0	0	0	80
038	Grid/general study area	0	20	0	0	20	40
039	Track	0	55	0	0	0	5
040	Grid/general study area	0	5	0	0	0	70
041	Borrow pit	0	10	0	0	1	65
043	Grid/general study area	0	3	0	0	0	55
044	Grid/general study area	0	20	0	1	1	35
045	Grid/general study area	2	5	0	0	0	45
046	Grid/general study area	0	0	0	0	15	50
047	Grid/general study area	0	0	0	0	1	90
048	Grid/general study area	0	5	0	0	0	20
049	Grid/general study area	0	1	0	0	2	60
050	Track	0	0	0	0	0	80
051	Turbine	0	0	0	0	0	90
052	Grid/general study area	1	0	0	0	10	70
053	Grid/general study area	0	15	0	0	30	35
054	Grid/general study area	0	5	0	0	5	20
055	Grid/general study area	0	0	0	0	0	90
056	Grid/general study area	0	10	0	0	0	5
057	Grid/general study area	0	40	0	0	20	10
058	Grid/general study area	0	2	0	0	2	30
059	Grid/general study area	0	5	0	1	0	60
060	Grid/general study area	0	2	0	0	45	30
061	Grid/general study area	0	0	0	0	0	90
062	Track	0	1	0	0	0	10
063	Turbine	0	2	0	0	1	20

Sample ID ²⁰	Sample Type ²¹	Bare ground /peat	Sphagna	Cladonia spp. lichens	Racomitrium lanuginosum	Polytrichum commune	Other Non-Sphagnum mosses
064	Grid/general study area	0	70	0	0	5	5
065	Grid/general study area	0	5	0	0	2	25
066	Grid/general study area	1	20	0	0	10	15
067	Grid/general study area	0	1	0	0	3	5
068	Grid/general study area	0	3	0	0	0	5
069	Grid/general study area	0	45	0	0	10	30
070	Grid/general study area	0	1	0	0	20	65
071	Grid/general study area	0	3	0	0	45	25
072	Grid/general study area	0	60	0	0	15	5
073	Grid/general study area	1	10	0	0	20	30
075	Grid/general study area	0	50	0	0	5	20
076	Track	0	60	0	0	20	10
077	Turbine	1	0	0	0	0	75
078	Grid/general study area	1	0	0	0	0	60
079	Grid/general study area	0	40	0	0	15	25
080	Grid/general study area	0	20	0	0	30	40
081	Grid/general study area	0	20	0	0	0	60
082	Grid/general study area	0	80	0	0	1	10
084	Grid/general study area	0	60	0	0	0	25
085	Grid/general study area	0	15	0	0	4	55
087	Grid/general study area	0	60	0	0	15	25
089	Grid/general study area	0	5	0	0	10	35
090	Grid/general study area	2	5	0	0	0	10
091	Track	0	2	0	0	0	10
092	Grid/general study area	0	10	0	0	0	30
093	Grid/general study area	0	0	0	0	1	45
094	Grid/general study area	0	5	0	0	0	20
095	Grid/general study area	0	15	0	0	0	50
096	Grid/general study area	0	2	0	0	1	45
097	Grid/general study area	0	15	0	0	0	10
098	Grid/general study area	0	0	0	0	0	20
100	Track	0	2	0	0	0	35
101	Grid/general study area	1	0	0	0	2	50
102	Turbine	0	5	0	0	0	30
103	Grid/general study area	0	0	0	0	0	3
104	Grid/general study area	5	0	0	0	0	55
105	Grid/general study area	2	0	0	0	0	15
106	Grid/general study area	0	0	0	0	0	2
107	Grid/general study area	0	3	0	0	0	50

Sample ID ²⁰	Sample Type ²¹	Bare ground /peat	Sphagna	<i>Cladonia</i> spp. lichens	<i>Racomitrium lanuginosum</i>	<i>Polytrichum commune</i>	Other Non-Sphagnum mosses
108	Grid/general study area	0	1	0	0	0	30
109	Turbine	0	0	0	0	0	5
110	Track	0	0	0	0	0	20
111	Grid/general study area	0	2	1	0	0	10
112	Grid/general study area	0	1	0	0	0	10

Table D-5 Sphagnum Species

Sphagnum species	No. Samples Present (out of 104)
<i>Sphagnum capillifolium</i>	50
<i>Sphagnum fallax</i>	40
<i>Sphagnum palustre</i>	13
<i>Sphagnum papillosum</i>	38
<i>Sphagnum medium</i>	1
<i>Sphagnum tenellum</i>	1
<i>Sphagnum denticulatum</i>	1
<i>Sphagnum subnitens</i>	1