

Vale of Leven Wind Farm National Vegetation Classification & Habitats Survey

Technical Appendix 6.1

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CONTENTS

1	INTRODUCTION	1
2	THE SITE AND SURVEY AREA	1
2.1	Overview	1
2.2	Designated Sites	1
2.3	Ancient Woodland	2
2.4	Carbon and Peatland Map 2016.....	3
3	METHODOLOGY	4
3.1	National Vegetation Classification (NVC)	4
3.2	Phase 1 Habitat Characterisation	4
4	SURVEY DETAILS & LIMITATIONS.....	5
5	RESULTS	5
5.1	Summary of Habitat Types & NVC Communities.....	5
5.2	Woodland & Scrub	8
5.3	Grasslands & Marsh	10
5.4	Tall Herb & Fern.....	13
5.5	Heathland	13
5.6	Mire.....	14
5.7	Swamp, Marginal & Inundation Habitats	17
5.8	Open Water	17
5.9	Rock Exposure & Waste	17
5.10	Miscellaneous.....	17
5.11	Invasive Non-Native Species	18
5.12	Notable Species	18
6	EVALUATION OF BOTANICAL INTEREST	18
6.1	Overview	18
6.2	Groundwater Dependent Terrestrial Ecosystems (GWDTE)	18
6.3	Annex I Habitats.....	20
6.4	Scottish Biodiversity List Priority Habitats	23
6.5	Sensitivity Summary.....	24
7	SUMMARY.....	26
8	REFERENCES	28
	ANNEX A. NVC TARGET NOTES.....	29

ANNEX B.	TARGET NOTE PHOTOGRAPHS	32
ANNEX C.	GENERAL COMMUNITY PHOTOGRAPHS.....	37

LIST OF TABLES

Table 2-1 Designated sites with botanical qualifying features within 5 km of the Application Boundary	2
Table 5-1 Phase 1 habitat type equivalents of NVC communities and other habitats recorded	6
Table 6-1 Communities within the survey area which may potentially be classified as GWDTE.....	19
Table 6-2 Annex I Habitats and Corresponding NVC Communities.....	20
Table 6-3 Summary of survey area communities and sensitivities.....	24

LIST OF FIGURES

Figure 6.1:	Ecological Designated Sites and Ancient Woodland within 5 km
Figure 6.2:	Carbon and Peatland Map 2016
Figure 6.3:	National Vegetation Classification Survey Area and Survey Results
Figure 6.4:	Potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs) Survey Area and Survey Results

1 INTRODUCTION

MacArthur Green was commissioned by Vale of Leven Wind Farm Limited (the applicant) to carry out a National Vegetation Classification (NVC) and habitats survey for the proposed Vale of Leven Wind Farm, hereafter the Proposed Development.

The aim of the NVC survey was to identify and map the vegetation communities present within the survey area 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). This information is used to inform the wind farm design process and the ecological assessment for the Proposed Development's Environmental Impact Assessment Report (EIAR).

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

2 THE SITE AND SURVEY AREA

2.1 Overview

The Proposed Development is located within the Kilpatrick Hills, West Dunbartonshire. The nearest settlement to the Site is Bonhill. The land within the Site is dominated by upland moorland predominately used for grazing sheep. There are numerous minor watercourses on and around the Site and some of which, within the south-western part of the survey area, are located within steep gullies.

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 1450.4 hectares (ha). The survey area in many areas extends well beyond the Application Boundary, which covers 330.2 ha; this reflects earlier and larger areas of interest which have been refined down during the iterative design process, and also to provide sufficient survey buffers to account for the possible presence of potential GWDTE. The survey area and its juxtaposition with the Application Boundary is shown in **Figure 6.3**. The appropriate scale for the assessment of effects with regards habitat loss has been deemed to be the Application Boundary (as defined in **Chapter 6: Ecology**).

2.2 Designated Sites

There are two designated sites containing habitat related, or botanical, qualifying features within 100 m of the Site; these are Dumbarton Muir Site of Special Scientific Interest (SSSI) and Auchenroch Glen SSSI. There are a further five designated sites within 5 km of the Application Boundary.

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>

The details of, and relevant qualifying features for, each designation relevant to this Technical Appendix are detailed in **Table 2-1**; see also **Figure 6.1**.

Table 2-1 Designated sites with botanical qualifying features within 5 km of the Application Boundary

Designated Site	Distance from Application Boundary	Qualifying Feature	Last Assessed Condition & Date ⁴
Auchenreoch Glen SSSI	68 m	Lowland calcareous grassland	Favourable Maintained 19 August 2010
		Springs (including flushes)	Favourable Maintained 10 August 2013
Dumbarton Muir SSSI	75 m	Blanket bog	Unfavourable Recovering 02 August 2012
		Raised bog	Favourable Maintained 18 January 2011
Lang Craigs SSSI	1,352 m	Tall herb ledge	Favourable Recovered 2 August 2016
Blairbeich Bog SSSI	2,425 m	Raised bog	Unfavourable No change 17 July 2019
Inner Clyde SSSI	2,523 m	Saltmarsh	Favourable Maintained 16 Jun 2011
Caldarvan Loch SSSI	2,652 m	Eutrophic loch	Favourable Maintained 14 Jul 2009
Haw Craig – Glenarbuck SSSI	3,997 m	Rocky slopes (includes inland cliff, rocky outcrops, chasmophytic vegetation)	Favourable Declining 22 August 2017
		Upland mixed ash woodland	Unfavourable Declining 17 November 2000

2.3 Ancient Woodland

There are a large number of areas of ancient woodland (as present on the Ancient Woodland Inventory (AWI)) within 5 km of the Application Boundary, including one small area of shelterbelt woodland within the Application Boundary, and along the Site Access. There are larger stands surrounding the Application Boundary, e.g. in Murroch Glen, Hazel Glen and along Gallangad Burn east of Merkins Muir, with several further areas bordering the Site and Site Access; see **Figure 6.1**.

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

⁴ As per <https://sitelink.nature.scot/home>

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 majority of ancient woodland within the Application Boundary is categorised as 2a, with some small areas of 2b.

2.4 Carbon and Peatland Map 2016

The Carbon and Peatland Map 2016⁵ was consulted to determine likely peatland classes present within the Application Boundary. 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 6.2 indicates that, according to this predictive tool and map, there is an area of Class 1 peatland in the north-east of the Site around Lang Dyke (mostly mapped outwith the Application Boundary) and a larger area of Class 2 peatland north and west of Lang Dyke around Blairquhomrie Muir, Merkins Muir and Red Brae. Class 1 and Class 2 peatland areas are largely avoided by the Proposed Development, although there is some overlap with Class 1 peatland at T4 and Class 2 peatland at T2 (**Figure 6.2**). Much of the Site and the majority of the proposed infrastructure locations are on areas categorised as Class 3⁷ soils, with large areas of Class 0⁸ (mineral) soils in the west on steeply sloping ground.

A large section of the east of the Site is mapped as Class 5⁹ soils; however, this would seem to be a misclassification or error in the Carbon and Peatland Map data. The majority of this particular area is categorised as Class 5 soil (i.e., no peatland vegetation) but is also concurrently a large part

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>

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

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

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.

of the Dumbarton Muir SSSI, which is designated for blanket bog. The results of this NVC survey have also confirmed that this area is generally intact and active blanket bog vegetation on deep peat, and therefore should be considered Class 1 peatland rather than Class 5 as currently indicated.

3 METHODOLOGY

3.1 National Vegetation Classification (NVC)

The vegetation was surveyed by a suitably qualified and experienced surveyor 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 surveyor 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) 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.

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

Surveys were undertaken for the Proposed Development within the NVC survey area as follows:

- June and July 2020 (within the Site and wider survey area); and
- July 2022 (within the Site Access and associated survey buffer).

Surveys were therefore undertaken during the optimal survey period, and all areas of the Site and Site Access were accessible. The weather conditions were amenable to survey on each survey day; bright, dry and relatively light wind.

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.

5 RESULTS

5.1 Summary of Habitat Types & NVC Communities

41 NVC communities (and various associated sub-communities) and 11 non-NVC communities/types were recorded within the survey area, and these corresponded to 30 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 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
A1.2.2 Coniferous Plantation Woodland	CP Coniferous Plantation (non-NVC type)
A2.1/2.2 Scrub – Dense/Continuous & Scattered	W1x <i>Salix</i> spp. scrub (non-NVC type) W21 <i>Crataegus monogyna</i> – <i>Hedera helix</i> scrub W23 <i>Ulex europaeus</i> – <i>Rubus fruticosus</i> scrub
A3.1 Scattered Broadleaved Trees	SBT (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
B2.1 Unimproved Neutral Grassland	MG1 <i>Arrhenatherum elatius</i> grassland MG5 <i>Cynosurus cristatus</i> – <i>Centaurea nigra</i> grassland
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 MG7 <i>Lolium perenne</i> leys and related grasslands
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 M25b <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire <i>Anthoxanthum odoratum</i> sub-community 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
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 OV26 <i>Epilobium hirsutum</i> community OV27 <i>Chamerion angustifolium</i> community W24 <i>Rubus fruticosus</i> – <i>Holcus lanatus</i> underscrub

Phase 1 Habitats	NVC Communities & Other Non-NVC Habitats/Features Recorded
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
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 M3 <i>Eriophorum angustifolium</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 M32 <i>Philonotis fontana</i> – <i>Saxifraga stellaris</i> spring
E2.2 Basic Flush/Spring	M10 <i>Carex dioica</i> - <i>Pinguicula vulgaris</i> mire
E3.2 Fen – Basin Mire	M6 <i>Carex echinata</i> - <i>Sphagnum fallax/denticulatum</i> mire
F1 Swamp	S9 <i>Carex rostrata</i> swamp
G1 Open Water	SW Standing Water (non-NVC type)
G2 Running Water	RW Running Water (non-NVC type)
I1.1.2 Natural Inland Cliff - Basic	BG (non-NVC type)
J1.2 Amenity Grassland	OV23 <i>Lolium perenne</i> - <i>Dactylis glomerata</i> community PG Private Gardens & Lawns, Parks etc (non-NVC type)
J2.1.2 Intact Hedge - Species-poor	W21 <i>Crataegus monogyna</i> – <i>Hedera helix</i> scrub
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 6.3** which combines Phase 1 symbology with NVC data.

Several target notes (TNs) were also made during surveys, often to pinpoint areas or species of special interest. These target notes are shown in **Figure 6.3** 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 uncommon within the Application Boundary and of low total extent, being restricted to a few main relatively small areas generally around the edges of the Site. The largest and most continuous stand is associated with Murroch Glen, and there are other slightly more fragmented areas in the east of the Site associated with riparian woodland along Gallangad Burn and the lower reach of Finland Burn. Outwith these main areas patches of woodland are very small and patchy, and often associated with small riparian trees that have avoided grazing, for example the small patches in the incised minor watercourses around Hazel Glen. Most of these stands of woodland described above are also ancient woodland (see Section 2.3, **Annex A** and **Figure 6.1**). Along the Site Access semi-natural broadleaved woodland is found in patches in the survey buffer outwith the Application Boundary and is again mostly associated with areas of riparian woodland, there are also occasional mature scattered trees here, usually found as part of field boundaries in the more intensively managed Murroch Farm area.

The majority of woodland recorded in the survey area and within the Site is W11 *Quercus petraea* – *Betula pubescens* – *Oxalis acetosella* woodland. However, some small patches of W4 *Betula pubescens* – *Molinia caerulea* woodland, W7 *Alnus glutinosa* – *Fraxinus excelsior* – *Lysimachia nemoreum* woodland and W17 *Quercus petraea* – *Betula pubescens* – *Dicranum majus* woodland can be found as a small percentage of some woodland mosaic areas. Patches of the more base-rich W9 *Fraxinus excelsior* – *Sorbus aucuparia* – *Mercurialis perennis* woodland were found in the extensive woodland around Murroch Glen. Patches of W10 *Quercus robur* – *Pteridium aquilinum* – *Rubus fruticosus* woodland are found in the lower and more managed and improved ground to the very west around the Site Access.

The W11 in Murroch Glen is dominated by *Quercus petraea* as the main canopy species, whereas the other stands of W11 recorded tend to be more dominated by *Betula* spp. The larger more diverse stand of W11 around Murroch Glen, as well as containing much *Quercus petraea* and *Betula* spp. also contains varying but lesser amounts of *Sorbus aucuparia*, *Fraxinus excelsior*, *Acer pseudoplatanus*, *Fagus sylvatica*, *Crataegus monogyna*, *Ilex aquifolium*, and more occasional to rare *Prunus spinosa*, *Prunus avium*, *Alnus glutinosa*, *Larix decidua* and *Pinus sylvestris*. The scrub layer often includes patches of *Rubus fruticosus*, *Rubus idaeus*, *Hedera helix*, *Ulex europaeus* and *Cytisus scoparius*. The field layer often contained, depending on the location of survey (e.g. see the TN's in **Annex A**), some scattered *Dryopteris* spp., *Pteridium aquilinum*, *Anthoxanthum odoratum*, *Agrostis* spp., *Deschampsia cespitosa*, *Avenella flexuosa*, *Holcus mollis*, *Holcus lanatus*, *Potentilla erecta*, *Galium saxatile*, *Oxalis acetosella*, *Hyacinthoides non-scripta*, *Silene dioica*, *Viola riviniana*, *Digitalis purpurea*, *Ranunculus repens*, *Geranium robertianum*, *Stachys sylvatica*, *Luzula* spp., *Stellaria holostea*, *Geum urbanum* and *Brachypodium sylvaticum* (rare) with some of the more herbaceous species appearing where transitions to other woodland types such as W9 were present. Moss species present include *Kindbergia praelonga*, *Plagiothecium undulatum*, *Thuidium tamariscinum*, *Polytrichum formosum*, *Rhytidiadelphus triquetrus*, *Rhytidiadelphus squarrosus* and liverworts also present.

The usually smaller patches of generally *Betula* spp. dominated W11 also often contained lesser amounts of *Salix* spp. and *Sorbus aucuparia* with more occasional *Corylus avellana* and *Crataegus monogyna*. The field layer in these areas often being dominated by grasses and *Pteridium aquilinum* and less species-rich than the larger Murroch Glen woodland.

The small areas of W4 consisted of *Betula* spp., *Sorbus aucuparia* and *Salix* spp. (sometimes just *Salix* spp.) over a *Molinia caerulea* or bog species dominated field layer.

The small area of W17 recorded comprised a small patch of birch on a crag protected from grazing with a field layer including *Calluna vulgaris*, *Vaccinium myrtillus* and ferns.

The W7 recorded often comprised *Betula* spp., *Alnus glutinosa* and *Salix* spp. with occasional *Crataegus monogyna* over a *Juncus* spp. dominated field layer referable to marshy grassland communities (see Section 5.3.6 and **Annex A** TN 7).

The patches of W9 recorded were present as patches within the wider expanse of W11 in Murroch Glen and tended to be of the W9a Typical sub-community. The canopy in these areas is dominated by *Fraxinus excelsior* and *Acer pseudoplatanus* with an understory of *Corylus avellana* and unlike the nearby areas of W10 and W11 woodland there were obvious base-rich indicators present in the field flora, including *Circaea lutetiana* and in particular a carpeting of *Mercurialis perennis*.

Patches of W10 were in some instances recorded as the W10e *Quercus robur* - *Pteridium aquilinum* - *Rubus fruticosus* woodland, *Acer pseudoplatanus* - *Oxalis acetosella* sub-community. The W10 recorded was usually dominated by a mix of *Acer pseudoplatanus* and *Fraxinus excelsior*, often with a scattering of *Quercus* spp., *Corylus avellana*, *Crataegus monogyna*, *Ilex aquifolium*, *Salix* spp., *Sambucus nigra* and rarely *Ulmus glabra* and *Prunus avium*. The understorey and field flora often included *Hedera helix*, *Rubus fruticosus*, *Dryopteris* spp., *Holcus mollis*, *Urtica dioica*, *Aegopodium podagraria* and occasionally a little *Pteridium aquilinum*.

The majority of isolated scattered broadleaved trees were mature *Fraxinus excelsior* in the Murroch Farm area around the Site Access.

5.2.2 A1.2.2 Coniferous Plantation Woodland

The Site does not contain any coniferous plantation woodland, however there were a few small patches within the survey area, bordering the Application Boundary in the west (south-west of Nobleston Wood).

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

Scrub is sparse and of low cover within the Application Boundary, with the main and largest stand found in the upper reaches of Murroch Burn, north of Glendonachy. Outwith this area, areas of scrub are very small and patchy.

The majority of scrub present is dense patches of W23 *Ulex europaeus* – *Rubus fruticosus* scrub, and it is characteristically dominated by *Ulex europaeus*. Other than W23 there is some sparse and more scattered W21 *Crataegus monogyna* – *Hedera helix* scrub located in the lower section of Auchenreoch Glen. A single small patch of *Salix* spp. scrub that did not align with any NVC community was recorded as W1x.

5.2.4 A4.2 Recently Felled Coniferous Woodland

A single small area of recently felled conifer plantation was recorded in the survey area but outwith the Application Boundary just to the north-west of Black Linn Reservoir.

5.3 Grasslands & Marsh

5.3.1 B1.1 Unimproved Acid Grassland

Unimproved acid grassland was found to be scattered widely throughout the survey area with the most extensive and largest stands found on thin mineral soils and often intensively grazed and sloping ground in the south-west of the Site, in the areas around Hazel Glen, Auchenreoch, Glendonachy, Auchenreoch Glen and Murroch Glen. Outwith this core area of acid grassland, it tends to be found in small, fragmented patches scattered across the Site, with some slightly larger patches found at Doughnot Hill, Meikle White Hill and Little White Hill.

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

The U4 community often contained a variable mix of *Agrostis capillaris*, *Festuca ovina* and *Anthoxanthum odoratum*. The herbs *Potentilla erecta* and *Galium saxatile* are very 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*, *Veronica chamaedrys*, *Euphrasia officinalis*, *Prunella vulgaris*, *Campanula rotundifolia*, *Ranunculus repens*, *Cerastium fontanum*, *Achillea millefolium*, *Trifolium repens*, *Viola lutea*, *Luzula* spp., and *Cirsium* sp. Mosses are common, 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) or *Juncus squarrosus* (U6) obviously the dominant species.

5.3.2 B1.2 Semi-Improved Acid Grassland

Areas of semi-improved acid grassland are characterised by the U4b *Holcus lanatus*-*Trifolium repens* sub-community only and this was recorded only once on the dam slopes of Black Linn Reservoir (outwith the Application Boundary). The sward here is likely of historically seeded origin and tends to be dominated by a semi-improved assemblage which includes typical species such as *Holcus lanatus*, *Agrostis* spp., *Cynosurus cristatus*, *Lolium perenne*, *Trifolium repens* and *Ranunculus repens*.

5.3.3 B2.1 Unimproved Neutral Grassland

Unimproved neutral grasslands are very uncommon within the survey area, with only a few very small fragments within the Application Boundary. Most of the stands recorded are present in the survey buffer for the Site Access and associated with road verges and neglected grassland patches around the A813 road.

These neutral grassland patches were all of the MG1 *Arrhenatherum elatius* grassland community except for a single small patch of MG5 *Cynosurus cristatus* – *Centaurea nigra* grassland recorded in

Auchenreoch Glen SSSI. This patch of MG5 was not notably species-rich and was dominated by *Cynosurus cristatus* in an area that appeared slightly more neutral, whilst also being part of a wider grassland mosaic that contained areas of acid (U4) and calcareous (CG10) grasslands.

5.3.4 B3.1 Unimproved Calcareous Grassland

Unimproved calcareous grassland is not present within the Application Boundary but was found in the wider survey area, being largely restricted to the Auchenreoch Glen area, and most of which also falls within the Auchenreoch Glen SSSI. Calcareous grassland is of the CG10a *Festuca ovina* - *Agrostis capillaris* - *Thymus polytrichus* grassland, *Trifolium repens* - *Luzula campestris* sub-community and is present on the thin soils and very steep slopes of Auchenreoch Glen.

In many respects this grassland is similar in appearance to U4 acid grassland (Section 5.3.1) and there is much overlap in species, however in general the CG10 lacks *Galium saxatile* and instead has a great abundance of *Thymus polytrichus*. The CG10a present was also recorded as containing variable amounts of *Agrostis capillaris*, *Festuca ovina*, *Anthoxanthum odoratum*, *Brachypodium sylvaticum*, *Thymus polytrichus*, *Potentilla erecta*, *Campanula rotundifolia*, *Luzula campestris*, *Achillea millefolium*, *Lotus corniculatus*, *Prunella vulgaris*, *Euphrasia officinalis*, *Viola riviniana*, *Galium verum* and rarely some small and sparse *Calluna vulgaris*.

5.3.5 B4 Improved Grassland

Improved grasslands are found in the Murroch Farm area and in and around the Site Access, with many of the enclosed and improved fields used for silage as well as cattle and sheep grazing. These areas are characterised by MG6 *Lolium perenne* – *Cynosurus cristatus* grassland and MG7 *Lolium perenne* leys and related grasslands.

These fields and communities are all dominated by *Lolium perenne*, with MG7 almost exclusively so. 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* and in patches some occasional *Matricaria discoidea*, *Rumex obtusifolius* and *Senecio jacobaea*.

5.3.6 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 Site and Site Access, with the largest areas concentrated in the south-west of the survey area.

Within the survey area, the M23 (a & b), M25, M25b and MG10a 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 mostly M23a *Juncus effusus/acutiflorus* – *Galium palustre* rush-pasture, *Juncus acutiflorus* sub-community, and the non-NVC type *Juncus acutiflorus*

acid grassland (Ja). However, there are patches of *Juncus effusus* dominated communities, but these tend to be less extensive, i.e. M23b *Juncus effusus/acutiflorus* – *Galium palustre* rush-pasture, *Juncus effusus* sub-community, the non-NVC type *Juncus effusus* acid grassland (Je) and a little MG10a *Holcus lanatus* – *Juncus effusus* rush-pasture, Typical sub-community.

The areas of M23 are often species poor with *Juncus* spp. being the dominant species, and its regularly grades in and out of 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*, *Poa* sp., and *Agrostis* spp. Within the sward, a variety of other graminoids and herbs are more occasional to rare and included *Cynosurus cristatus*, *Galium palustre*, *Cirsium palustre*, *Rumex acetosa*, *Epilobium palustre*, *Viola palustris*, *Potentilla erecta*, *Ranunculus repens*, *Plantago lanceolata*, *Trifolium repens*, *Equisetum* spp., *Cardamine pratensis*, *Myosotis scorpioides*, *Filipendula ulmaria*, *Iris pseudacorus*, *Silene flos-cuculi*, *Carex nigra*, *C. echinata* and *C. panicea*. 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 M25b *Anthoxanthum odoratum* sub-community. These were areas either wholly dominated by *Molinia caerulea* (M25) or where *Molinia caerulea* was accompanied by a mixture of grassland species (M25b). 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* was not purely dominant, species included variable abundances of *Potentilla erecta*, *Galium saxatile*, *Anthoxanthum odoratum*, *Holcus lanatus*, *Avenella flexuosa*, *Festuca* spp., *Rumex acetosa*, *Agrostis capillaris*, *Juncus effusus*, *Juncus acutiflorus* and the mosses *Hylocomium splendens*, *Polytrichum commune* and *Pleurozium schreberi*. M25 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 *Agrostis* spp., *Cirsium palustre*, *Rumex obtusifolius*, *Senecio jacobaea*, *Rumex acetosa*, *Prunella vulgaris* and *Ranunculus repens*.

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 (in the case of Ja) 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 extensive within the south-west of the survey area on sloping areas and thin mineral soils, it is also widely scattered around the northern and eastern fringes of the survey area. 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, 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).

It was noted and mapped during the NVC surveys that Auchenreoch Glen SSSI has been negatively impacted by bracken encroachment. Large areas of the SSSI area that were previously mapped as MG5 and CG10 as part of the designation of the SSSI¹⁰ are now covered in dense bracken (U20) with a corresponding loss of the habitats and species for which the SSSI was designated. Further information is also provided in **Annex A**, TNs 10 – 12.

5.4.2 C3.1 Tall Ruderal

This habitat type within the survey area is sparse and covers a very small total area, being made up several small areas of OV24 *Urtica dioica* – *Galium aparine* community, OV25 *Urtica dioica* – *Cirsium arvense* community, OV26 *Epilobium hirsutum* community, OV27 *Chamerion angustifolium* community and W24 *Rubus fruticosus* – *Holcus lanatus* underscrub in and around the Site Access and Murroch Farm, usually associated with patches of waste or neglected ground or as part of trackside verges.

5.5 Heathland

5.5.1 D1.1 Dry Dwarf Shrub Heath – Acid

Acid dry dwarf shrub heath is scattered throughout the survey area, it is generally found as small stands and the total cover within the survey area is low. Dry heath within the Site is particularly fragmented and of very small patch sizes. The largest extent of dry heath is present outwith the Application Boundary on the upper slopes and summits around Meikle White Hill and Little White Hill. Many of the small, fragmented stands are associated with steep slopes in the narrow riparian zone around watercourses.

The majority of dry heath present is H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath, with the H12a *Calluna vulgaris* sub-community being most prominent, although there are areas of the sparser and grassier H12c *Galium saxatile* - *Festuca ovina* sub-community also present. In addition to H12 there are only a few very small patches of H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath, H10 *Calluna vulgaris* – *Erica cinerea* heath and H21 *Calluna vulgaris* - *Vaccinium myrtillus* - *Sphagnum capillifolium* heath within the survey area.

¹⁰ NatureScot NVC data for Auchenreoch Glen SSSI.

H12 has the typical species assemblage of *Calluna vulgaris* with abundant to frequent *Vaccinium myrtillus*, with the sward also containing frequent to occasional *Potentilla erecta*, *Galium saxatile*, *Agrostis capillaris*, *Anthoxanthum odoratum*, *Festuca ovina*, *Deschampsia flexuosa*, *Erica cinerea* and the mosses *Hylocomium splendens*, *Pleurozium schreberi* and *Hypnum jutlandicum*. The H12c areas tend to contain a higher cover of grasses and are grazed, often grading into acid grasslands.

The one small area of H10 recorded was present on a rocky outcrop and consisted of a sward dominated by *Calluna vulgaris* and *Erica cinerea*. The small area of H9 consisted of little more than dense *Calluna vulgaris* over *Pleurozium schreberi* and *Hypnum jutlandicum*.

The small areas of H21 on steep and shady watercourse banks are a typical assemblage of *Calluna vulgaris* and *Vaccinium myrtillus* with some ferns over a moss layer with abundant *Sphagnum capillifolium* and pleurocarpous mosses.

5.5.2 D2 Wet Dwarf Shrub Heath

Wet heath within the survey area is all the M15 *Trichophorum germanicum* – *Erica tetralix* wet heath community. The majority is the M15b Typical sub-community with lesser extents of the M15d *Vaccinium myrtillus* sub-community. Rarely M15 was recorded to community level only.

The largest and most contiguous area of wet heath is found on the slopes to the east of Spouts Burn, other areas tend to be smaller and more scattered throughout the Site and survey area, but they are commonplace.

The dominants can be variable within the M15b and M15d sub-communities but in general the wet heath within the survey area consists of a characteristic mixed sward which includes abundant *Calluna vulgaris*, *Trichophorum germanicum* and *Erica tetralix* (*Trichophorum germanicum* more dominant in M15d), with more variable amounts of *Molina caerulea* and *Vaccinium myrtillus*. There are also variable amounts of *Avenella flexuosa*, *Agrostis* sp., *Anthoxanthum odoratum*, *Galium saxatile*, *Potentilla erecta*, *Carex nigra*, *C. echinata*, *C. binervis*, *C. panicea*, *Polygala serpyllifolia* and *Narthecium ossifragum*. The moss layer typically includes *Sphagnum capillifolium*, *Rhytidiadelphus* spp., *Hylocomium splendens*, *Polytrichum commune*, *Pleurozium schreberi* and *Hypnum jutlandicum*.

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 extensive and relatively contiguous within the Site and survey area apart from the south-western corner. The eastern part of the survey area overlaps with Dumbarton Muir SSSI which is designated for its blanket bog and raised bog (**Table 2-1**).

Much of the blanket bog present is M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire but there are also substantial areas of M17 *Trichophorum germanicum* – *Eriophorum vaginatum* blanket

mire. The M17 community often represents areas of relatively better-quality bog, with frequent to abundant *Sphagna* in the basal layer. Rarely there are small M2 *Sphagnum cuspidatum/fallax* bog pools and M3 *Eriophorum angustifolium* bog pools within areas of blanket bog. M19 tends to be more prevalent in the north, north-east and north-central parts of the survey area, whereas M17 tends to be more prevalent in the south, south-east, and south-central parts of the Site, however in many areas M19 and M17 form mosaics and transitional areas with overlap between each other.

The M19 community is the most frequently found community within this blanket bog habitat, occurring on peat-covered level to gently sloping ground, and it was all recorded as the M19a *Erica tetralix* sub-community. 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 a 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 *Sphagnum capillifolium* are collectively very abundant, with *Sphagnum papillosum* occasional, these mosses forming deep and extensive carpets. *Cladonia* spp. (lichens) are also present.

M17, while recorded at times at community level only, the majority of this type of blanket bog was recorded as the M17a *Drosera rotundifolia* – *Sphagnum* spp. sub-community. The M17a sub-community retains a high *Sphagnum* cover and high water table and represents the best quality mire on the Site and in the survey area. 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 included *Erica tetralix*, *Eriophorum angustifolium*, *Vaccinium myrtillus*, *Drosera rotundifolia*, *Molinia caerulea*, *Calluna vulgaris*, *Narthecium ossifragum*, *Avenella flexuosa*, *Juncus squarrosus*, *Potentilla erecta*, *Galium saxatile* and *Vaccinium oxycoccos*. The basal layer includes *Sphagnum papillosum*, *S. medium*, *S. fallax*, *S. palustre*, *S. cuspidatum*, *S. capillifolium*, *Aulacomnium palustre*, *Hylocomium splendens* and *Pleurozium schreberi*. The presence of *Sphagnum medium* and *Vaccinium oxycoccos* in some areas indicates a potential shift towards patches of M18 *Erica tetralix* - *Sphagnum papillosum* mire within the blanket bog unit.

5.6.2 E1.7 Wet Modified Bog

Wet modified bog is of relatively low total cover within the Application Boundary, with the largest stands outwith the Site and found in the very north of the survey area, north and east of Merkins Muir and north-east of Blairquhomrie Muir. The remainder of the wet modified bog generally forms small, scattered patches in the centre of the survey area, for example around Auchenreoch Muir, Red Brae and north of Knockshanoch. Almost all wet modified bog present is M25a *Molinia caerulea* – *Potentilla erecta* mire *Erica tetralix* sub-community¹¹, with M20 *Eriophorum vaginatum* blanket mire only recorded twice.

The M25a areas were identified due to *Molinia* overwhelmingly dominating the sward but with an associated flora containing mire species. The majority of the subordinate and associate species found within this M25a assemblage were occasional *Calluna vulgaris*, *Vaccinium myrtillus*, *Erica*

¹¹ M25 and M25b have been classified as marshy grassland; see Section 5.3.6.

tetralix, *Trichophorum germanicum*, *Juncus squarrosus*, *Anthoxanthum odoratum*, *Potentilla erecta* and *Avenella flexuosa*. Mosses such as *Hylocomium splendens*, *Pleurozium schreberi*, *Hypnum jutlandicum*, *Rhytidiadelphus squarrosus*, *Polytrichum commune* dominate but there are occasional patches of *Sphagnum capillifolium*, *S. fallax* and *S. palustre*.

The areas of M20 were typically characterised by tussocks of *Eriophorum vaginatum* which are abundant to dominant but with little or no *Calluna vulgaris* or *Molinia caerulea*, other typical mire species are also of very low cover.

5.6.3 E2.1 Acid/Neutral Flush/Spring

Acid/neutral flushes are commonplace and appear in small and scattered areas across the survey area, however their overall total extent is relatively low. They are concentrated more in the central and northern parts of the survey area. The majority of acid/neutral flushes present are of the M6d *Carex echinata* – *Sphagnum fallax/denticulatum* mire, *Juncus acutiflorus* sub-community, however smaller patches of the M6c *Carex echinata* – *Sphagnum fallax/denticulatum* mire, *Juncus effusus* sub-community are also commonplace, and these two sub-communities often merge and overlap with each other and *Juncus* spp. dominated marshy grasslands (Section 5.3.6). M4 *Carex rostrata* - *Sphagnum fallax* mire was also recorded as very small patches in a few localities, but its extent within the survey area is very low. Additionally, two M32 *Philonotis fontana* – *Saxifraga stellaris* springs were recorded during surveys (see **Annex A**).

The M6c and M6d sub-communities are rush mires on wet and mostly flushed ground, often following the lines of watercourses, and whose soils appear to be acidic, as judged by the abundance of *Sphagnum* mosses (especially *Sphagnum fallax* and *S. palustre*) and the moss *Polytrichum commune*. 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 *Molinia caerulea* and *Rumex acetosa*. Occasionally species such as *Ranunculus repens*, *Cirsium palustre*, *Carex* spp. and *Sphagnum capillifolium* were noted.

The small patches of M4 were dominated by *Carex rostrata* with a basal layer composed of *Sphagnum fallax*.

The M32 springs contained typical vegetation for the community and had an abundance of *Philonotis fontana*.

5.6.4 E2.2 Basic Flush/Spring

Two basic stony flushes were found within the survey area in the vicinity of Blairquhomrie Muir and recorded as target notes (see **Annex A**). These flushes are represented by the M10 *Carex dioica* – *Pinguicula vulgaris* mire community, one of which was fed by a M32 *Philonotis fontana* – *Saxifraga stellaris* spring (Section 5.6.3).

The M10 vegetation present includes small *Carex* spp., *Pinguicula vulgaris*, *Equisetum* sp., small *Juncus* sp., *Pedicularis sylvatica*, *Euphrasia officinalis*, *Selaginella selaginoides* and the community characteristic ‘brown mosses’.

5.6.5 E3.2 Basin Mire Fen

Two areas of M6c *Carex echinata* – *Sphagnum fallax/denticulatum* mire, *Juncus effusus* sub-community were assigned the Phase 1 basin mire fen (E3.2) code due to their specific setting in small infilling basins rather than a typical flush vegetation feature. These were located on the west of Auchenreoch Muir and just south of Auchenreoch Glen. The M6c vegetation was as described in Section 5.6.3 but with added *Menyanthes trifoliata* in one stand.

5.7 Swamp, Marginal & Inundation Habitats

5.7.1 F1 Swamp

A single very small patch of S9 *Carex rostrata* swamp was recorded in a hollow north-west of Lang Dyke, which comprised a pure stand of *Carex rostrata* in shallow standing water.

5.8 Open Water

5.8.1 G1 Standing Water

Standing waterbodies within the survey area comprise Black Linn Reservoir and two small ponds.

5.8.2 G2 Running Water

Several watercourses are present within the within the survey area and surrounding area, including many named burns, the largest of which are Murroch Burn in the south-west and Gallangad Burn in the north-east.

5.9 Rock Exposure & Waste

5.9.1 I1.1.2 Natural Inland Cliff – Basic

Inland cliffs are present in the steep gorge in the lower section of Auchenreoch Glen, these are contained within Auchenreoch Glen SSSI.

5.10 Miscellaneous

5.10.1 J1.2 Cultivated/Disturbed Land – Amenity Grassland

Amenity grassland is a non-NVC community used here for private gardens (PG) within the survey area. Most commonly these areas form lawns within the curtilage of private properties and in some instances may include scattered trees and hedges.

In addition, several patches of grassland managed along road verges and roundabouts where the Site access joins the A813 and amenity grassland around houses, commercial units and footpaths was recorded as the OV23 *Lolium perenne* - *Dactylis glomerata* community.

Whilst present within the survey area, none of this habitat type is present within the Application Boundary.

5.10.2 J2.1.2 Intact Hedge - Species-poor

There are a number of narrow and managed hedges forming field boundaries around the Site access area and Murroch Farm. These hedges are dominated by *Crataegus monogyna* and are of the W21 *Crataegus monogyna* – *Hedera helix* scrub community. In addition to *Crataegus monogyna*

there are sometimes occasional small *Salix* spp. or *Acer pseudoplatanus* in the hedge. Through the hedges or at the bases there is also occasionally some *Rubus fruticosus*, *Rosa canina*, *Urtica dioica* and *Galium aparine*.

5.10.3 J3.6 Buildings

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

5.10.4 J4 Bare Ground

Bare ground is a non-NVC community (BG) 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.

5.11 Invasive Non-Native Species

Impatiens glandulifera (Himalayan balsam), an Invasive Non-Native Species (INNS), was recorded once during surveys. This was located on a shaded track edge just off the A813 but outwith the Application Boundary and 90 m from the Site Access (see TN4 on **Figure 6.3** and in **Annex A**).

5.12 Notable Species

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

6 EVALUATION OF BOTANICAL INTEREST

6.1 Overview

NVC communities can be compared with a number of 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 Groundwater Dependent Terrestrial Ecosystems (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 8: Geology, Hydrogeology, Hydrology and Peat**).

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
W1x ¹²	<i>Salix</i> spp. scrub
M15	<i>Trichophorum germanicum</i> – <i>Erica tetralix</i> wet heath
M25	<i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire
MG10	<i>Holcus lanatus</i> – <i>Juncus effusus</i> rush pasture
U6	<i>Juncus squarrosus</i> – <i>Festuca ovina</i> grassland
Je ¹²	<i>Juncus effusus</i> acid grassland
Ja ¹²	<i>Juncus acutiflorus</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
M32	<i>Philonotis fontana</i> – <i>Saxifraga stellaris</i> spring
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 6.4**.

Within **Figure 6.4** 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

¹² In light of the SEPA classification on potential GWDTEs the non NVC types W1x, Je and Ja should also qualify for potential GWDTE status. The classification of moderate sensitivity is keeping in line with other similar *Salix* spp. woodlands and *Juncus* spp. dominated grassland communities (e.g. W1 and MG10).

- ‘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 8: Geology, Hydrogeology, Hydrology and Peat**).

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 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 M3 <i>Eriophorum angustifolium</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

¹³ <https://sac.jncc.gov.uk/habitat/>

Annex I Habitat	Corresponding NVC Communities & Other Non-NVC Habitats/Features Recorded
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
9180 <i>Tilio-Acerion</i> forests of slopes, screes and ravines	W9 <i>Fraxinus excelsior</i> – <i>Sorbus aucuparia</i> – <i>Mercurialis perennis</i> woodland
91A0 Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	W11 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland

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 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.

6.3.3 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, i.e. H9, H10, 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 fall under the 4030 European dry heaths.

6.3.4 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. Two main types of grassland belonging within the species-rich *Nardus* grassland Annex I habitat occur in the UK: CG10 *Festuca ovina* – *Agrostis capillaris* – *Thymus polytrichus* grassland and CG11 *Festuca ovina* – *Agrostis capillaris* – *Alchemilla alpina* grassland. This Annex I type is of relatively low and restricted cover within the survey area, being present as areas of CG10a within Auchenreoch Glen SSSI (see Section 5.3.4 above).

6.3.5 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 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 and M3 within the survey area are also assigned to the blanket bog Annex I type, as they are often associated with areas of M17 and M19 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. As described in Sections 5.3.6 and 5.6.2 above, M25 within the survey area is for the most part species-poor, grassy, and at the drier end of the scale. Many areas are a ubiquitous swathe of *Molinia* tussocks with few associate species and generally lack many of the main peat forming species such as *Sphagnum* mosses. Much of the M25 within the survey area is also grazed, in some areas quite intensively, and this has resulted in many areas of M25 appearing transitional to acid grassland communities (U4 – U6) and is often present in mosaics with these same communities. General field observations of M25 also indicate that this habitat is unlikely to be on deep peat within the survey area, as confirmed via peat probing surveys (see **Chapter 8: Geology, Hydrogeology, Hydrology and Peat**). Given the character of the majority of M25 within the survey area it has not been considered to be of Annex I habitat quality in this case.

6.3.6 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.

6.3.7 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. The examples of M10 mire in the survey area fall within this Annex I habitat type.

6.3.8 9180 *Tilio-Acerion* forests of slopes, screes and ravines

Tilio-Acerion ravine forests typically occur on nutrient-rich soils that often accumulate in the shady micro-climates towards the bases of slopes and ravines. Therefore, it is found on calcareous substrates associated with coarse scree, cliffs, steep rocky slopes and ravines, where inaccessibility has reduced human impact. It often occurs as a series of scattered patches grading into other types

of woodland on level valley floors and on slopes above, or as narrow strips along stream-sides. More extensive stands occur on limestone and other base-rich rocks.

This habitat type is ecologically variable, particularly with respect to the dominant tree species. Floristic differences due to variations in slope, aspect and nature of the substrate add to the diversity of the habitat. The ground flora can be very varied, but the following elements are usually present: fern banks (particularly *Phyllitis scolopendrium*, *Polystichum setiferum* and *Dryopteris* spp.); stands of *Allium ursinum* in the moister zones; *Mercurialis perennis* and *Circaea* spp. on drier but still base-rich soils; *Geum urbanum*, and natural ‘disturbance communities’ comprising *Urtica dioica*, *Geranium robertianum* and *Galium aparine* associated with scree and cliff-bases. A wide range of other basiphilous herbs and grasses may occur within these stands.

The patches of W9 recorded within Murroch Glen (see Section 5.2.1) are within the typical situation, fill many of the criteria, and contain several of the characteristic species required for this Annex I woodland type. This woodland is present in a mosaic with the more extensive 91A0 Annex I woodland type (Section 6.3.9).

6.3.9 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

This habitat type comprises a range of woodland types dominated by mixtures of *Quercus* spp. and *Betula* spp. It is characteristic of base-poor soils in areas of at least moderately high rainfall in northern and western parts of the UK. The habitat corresponds particularly to NVC types W10e, W11, W16b and W17. The habitat shows considerable variation across its range, in terms of the associated ground flora and the richness of bryophyte communities. There is also a continuous spectrum of variation between *Quercus*-dominated and *Betula*-dominated stands. Often these local variations reflect factors such as rainfall, slope, aspect, soil depth, and past and present woodland management.

The large area of W11 in Murroch Glen is likely to be considered to fall within the Annex I type.

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: W7;
- Upland birchwoods: W4, W11 and W17;

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

- Upland oakwoods: W11 and W17 (where oak forms >30% of canopy cover);
- Upland mixed ashwoods: W9;
- Lowland mixed deciduous woodland: W10;
- Blanket bog: M17, M19, M20, and M2-M3 where associated with M17-M20;
- Upland flushes, fens and swamps: S9, M4, M6, M10, M23a and M32;
- Upland heathland: M15, H9, H10, H12 and H21;
- Upland calcareous grassland: CG10; and
- Hedgerows: W21 (when present as a hedge).

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

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 survey 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
M3	-	7130 Blanket bogs (examples associated with M17-M20)	Blanket bog
M4	-	7140 Transition mires and quaking bogs	Upland flushes, fens and swamps
M6c, M6d	High	-	Upland flushes, fens and swamps
M10	High	7230 Alkaline fens	Upland flushes, fens and swamps
M15, M15b, M15d	Moderate	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	Upland heathland
M17, M17a	-	7130 Blanket bogs	Blanket bog
M19a	-	7130 Blanket bogs	Blanket bog
M20	-	7130 Blanket bogs	Blanket bog
M23a, M23b	High	-	Upland flushes, fens and swamps (applies to M23a only)
M25, M25a, M25b	Moderate	-	-

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

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat Type
M32	High	-	Upland flushes, fens and swamps
Dry Heaths			
H9	-	4030 European dry heaths	Upland heathland
H10a	-	4030 European dry heaths	Upland heathland
H12, H12a, H12c	-	4030 European dry heaths	Upland heathland
H21a	-	4030 European dry heaths	Upland heathland
Calcifugous Grasslands & Ferns			
U4, U4a, U4b	-	-	-
U5	-	-	-
U6	Moderate	-	-
U20, U20a, U20c	-	-	-
Mesotrophic Grasslands			
MG1	-	-	-
MG5	-	-	-
MG6	-	-	-
MG7	-	-	-
MG10a	Moderate	-	-
Calcareous Grassland			
CG10a	High	6230 Species-rich <i>Nardus</i> grassland	Upland calcareous grassland
Woodland & Scrub			
W4	High	-	Upland birchwoods
W7, W7c	High	-	Wet woodland
W9a	-	9180 <i>Tilio-Acerion</i> forests of slopes, screes and ravines	Upland mixed ashwoods
W10, W10e	-	-	Lowland mixed deciduous woodland
W11	-	91A0 Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	Upland birchwoods or Upland oakwoods (where oak forms >30% of canopy cover)
W17	-	-	Upland birchwoods or Upland oakwoods (where oak forms >30% of canopy cover)
W21	-	-	Hedgerows (when present as a hedge)
W23	-	-	-

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat Type
W24	-	-	-
Swamps & Tall-Herb Fens			
S9	-	-	Upland flushes, fens and swamps
Vegetation of Open Habitats			
OV23	-	-	-
OV24	-	-	-
OV25	-	-	-
OV26	-	-	-
OV27	-	-	-
Non-NVC Types			
CP	-	-	-
CF	-	-	-
SBT	-	-	-
W1x	Moderate	-	-
Je	Moderate	-	-
Ja	Moderate	-	-
SW	-	-	-
RW	-	-	-
PG	-	-	-
BG	-	-	-
BD	-	-	-

7 SUMMARY

MacArthur Green carried out NVC and habitat surveys within the survey area in order to identify those areas of vegetation communities with the greatest ecological or conservation interest.

In total 41 NVC communities were recorded within the respective survey area along with various associated sub-communities; a number of non-NVC habitat types are also present (**Table 5-1**). A relatively small number of communities or habitat types account for the majority of the survey area and the Application Boundary (**Figure 6.3**).

The survey area is mainly open upland habitats, the most common and widespread making up the bulk of the landscape are blanket bog and marshy grassland. Interwoven throughout the larger areas of blanket bog and marshy grassland are patches and pockets of several other habitat types.

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 6.3** 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	Grid Ref.	NVC Community	Feature	Description	Photo Ref.
TN 1	NS 43082 80355	M32	Spring	Large area of M32 spring vegetation.	B-1
TN 2	NS 43278 81288	M32/M10	Spring & Flush	Small M32 spring feature with lots of <i>Philonotus fontana</i> which feeds small stony M10 flush with <i>Carex</i> spp., <i>Pinguicula vulgaris</i> and brown mosses.	B-2
TN 3	NS 43836 82358	M10	Flush	Small M10 flush with brown mosses, <i>Carex</i> spp., small <i>Juncus</i> sp., <i>Pinguicula vulgaris</i> , <i>Equisetum</i> sp., <i>Selaginella selaginoides</i> , <i>Euphrasia officinalis</i> and <i>Pedicularis sylvatica</i> .	
TN 4	NS 40048 77413	n/a	Invasive Species	<i>Impatiens glandulifera</i> (Himalayan balsam) recorded on track edge.	B-3
TN 5	NS 41020 77787	W11	Ancient woodland	Ancient woodland area either side of relatively deep gully around Murroch Burn. Mostly W11 but some patches grade into W9. Mature dense woodland with various age classes of trees from seedlings and young trees to mature, and likely some veteran specimens. Standing and fallen deadwood present. The canopy is mostly oak, birch and ash but there are also scattered occasional to rare hawthorn, willows, sycamore, rowan, beech, blackthorn, hazel, alder, holly, Scots pine, larch, Sitka spruce. Scrub includes brambles, raspberry, gorse and broom. Understorey includes <i>Dryopteris</i> spp., ivy, creeping soft-grass, herb robert, hedge woundwort, wood avens, tufted hair-grass, bents, false broome (rare), Yorkshire fog, wood sorrel, dog violet, red campion, foxglove, sweet vernal grass, nettle, bluebell, creeping buttercup, woodrushes, cleavers and greater stitchwort. Mosses include <i>Kindbergia praelonga</i> , <i>Thuidium tamariscinum</i> , <i>Polytrichum formosum</i> and <i>Rhytidiadelphus squarrosus</i> . Liverworts also present.	

Target Note ID	Grid Ref.	NVC Community	Feature	Description	Photo Ref.
TN 6	NS 41164 77779	W11	Ancient woodland	Northern and southern edges of this polygon are mature planted beech trees, within the central portion there are a few mature Scots pine and single mature oak. Some younger birch also present. The ground flora is similar to a U4 acid grassland and therefore the woodland has been classified as W11 despite the canopy 'mis-match'. The field flora contains bents, wavy-hair grass, sweet vernal grass, wood sorrel, tormentil, heath bedstraw, field wood-rush, dog violet, Yorkshire fog, some bracken and rarely a couple of sprigs of bilberry. Mosses include <i>Polytrichum formosum</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomiadelphus triquetrus</i> and <i>Plagiothecium undulatum</i> .	B-4
TN 7	NS 41181 77735	W7c	Ancient woodland	Small wetter pocket within this area of woodland, contains birch with a few beeches at edge. The ground flora is damper with tufted hair-grass, soft rush, Yorkshire fog, creeping buttercup, marsh thistle and rarely marsh willowherb.	B-5
TN 8	NS 41199 77700	W11	Ancient woodland	Similar woodland to that within TN 6, but not as obviously acid. Contains many of the same species but the grass sward is thicker and lacks tormentil. Still contains bents, Yorkshire fog, sweet vernal grass, wavy hair-grass, wood sorrel, heath bedstraw, rarely some bilberry sprigs, and bryophytes. Planted beech trees (mature) again form the outer edge/border. Birch dominates within the polygon although there are a few mature Scots pine and oak seedlings noted. Further south the woodland in this polygon opens out more and other species make an appearance including rowan, oak, hawthorn, willow and gorse.	B-6
TN 9	NS 41302 77851	W11	Ancient woodland	Mature broadleaved woodland around steep gully, some large mature trees present. Some mature beech trees on edge, but main species are oak, birch and some ash, some occasional conifer trees including larch. Generally, a grassy/mossy/fern ground flora with acid grasses and ferns.	
TN 10	NS 41665 78274	U20c	SSSI	Within Auchenreoch Glen SSSI - area has been completely taken over by bracken with former open grassland habitats lost.	B-7

Target Note ID	Grid Ref.	NVC Community	Feature	Description	Photo Ref.
TN 11	NS 41715 78308	U4	SSSI	Within Auchenreoch Glen SSSI - mapped in NatureScot NVC data as MG6/MG5. Area re-mapped as U4 with bents, sweet vernal grass, crested dogs-tail, Yorkshire fog, tormentil (abundant), self-heal, heath bedstraw, harebell, eyebright, creeping buttercup, common mouse ear, thistle, white clover, some ladies bedstraw, and <i>Rhytidadelphus squarrosus</i> .	
TN 12	NS 41632 78326	CG10a	SSSI	Within Auchenreoch Glen SSSI - species-rich grassland and species present include bents, sweet vernal grass, false broome, wild thyme, tormentil, harebell, yarrow, field woodrush, birds-foot trefoil, self-heal, dog violet, ladies bedstraw, eyebright and occasional common heather.	B-8
TN 13	NS 40684 77747	W9a	Ancient woodland	Area where W9 is more obvious and base-rich indicators are present in the field flora. Ash and sycamore dominate the canopy here with hazel underneath. Dogs' mercury is dominant to abundant in the field layer, with frequent ferns.	B-9

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



Photo B-2 Target Note 2 (M10 flush)



Photo B-3 Target Note 4



Photo B-4 Target Note 6



Photo B-5 Target Note 7



Photo B-6 Target Note 8



Photo B-7 Target Note 10



Photo B-8 Target Note 12



Photo B-9 Target Note 13



ANNEX C. GENERAL COMMUNITY PHOTOGRAPHS

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

Photo C-1 W11 in Murroch Glen



Photo C-2 Auchenreoch Glen SSSI – bare slopes with patches of calcareous grassland and extensive bracken invasion of SSSI in right foreground



Photo C-3 M25/M25b marshy grassland in foreground



Photo C-4 Large expanse of M25 with patches of *Juncus* spp., typical of survey area



Photo C-5 M25b



Photo C-6 Part of Dumarton Muir SSSI viewed from lower slopes of Doughnot Hill northwards towards Meikle White Hill in distance. M19 bog in foreground, giving way to large flat expanse of M17 and M19 bog mosaic with some M6c/d flushes. Self-seeded invading conifers can be seen to upper right.



Photo C-7 M17 blanket bog in flat foreground giving way to raised ground with H12 dry heath and small interspersed patches of U4 acid grassland



Photo C-8 M17/M19 blanket bog



Photo C-9 Large flat area of M19 blanket bog, distant sloping ground a mosaic of rush pasture, rushy flushes, wet heath and mire.



Photo C-10 M15 wet heath



Photo C-11 M6d



Photo C-12 M23a rush pasture in hollow with bordering dry slopes of U20 bracken



Photo C-13 U4 acid grassland



Photo C-14 U4a acid grassland and U20 bracken mosaic

