

TECHNICAL APPENDIX 9.1

Phase 1 and NVC Survey Results



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Clashindarroch II Wind Farm EIA Report

Chapter 9 Technical Appendix:

9.1. Phase 1 Habitat and NVC Survey Results

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1. INTRODUCTION

1.1 Purpose of this Document

- 1.1.1 This a technical appendix to Chapter 9 (Ecology) of the Clashindarroch II wind farm (the 'proposed development') EIA Report. It provides the results of Phase I habitat and National Vegetation Classification (NVC) surveys completed by MBEC between May 2015 and August 2019.
- 1.1.2 This is not a 'standalone' document as it refers to text and figures associated with Chapter 9 of the EIA Report.

1.2 Background

- 1.2.1 MBEC was appointed by Vattenfall in May 2015 to carry out baseline Phase I habitat and targeted NVC surveys for a proposed wind farm (referred to as Clashindarroch II), which is located on the border of Moray and Aberdeenshire, approximately 10 km southwest of the town of Huntly.
- 1.2.2 A map showing an indicative wind turbine layout was provided by Vattenfall at that time and this was used to define the extents of the survey areas (see Figures 9.1a and b). This area fully encompasses the extents of the current proposed wind farm.
- 1.2.3 The following surveys were completed between September 2015 and September 2016:
- Phase 1 Habitat Survey (September 2015, updated September 2017); and
 - National Vegetation Classification Survey (September 2016, with updates in September 2017).
- 1.2.4 Following changes to the proposed wind farm layout during 2018 further Phase 1 and NVC surveys were completed in 2018 and 2019 to ensure that there was complete coverage of the proposed development site and the necessary buffer zones around all of the infrastructure.
- 1.2.5 The results from these surveys have informed the design and assessment of the potential impacts of the proposed development and have been fully considered in Chapter 9 of the Clashindarroch II Environmental Impact Assessment Report (EIA-R) and within Chapter 11 with respect to potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs) identified through the NVC survey data and reference to the relevant guidance (SEPA 2017).

1.3 Site Description

- 1.3.1 The proposed development site is located within an extensive area of predominantly upland conifer plantation known as Clashindarroch Forest, managed by Forest Enterprise Scotland on behalf of Forestry and Land Scotland. Clashindarroch Forest extends to 59 km² in total and is dominated by non-native conifers such as Sitka spruce (*Picea sitchensis*), Norway spruce (*Picea abies*), lodgepole pine (*Pinus contorta*), hybrid larch (*Larix x eurolepis*) and Japanese larch (*L. kaempferi*) of various age-classes and planted at typical commercial stocking densities.

- 1.3.2 The proposed development lies to the north and east of the existing Clashindarroch Wind Farm and would be located on ridges and spurs, occupying an area (based on a 500 m wide buffer around the proposed wind turbines) of approximately 546 hectares. Approximately 90% of the area is comprised of commercial non-native conifer plantation at various stages in the forestry rotation.
- 1.3.3 The proposed development site is intersected by a number of minor watercourses with banksides vegetated with damp neutral grassland communities. There is some unplanted moorland within the survey area, the most significant of which is located at the western edge of the survey area, which includes the south-east slopes of Grumack Hill and the adjacent hill to the south-west.

2. METHODS

2.1 Desk Study

- 2.1.1 Details were obtained of all designated sites (local, regional, national and international) within a 5 km-wide buffer around the Site boundary (i.e. a boundary around the outermost proposed wind turbine locations).
- 2.1.2 As part of the desk study, relevant ecological data from published Environmental Statements from previous studies (for example, for the operational Clashindarroch wind farm) were also considered.
- 2.1.3 Details of international and national designated sites, such as Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs), were obtained through SNH's Sitelink website [www.gateway.snh.gov.uk/] and associated GIS (Geographic Information System) data made publically available by SNH.
- 2.1.4 The websites of Aberdeenshire Council [www.aberdeenshire.gov.uk], Moray Council [www.moray.gov.uk] and Scottish Wildlife Trust [www.scottishwildlifetrust.org.uk] were searched for details of any Wildlife Sites, Local Biodiversity Sites, Local Nature Conservation Sites, Local Nature Reserves etc. within the wider desk study area.
- 2.1.5 The SNH Ancient Woodland Inventory (Edition 3) was searched, using publically available GIS data, to identify areas identified as ancient woodland, both semi-natural and those of plantation origin (areas that have been under continuous woodland cover since about 1750). Data from the Native Woodland Survey of Scotland, provided by the Forestry Commission Scotland, were also searched for any information relevant to the study area.

2.2 Survey Areas

- 2.2.1 The various surveys areas referred to in this report are shown on Figures 9.1a and b. The boundaries of the survey areas for the Phase 1 habitat and protected species surveys were defined by 1km and 0.5km buffers around the indicative wind turbine layout provided by Vattenfall in 2015. This layout differs slightly from the version which was used to define the extent of the NVC survey area, which was a boundary set at 0.5km from the outermost wind turbines based on indicative layout in September 2016.

- 2.2.2 The baseline survey areas encompass all of the currently proposed wind turbines with at least a 500 m wide buffer for the Phase 1 habitat and at least a 250m wide buffer for the NVC survey data.

2.3 Survey Methods

- 2.3.1 This section provides a brief summary of the survey methods used to record, map and characterise the habitats and vegetation communities present in the survey area.
- 2.3.2 For all botanical surveys, the common and scientific names used for vascular plants follow those provided in Stace (2010) and for non-vascular plants (mosses and liverworts) they follow Atherton *et al.* (2010) and Smith (2004).

Phase 1 Habitat Survey

- 2.3.3 The purpose of the Phase 1 habitat survey was to describe the type, extent and sensitivity of the habitats present in the proposed development area, in order to inform the wind farm layout design process. The Phase 1 habitat types were mapped and categorised according to the method and definitions outlined in the JNCC Handbook for Phase 1 Habitat Survey (JNCC 2010) .
- 2.3.4 Target notes were recorded at the time of the Phase 1 survey, which provide additional detail on habitat condition, vegetation composition and diversity, management impacts, and the location of notable habitats and species too small to map.
- 2.3.5 Any highly invasive non-native plant species, such as giant hogweed (*Heracleum mantegazzianum*) or Japanese knotweed (*Fallopia japonica*), were also included in the target notes.

NVC Survey

- 2.3.6 The aim of the NVC survey was to describe in further detail the type and distribution of all vegetation communities identified during the Phase 1 habitat survey which might be affected by the Proposed Development, and to identify sensitive habitats of nature conservation interest, including those considered to be GWDTEs. GWDTEs are habitats that are considered sensitive to changes in groundwater flow and quality, particularly in response to earthworks associated with construction sites.
- 2.3.7 The NVC survey included all accessible, non-afforested areas within the proposed development area, as defined in 2018. Depending on the size of the habitat areas that were considered and also the uniformity of the vegetation composition within each given habitat area, a total of between two to five quadrats were completed for each type of homogenous and representative vegetation stand. The quadrats were 2m x 2m in size, as this is considered to be the most appropriate scale to sample the various habitats that were the focus of the survey. Within each quadrat, all higher and lower plant species were identified and a total percentage cover for each was estimated, following the Domin scale of cover/abundance (following the method described in Rodwell 2006). Using field notes and quadrat data the closest matching NVC community was assigned, using professional judgement and with reference to the descriptions provided in Rodwell (1991) and the keys provided in Averis *et al.* (2004).

3. RESULTS

3.1 Survey Limitations

- 3.1.1 A number of the areas of pole stage and high forest have areas of windthrow (i.e. pole stage and older plantation trees that have been blown over often creating an impenetrable thicket of fallen and hanging trees that is unsafe to enter on foot). In some locations this is quite extensive. Access to these parts of the survey area was therefore limited, as some rides were blocked and other areas were considered unsafe to access.
- 3.1.2 The Phase 1 habitat and NVC surveys were completed at a time of year which coincided with the growing season for the majority of plant species, and therefore they would be visible and allow for accurate recording. However, due to the variability in the timings of growing seasons between species, it is possible that some species may have been missed. This is considered very unlikely to have an effect on the validity of the surveys and the assessments.
- 3.1.3 The baseline data collated to inform the assessment are considered to accurately represent the key habitats and species using the site, and is sufficiently detailed and concurrent to allow a realistic assessment. There is considered to be sufficient information available about the proposed development to base the assessment on, where there is uncertainty realistic 'worst cases' have been assumed in order to avoid under-estimating the magnitude of potential effects.

3.2 Desk Study

Designated Sites

- 3.2.1 No site designated in whole or in part for the purposes of nature conservation occurs within the proposed wind farm site.
- 3.2.2 Figure 9.2 shows the designated sites with natural heritage interest located within 10km of the proposed development. In the wider area, Craigs of Succoth SSSI occurs 2.2 km to the north of the nearest proposed wind turbine, and Hill of Towanreef Special Area of Conservation (SAC)/SSSI occurs 2.9 km to the south of the nearest proposed wind turbine.
- 3.2.3 Craigs of Succoth SSSI is designated for calaminarian grassland, serpentine heath and subalpine flushes. The Hill of Towanreef SAC/SSSI is designated for both geology and habitats, including alpine and subalpine heaths, blanket bog, dry heaths, grasslands on soils rich in heavy metals, juniper (*Juniperus communis*) and marsh saxifrage (*Saxifraga hirculus*).
- 3.2.4 There is no ecological / hydrological link between these sites and the proposed wind farm development site. However, the potential for similar habitats to occur within the survey area was considered during the surveys. For example the potential for metal-rich geology, similar to that found within both of these designations, and the specialised plants associated with this relatively rare habitat to be present.
- 3.2.5 There are no local authority designated sites, such as Local Nature Reserves, Wildlife Sites or Local Biodiversity Sites (or similar), within or adjacent to the proposed development. The Clashindarroch ES refers to the 'Glenlivet, Glenfiddich and Cabrach Site of Interest for Natural Science', described as an extensive site that abuts the

western boundary of the Clashindarroch Forest comprised of a complex mosaic of heather moorland and acid grassland. This site is within the Moray local authority area. There appears to be no information on the Moray Council website about this designation and whether it is still recognised. However, no direct effects on the habitats within this area are possible from the proposed development.

- 3.2.6 Clashindarroch Forest is situated within the Strathbogie Wildcat Priority Area, which extends north of Huntly and eastwards over Gartly Moor (see Figure 9.2).

Ancient Woodlands

- 3.2.7 There is one area on the Ancient Woodland Inventory which is identified as an ancient woodland of semi-natural origin. This occurs alongside the Dry Burn in the centre of the study area (see Figure 9.2). It is located c. 100m from the nearest proposed wind turbine.

Notable Species Records

- 3.2.8 The desk study revealed the presence of a small number of notable floral species within the NJ 43 grid square: in particular, heath cudweed (*Gnaphalium sylvaticum*) was recorded as present at several locations in the forestry area to the south of the proposed development. Heath cudweed is listed as 'Endangered' and is also included on the Scottish Biodiversity List.

3.3 Survey Results

- 3.3.1 The Phase 1 habitat survey was initially completed in September 2015. There were additional targeted surveys completed in 2018 and 2019 to ensure that the final design of the proposed wind farm was fully surveyed as well as the necessary buffer zones around the proposed development. The mapped results of the Phase 1 habitat survey are shown on Figures 9.3a and b. Target note descriptions are provided in Appendix 1 to this report.
- 3.3.2 The NVC survey was initially completed in September 2016 and updated and extended as necessary in 2018 and 2019 to ensure full coverage of the proposed development and associated buffer zones (i.e. a 250m wide strip around the proposed infrastructure). The NVC communities that comprise the various Phase 1 habitat types are described where applicable (due to the land use across the site and subsequent changes to ground conditions, it was not always possible to assign a NVC type) are shown on Figure 9.4a and b. The results from the representative 2 x 2m quadrats used to help determine the NVC community types that most closely aligned with the habitats surveyed are included Appendix 2 to this report. A list of higher and lower plant species recorded is provided in Appendix 3.
- 3.3.3 The following section provides an overview of the habitat types and plant communities present within the survey area. A description of potential GWDTEs is also provided.

Overview of Habitat Types

- 3.3.4 The proposed Clashindarroch II wind farm site is located within an extensive area of coniferous plantation predominantly comprised of non-native trees that are felled and replanted under commercial rotation and restocking. The plantation area is intersected by a number of minor watercourses which typically flow through corridors dominated

by damp neutral grasslands. In a number of areas these riparian zones have been planted with native broad-leaved trees. In some of the higher-lying and open unplanted areas, where there is some accumulation of peat and the ground is less suitable for forestry, there are small areas of dry and wet dwarf shrub heath, as well as an area of wet modified bog. Generally, across all open areas of the site, there is encroachment by self-seeded Sitka spruce. There are a number of well-used forestry tracks that pass through the site, as well as the main access track leading to the operational Clashindarroch wind farm. Other tracks that are less well used are becoming vegetated by heathland species and self-seeded trees.

- 3.3.5 Phase 1 habitat type and their estimated total extent within 500m of the proposed wind turbines are listed in Table 9.1.1 and shown on Figures 9.3a and b.

Table 9.1.1: Phase 1 Habitat Types within the Survey Area

Phase 1 Habitat Code & Title		Area (hectares)	% Cover
A122	Coniferous plantation woodland	429.10	80.32
A42	Recently felled coniferous woodland	34.86	6.52
A112	Broad-leaved plantation woodland	27.08	5.07
B21	Unimproved neutral grassland	16.53	3.09
A132	Mixed plantation woodland	11.48	2.15
E17	Wet modified bog	5.67	1.06
D5	Dry heath / acid grassland mosaic	3.91	0.73
D11	Acid dry dwarf shrub heath	2.00	0.37
D2	Wet dwarf shrub heath	1.51	0.28
A131	Mixed semi-natural woodland	1.16	0.22
B22	Semi-improved neutral grassland	0.72	0.13
C31	Tall ruderal	0.24	0.04
J36	Buildings	0.01	0.00
Totals		534.26	100.00

- 3.3.6 Table 9.1.2 lists the NVC communities identified within 250 m of the proposed wind turbines (see Figure 9.1a and b), along with their extent and percentage cover. Vegetation communities not covered by the NVC system (for example, conifer plantation) are also included. The mapped results of the NVC survey are shown on Figures 9.4a and b.

Table 9.1.2: NVC Communities Present within the Survey Area

NVC Community / habitat	Area (ha)	% Cover
Coniferous plantation woodland	219.74	85.06
Broad-leaved plantation woodland	10.16	3.93
Recently felled coniferous plantation	9.19	3.56

NVC Community / habitat	Area (ha)	% Cover
MG9 (<i>Holcus lanatus</i> - <i>Deschampsia cespitosa</i> grassland)	7.94	3.07
Track, bare ground	5.24	2.03
Mixed plantation woodland	3.34	1.29
H9 (<i>Calluna vulgaris</i> - <i>Deschampsia flexuosa</i> heath)	1.30	0.51
M19 (<i>Calluna vulgaris</i> - <i>Eriophorum vaginatum</i> blanket mire)	0.65	0.25
Other habitat	0.42	0.16
OV25 (<i>Urtica dioica</i> - <i>Cirsium arvense</i> community)	0.24	0.09
H12 / U2 (<i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> heath / <i>Deschampsia flexuosa</i> grassland)	0.11	0.04
Totals	258.33	100.00

- 3.3.7 Descriptions of each of the Phase 1 habitats recorded within the survey area are provided below, in order of percentage cover. Details of the NVC plant communities applicable to each habitat type are also included under each relevant Phase 1 habitat heading.

Coniferous Plantation Woodland (including recently felled)

- 3.3.8 Coniferous plantation is by far the most extensive habitat within the survey area. The majority of the plantation is dominated by Sitka spruce planted at typical commercial densities, with some relatively small areas dominated by larch (*Larix sp.*) and Norway spruce (see Figures 9.6a and b and Table 9.1.3 below). These figures are based on analysis of National Forest Estate open data (Forest Sub-compartments, Scotland, July 2019).

Table 9.1.3: Forest Age-classes and Dominant Tree Species within 500m of the proposed wind turbines

Codes	Dominant Tree Species	Area (ha)	% Cover
SS	Sitka spruce	339.12	62.14
n/a	e.g. open space, tracks	97.70	17.90
HL	Hybrid larch	39.50	7.24
NS	Norway spruce	15.90	2.91
LP	Lodgepole pine	12.85	2.35
JL	Japanese larch	10.31	1.89
SBI	Silver birch (planted)	8.95	1.64
MB	Mixed broadleaves (planted)	6.99	1.28
WEM	Wych elm	4.43	0.81
AR	Alder	3.34	0.61
HAZ	Hazel	1.79	0.33

ASP	Aspen	1.72	0.31
PBI	Downy birch	0.80	0.15
EL	European larch	0.75	0.14
WCH	Wild cherry / gean	0.75	0.14
MC	Mixed conifers	0.72	0.13
SP	Scots pine	0.14	0.03
	Total	545.76	100.00

- 3.3.9 The age-class of the various plantation sub-compartments ranges from mature high forest to young thicket plantation that has not yet been thinned. The dominant age-class type within 500m of the proposed wind turbines is thicket stage followed by high forest. A breakdown is provided in Table 9.1.4 below.

Table 9.1.4: Forest Age-classes and Dominant Tree Species within the Survey Area (i.e. 500m of the proposed wind turbines)

Forest age-class	Area (ha)	% Cover
Thicket	217.34	39.82
High Forest	105.08	19.25
Pole	67.75	12.41
n/a e.g. open space, tracks	42.08	7.71
Restock	40.79	7.47
Recently felled coniferous plantation	31.61	5.79
Broad-leaved plantation	27.08	4.96
Mixed plantation	11.48	2.10
Pre-thicket	1.39	0.26
Mixed semi-natural woodland	1.16	0.21
Grand Total	545.76	100.00

- 3.3.10 The tree species composition of the plantation at the proposed wind turbine locations (i.e. within c. 80m) is dominated by thicket stage Sitka spruce (>85%). The age-class and dominant species of the plantation at the proposed wind turbine locations is provided in Table 9.1.5 below.

Table 9.1.5: Forest Sub-compartment Age-classes and Dominant Tree Species at the Proposed Wind Turbine Locations

Dominant trees species and forest age-class	Area (ha)	% Cover
Sitka spruce	22.98	85.93
Thicket	15.37	
High Forest	4.74	

Dominant trees species and forest age-class	Area (ha)	% Cover
Pole	2.55	
Restock	0.32	
Norway spruce	1.93	7.20
Thicket	1.45	
High Forest	0.48	
Japanese larch	0.68	2.55
High Forest	0.68	
Hybrid larch	0.56	2.09
High Forest	0.56	
Lodgepole pine	0.06	0.21
High Forest	0.06	
Mixed broadleaves	0.54	2.03
Mixed plantation	0.41	
Broad-leaved plantation	0.13	
Total	26.74	

- 3.3.11 The ground flora within the plantations, where it exists, is varied across the survey area. Typically, it is dominated by wet heath communities that have become modified due to management, drainage and shading, which has limited the number of plant species that were able to grow. In areas where the heathland habitat is under heavier shade, broad-leaved species are more limited and vegetation communities are dominated by grasses, such as creeping bent (*Agrostis stolonifera*), and woodland mosses including *Plagiothecium undulatum*, *Polytrichum commune* and *Rhytidadelphus loreus*, with occasional patches of *Sphagnum* spp. In sub-compartments with thicket and pole stage Sitka spruce (the most common age-class and tree species within the survey area) the shading from the densely planted conifers is very high and in many of these areas there are no higher plants present in the ground flora.
- 3.3.12 There are numerous rides intersecting the plantation. In areas of pole and high forest rides are often narrow and overgrown, often having closed in altogether. Where rides are still relatively open and intact a wet dwarf shrub heath habitat is the most typical; as stated above, the plant species may vary from those found in more open situations due to shading and the effects of artificial drainage and water table draw-down by the adjacent densely planted trees.
- 3.3.13 Areas of recently felled coniferous plantation are present across parts of the survey area, particularly on the western side (felling and thinning operations were occurring at the time that the surveys took place). These areas were not accessed due to safety concerns, as they had not been cleared of stumps and branches, with brash piles appearing to be quite deep in some areas. Generally, the felled areas are being colonised by typical suite of species encountered in recent clear-fell including foxglove (*Digitalis purpurea*), soft-rush (*Juncus effusus*), and tufted hair-grass (*Deschampsia cespitosa*).

- 3.3.14 No NVC survey was carried out in this Phase 1 habitat type as coniferous plantation, and the vegetation typically associated with the various stages in commercial felling and restocking rotations, is not covered by the NVC system.

Unimproved Neutral Grassland

- 3.3.15 Unimproved neutral grassland is not extensive but is widely distributed across the survey area, typically in wide margins along watercourses, and to a lesser extent as small patches or narrow strips alongside forestry tracks. The unimproved neutral grasslands are generally on damper soils and are characterised by species such as Yorkshire-fog (*Holcus lanatus*), with creeping bent (*Agrostis stolonifera*) and false oat-grass (*Arrhenatherum elatius*) and forbs such as common sorrel (*Rumex acetosa*) and creeping buttercup (*Ranunculus repens*). In some of the damper locations, species such as soft-rush (*Juncus effusus*) are also present, although not at a high enough cover for the habitat to be classified as marshy grassland. Tufted hair-grass (*Deschampsia cespitosa*) may also be present, with other frequently occurring species including common marsh-bedstraw (*Galium palustre*), marsh thistle (*Cirsium palustre*) and marsh willowherb (*Epilobium palustre*). In some areas this habitat has also been planted into with broad-leaved trees, including alder (*Alnus glutinosa*), rowan (*Sorbus aucuparia*) and sessile oak (*Quercus petraea*), and there are frequent self-seeded Sitka spruce scattered throughout many areas of neutral grassland.
- 3.3.16 The unimproved neutral grassland within the survey area was classified as the NVC community MG9 *Holcus lanatus - Deschampsia cespitosa* grassland. In all areas sampled the habitat was dominated by tufted hair-grass, with other species generally scarce overall. This is a grassland community that is typically found in permanently damp areas.

Broad-leaved Plantation Woodland

- 3.3.17 Broad-leaved trees have been planted in various parts of the survey area, primarily along the edges of conifer coupes. The canopy species include downy birch (*Betula pubescens*), cherry (*Prunus* sp.), hawthorn (*Crataegus monogyna*), oak sp. and willow (*Salix* sp.). The recent planting occurs mostly along the watercourses that form wide corridors throughout the plantation area.
- 3.3.18 The largest area of broad-leaved plantation occurs alongside Dry Burn, at Three Sisters towards the centre of the survey area. There are also some lines of planted mature broad-leaved trees, primarily beech (*Fagus sylvatica*), near to Corrylair Farm and along the Dry Burn.
- 3.3.19 No NVC community was assigned to this habitat.

Dry Dwarf Shrub Heath

- 3.3.20 Dry heath occurs sporadically across the survey area, alongside forestry rides and tracks and on some of the free-draining slopes adjacent to forestry areas, as well more extensively on the areas of unplanted higher ground such as the Cloichedubh Hill. Dry heath communities are also regenerating in some sections of disused forestry track.
- 3.3.21 Most of the dry heath within the survey area is dominated by the dwarf shrubs bilberry (*Vaccinium myrtillus*) and heather (*Calluna vulgaris*). Other species that are frequently present throughout this habitat include crowberry (*Empetrum nigrum*), heath bedstraw

(*Galium saxatile*) and heath rush (*Juncus squarrosus*), and the mosses *Hylocomium splendens* and *Pleurozium schreberi*. Species occurring more occasionally include brown bent (*Agrostis vinealis*), cowberry (*Vaccinium vitis-idaea*), star sedge (*Carex echinata*) and tormentil (*Potentilla erecta*), and the mosses *Hypnum cupressiforme* and *Polytrichum commune*.

- 3.3.22 In a number of areas there are non-native conifer seedlings growing in dry heath habitats, particularly lodgepole pine and Sitka spruce, where they have self-seeded from adjacent plantations.
- 3.3.23 Two NVC communities were assigned to this habitat type. The majority of the dry heath communities were a good fit to H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath. It is noticeably drier than the wet communities in that it contained no *Sphagnum* spp. or cross-leaved heath, and a high abundance of pleurocarpous mosses. It was often found on relatively steeply sloping and / or free draining ground, which is typical of this community.
- 3.3.24 H10 *Calluna vulgaris* – *Erica cinerea* heath was present as a mosaic habitat with acid grassland communities. This vegetation community was characterised by the presence of bell heather and very small amounts of bilberry overall. The disturbed nature of the ground where this habitat was present, as a result of forestry management practices and grazing, may account for the mosaic communities that are established along the edges of forestry rides.

Wet Dwarf Shrub Heath

- 3.3.25 Wet heath communities can resemble blanket bog vegetation but they are characterised by the absence (or near absence) of hare's-tail cottongrass (*Eriophorum vaginatum*) and of bog mosses such as *Sphagnum papillosum*. In terms of the Phase 1 habitat survey methodology, wet heath vegetation that occurs on peat that is more than 50 cm deep is classified as blanket bog or wet/dry modified bog.
- 3.3.26 Wet heath is never extensive within the survey area but is found in a number of locations where there is damp peat, typically on the unplanted slope of Grumack Hill on the western edge of the survey area, in some of the larger forest rides, and as a fragmented habitat within some of the forestry areas. The vegetation is typically dominated by heather and bilberry. Where this habitat occurs in some of the narrower forest rides the habitat supports a higher percentage of grasses, including common bent (*Agrostis capillaris*) and wavy hair-grass (*Deschampsia flexuosa*). Other species present across this habitat include cross-leaved heath (*Erica tetralix*) and crowberry.
- 3.3.27 In some areas of wet heath the depth of peat can be variable but is around 0.5m, which in terms of the Phase 1 methodology is the boundary between wet heath and blanket bog habitat (due to the variability of the peat depth and the average depth being shallower than this, it is still classified as a wet heath habitat). Some of these areas support species commonly found in areas of deeper peat, including hare's-tail cottongrass.
- 3.3.28 In the open areas of wet heath, there is some encroachment by self-seeded Sitka spruce. Generally these trees are not forming a closed canopy, with trees occurring in small groups at the most. A smaller number of broad-leaved trees, including birch sp. (*Betula* sp.), also occur.

- 3.3.29 The NVC community H21 *Calluna vulgaris* - *Vaccinium myrtillus* - *Sphagnum capillifolium* heath has been assigned to this habitat type. This vegetation community typically grows in damp and shaded places, often on slopes, and is characterised by an abundance of mosses, including *Sphagnum* spp.

Dry Modified Bog

- 3.3.30 There is one main area of dry modified bog occurring along the western edge of the survey area at Grumack Hill and extending beyond the survey area boundary. There is only intermittent *Sphagnum* cover (*S. capillifolium* is an occasional species), resulting in this habitat being classified as dry modified bog according to the Phase 1 habitat survey methodology.

- 3.3.31 This habitat did not fall within the NVC survey area.

Wet Modified Bog

- 3.3.32 In terms of the Phase 1 habitat survey methodology, bog habitats (modified and unmodified) are defined by vegetation communities growing on peat that is in excess of 50cm deep. Although the habitats within the survey area that have been categorised as bog are within areas where the peat depth is variable, typically 40 – 50cm (and sometimes deeper), the more detailed NVC data, that take into account the full floristic composition of these habitats, has been assessed as being of closest fit to a mire community. This is due in part to the presence of species more commonly found in areas of deeper peat, most notably the high frequencies of hare's-tail cottongrass.

- 3.3.33 One area of wet modified bog are present within the survey area, on the north-eastern edge in an area known as The Lumps. This area has been modified through a combination of factors, such as grazing, drainage associated with plantation forestry, and the regeneration of coniferous trees from the adjacent plantations. Tree growth is scattered sparsely across both areas, with trees of various ages and often occurring in small groups. This area is a sufficient distance away from the proposed turbine and track locations that it would not be affected by the works.

- 3.3.34 Species that are present in the wet modified bog include cloudberry (*Rubus chamaemorus*), cowberry, deer-grass (*Trichophorum germanicum*), heath rush and purple moor-grass (*Molinia caerulea*), with lower plants including *Cladonia*, *Polytrichum commune* and *Sphagnum* species.

- 3.3.35 The wet modified bog habitat is a closest fit to M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire. In an unmodified form this habitat is characterised by the dominance of hare's-tail cottongrass and the presence of features such as pools and hags. In the context of the survey area, this community is present in an area that is peat-forming but lacks the more typical deep peat layer.

Mixed Plantation Woodland

- 3.3.36 While there are several areas of mixed plantation woodland across the survey area, they are all relatively small. They mostly occur as narrow strips alongside watercourses and tracks, or at the edges of larger forestry compartments. The understorey in these areas is generally an acid grassland or dry heath community.

- 3.3.37 No NVC community was assigned to this habitat.

Dry Heath / Acid Grassland Mosaic

- 3.3.38 There are a number of examples of dry heath / acid grassland mosaic across the survey area, occurring either in narrow strips alongside watercourse or along forest rides, or as larger areas that have previously been forested and still have the remains of the previous tree crop. The heathland element within these habitats is characterised by the presence of heather, heath bedstraw, heath rush and tormentil, with more occasional bilberry and green-ribbed sedge (*Carex binervis*). These habitats were typically quite grassy, with grass species present including creeping bent and wavy hair-grass, with the mosses *Dicranum scoparium*, *Hypnum jutlandicum* and *Rhytidadelphus squarrosus*. In many areas, there are numerous self-seeded conifer trees that have spread from nearby plantations. There are also species here that are indicative of disturbance, including foxglove and rosebay willowherb (*Chamerion angustifolium*).
- 3.3.39 The dry heath / acid grassland mosaic communities within the survey area were most closely aligned to either H10 *Calluna vulgaris* - *Erica cinerea* heath or H12 *Calluna vulgaris* - *Vaccinium myrtillus* heath, growing with U2 *Deschampsia flexuosa* grassland or U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland. The dry heath communities are already described in the relevant section. The U2 grassland community is characterised by the overall dominance of wavy hair-grass and is a community often associated with colonising areas of felled coniferous plantation. Where this occurs in the study area as a mosaic habitat, with the heath component a remnant of the habitat that would have been present prior to forestation, and U2 grassland which has established more vigorously. The U4 grassland is characterised by a high percentage cover of common bent and sweet vernal-grass and mosses, particularly *Rhytidadelphus squarrosus*.

Wet Heath / Acid Grassland Mosaic

- 3.3.40 This habitat is confined to two locations within the survey area; at the far northern end, alongside the Killin Burn, and to the south-west of this location, towards Burn of Bedlaithen. In both areas the heath element is characterised by heather with bilberry and cowberry, with common marsh-bedstraw, heath bedstraw and *Sphagnum* sp., while the grassland communities include brown bent, sweet vernal-grass (*Anthoxanthum odoratum*), tufted hair-grass and Yorkshire-fog. There are also small amounts of soft-rush present, which is likely to be due to the damp nature of the ground and also to ground disturbance (due to forestry practices).
- 3.3.41 There were no wet heath / acid grassland mosaic communities within the NVC survey area.

Improved Grassland

- 3.3.42 A single area of improved grassland was identified on the north-eastern edge of the Phase 1 survey area, in a field associated with Corrylair Farm and to the north of the proposed temporary compound.

Tall Ruderal Vegetation

- 3.3.43 This habitat type is confined to small areas where there has been notable ground disturbance and previous human occupation, for example adjacent to the derelict buildings within the survey area where former garden areas have been colonised. Broad-leaved dock (*Rumex obtusifolius*), common ragwort (*Senecio jacobaea*) and

rosebay willowherb were the most frequent species in such areas, with common nettle and tufted hair-grass also recorded.

- 3.3.44 Areas of tall ruderal vegetation within the NVC survey, and the site as a whole, were very small and were therefore not assigned to any NVC community. Areas of tall ruderal vegetation that are dominated by rosebay willowherb fit into the OV27 *Epilobium angustifolium* community. This is a vegetation community that characteristically colonises disturbed ground, including tracksides. Where common nettle dominates, the closest fit would be OV25 *Urtica dioica-Cirsium arvense* community. This is another community that establishes on disturbed ground, including woodland clearings and derelict ground.

Marshy Grassland

- 3.3.45 Marshy grassland is a fragmented habitat within the survey area, in that it occurs primarily alongside other habitats, particularly unimproved neutral grassland, or in clearfell and restock areas before canopy closure. An open area of marshy grassland is also present at the site of the northern compound, adjacent to the main access track into the proposed development and just outwith the forestry boundary. The dominant species across these marshy grassland areas is soft-rush, with additional species including marsh thistle, marsh willowherb and *Sphagnum*.
- 3.3.46 Areas of marshy grassland dominated by soft-rush fall into the NVC category M23 *Juncus effusus – Galium palustre* rush-pasture. Areas of this habitat that were present within the NVC survey area were confined to small stands in areas alongside watercourses that were otherwise dominated by neutral grassland communities. To the north of the wind turbine area there was a relatively large area of M23b and MG10 located to the north of the proposed temporary construction compound.

Mixed Semi-natural Woodland

- 3.3.47 Small pockets of mixed semi-natural woodland occur in two locations: on the south and east sides of Red Hill, and the south side of Burn of Corrylair on the eastern edge of the survey area.
- 3.3.48 These woodland habitats were outside of the NVC survey area.

Running Water

- 3.3.49 There are numerous minor watercourses within the survey area, many of which originate on the site. These were all typically fast to moderately flowing, with clear water and a substrate of gravel, rocks or cobbles. The majority of watercourses are within channels less than 1 m wide, with some sections that are partly or entirely vegetated over.

Other Habitats and Features

- 3.3.50 There are a small number of derelict dwellings within the survey area. These include Corrydown, towards the northern edge, which is falling into ruin. Another derelict dwelling is present towards the southern end, at Old Forest, which has only standing walls remaining. Remnants of former garden areas are apparent next to both of these buildings.

Invasive Non-Native Plants

- 3.3.51 Other than the self-seeded non-native conifers there were no invasive non-native plant species recorded during any of the vegetation surveys.

Groundwater Dependent Terrestrial Ecosystems

- 3.3.52 The NVC habitats that correspond to potential GWDTEs, following the SEPA guidance, are shown on Figure 9.5a and b.

- 3.3.53 The majority of the NVC communities found within the survey area are not classed as GWDTEs. This included the wet and dry heath communities and the areas of acid grassland. However, the MG9 neutral grassland community, which was present alongside a large number of watercourses and in some of the low-lying areas, is classed as moderately groundwater dependent in the SEPA guidance (SEPA 2017) as is an area of MG10 and M23a located to the north of the proposed temporary construction compound. Where this habitat was situated along channels and beside watercourses it is less likely that this community is groundwater dependent; however, in some of the more level areas of the site and towards the higher points of channels this is more likely. No highly dependent GWDTEs were found within the survey area.

3.4 Conclusions

- 3.4.1 Approximately 85% of the survey area is coniferous plantation (including the areas that are recently felled), which in its own right is unlikely to be a constraint for development as it is generally of low nature conservation value. However, due to the relatively complex site topography, with several steeply sloping valley sides and intervening ridges, as well as the age-class diversity of the plantation, the forest as a whole provides a variety of habitats for a number of protected species. Furthermore, there are a number of watercourses which originate within these forested areas that have ecological value where they flow through more open habitats and are also likely to support populations of brown trout that may spawn near to the site.
- 3.4.2 Habitats of greater nature conservation value, in comparison to conifer plantation, within the wider area include two open areas of modified bog and dwarf shrub heath: one extensive area to the west of the proposed wind farm and a second area above approximately 460m altitude on the ridge of Cloichedubh Hill. Both of these locations have been avoided by the proposed development. MG9, MG10 and M23a NVC communities, present in localised areas only, were the only communities present that were assessed as being moderately groundwater-dependent.
- 3.4.3 Although no peat depth measurements were completed during the vegetation surveys, the growth of the conifer plantation trees and the relatively steep slopes indicate that where peat is present it is likely to be fairly shallow. However, the modified bog to the immediate west of the plantation may have peat deposits greater than 1m in depth. This area has been avoided by the proposed development.

4. REFERENCES

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APPENDICES

APPENDIX 1: Target Notes from the Phase 1 Habitat Survey

This appendix provides the target notes from the Phase 1 habitat survey undertaken at the Clashindarroch II Wind Farm site in October 2015 (see Figures 9.3a and b for the mapped results) and with some updates following the NVC surveys in September 2016 and 2017.

Table A1.1: Phase 1 Habitat Survey Target Notes

Target Note	Easting	Northing	Habitat Type	Description
1	345000	834965	Track	Track approximately 6 m wide, with deep, wide U-shaped ditches on both sides. Constructed of shale and stone. Vegetation limited to acrocarpus mosses forming a very low mat.
2	344884	834961	Ride	Ride approximately 200 m long and 6 m wide, with heathland vegetation. Abundant bilberry (<i>Vaccinium myrtillus</i>), brown bent (<i>Agrostis vinealis</i>) and heather (<i>Calluna vulgaris</i>), with frequent <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Pleurozium schreberi</i> . Occasional species include cowberry (<i>Vaccinium vitis-idaea</i>) and deergrass (<i>Trichophorum germanicum</i>). Heath rush (<i>Juncus squarrosus</i>), star sedge (<i>Carex echinata</i>) and tormentil (<i>Potentilla erecta</i>) are also present.
3	345389	834910	Dry ditch	Channel dry at time of survey. The U-shaped channel covered with a thick carpet of mosses, including <i>Hylocomium splendens</i> and <i>Sphagnum</i> spp. Numerous fallen trees covering and blocking the channel.
4	344830	834897	Ride	Along route of a long-disused track. Heather is the most abundant species, with frequent bilberry and more occasional brown bent, cowberry, <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> and <i>Rhytidadelphus loreus</i> . Other bent grasses, heath-rush sp. (<i>Luzula</i> sp.), <i>Sphagnum</i> sp. and wavy hair-grass (<i>Deschampsia flexuosa</i>) are also present. There are also occasional self-set lodgepole pine (<i>Pinus contorta</i>) and Sitka spruce (<i>Picea sitchensis</i>) seedlings.
5	344398	834765	Wet dwarf shrub heath	Area of wet heath with bilberry, birch (<i>Betula</i> sp.) seedlings, cloudberry (<i>Rubus chamaemorus</i>), crowberry (<i>Empetrum nigrum</i>) and deergrass. <i>Cladonia</i> sp. and <i>Sphagnum capillifolium</i> are also present.
6	344508	834744	Wet heath / acid grassland mosaic	Mosaic of wet heath, acid grassland and neutral grassland habitats, in an area with approximately 20% coverage of rushes. Wet heath species include bilberry, cowberry, heather and <i>Sphagnum</i> sp. Approximately 50% of the area is grassland dominated by tufted hair-grass (<i>Deschampsia cespitosa</i>), with brown bent, common marsh-bedstraw (<i>Galium palustre</i>), sweet vernal-grass (<i>Anthoxanthum odoratum</i>) and wavy hair-grass. A minor stream flows beneath the vegetation.
7	344765	834622	Wet dwarf shrub heath with scattered coniferous trees	Scattered spruce (over 10 m tall) in an area of wet heath.
8	344307	834578	Ride	Overgrown ride with wet heath vegetation. Species include bilberry, heather and <i>Sphagnum</i> , with self-seeded spruce.

Target Note	Easting	Northing	Habitat Type	Description
9	344851	834517	Running water	Killin Burn. Approximately 0.5 m wide and fast flowing at this location, in a deeply incised channel which is often vegetated over. There is a line of marshy grassland immediately adjacent to the watercourse. To the east is neutral grassland with heather and scattered trees; to the west is a narrow strip of wet heath on a steep bank.
10	344346	834474	Wet dwarf shrub heath	Area of wet heath within a large forest clearing. Abundant heather with <i>Cladonia</i> sp., cowberry, common cottongrass (<i>Eriophorum angustifolium</i>), cross-leaved heath (<i>Erica tetralix</i>), crowberry, deergrass and <i>Sphagnum</i> spp., including <i>S. capillifolium</i> . There are also some bog pools with <i>Sphagnum</i> .
11	343933	834468	Running water	Burn of Bedlaithen. At this point the watercourse is vegetated over. Associated vegetation includes soft-rush (<i>Juncus effusus</i>) and foxglove (<i>Digitalis purpurea</i>).
12	344896	834457	Coniferous plantation woodland	Small area of mature spruce sp. With an understorey dominated by mosses and grasses, with wood-sorrel (<i>Oxalis acetosella</i>).
13	343969	834399	Mixed plantation woodland	Strip of recently-planted deciduous trees of various species. Alongside minor watercourse within more mature coniferous plantation.
14	344956	834386	Mixed plantation woodland	Recent mixed planting with an understorey including heather and tufted hair-grass.
15	345178	834366	Dry heath / acid grassland mosaic	Dry heath habitat dominated by heather with bell heather (<i>Erica cinerea</i>) and scattered wavy hair-grass, with a small number of self-seeded spruce trees. The understorey includes bedstraw sp., milkwort sp. (<i>Polygala</i> sp.), tormentil and various mosses and lichens.
16	345232	834282	Coniferous plantation woodland	High forest with an understorey of ferns, foxglove, grasses and wood sorrel. Channelised stream measuring about 50 x 50 cm.
17	344249	834270	Wet heath / acid grassland mosaic with scattered coniferous trees	Open area within coniferous plantation supporting a mosaic of wet heath and acid grassland. The centre of the area is dominated by acid grassland, which grades into wet heath towards the northern corner. The grassland resource includes common bent (<i>Agrostis capillaris</i>), heath bedstraw (<i>Galium saxatile</i>), sweet vernal-grass and wavy hair-grass, with <i>Hylocomium splendens</i> and small amounts of soft-rush. The wet heath includes abundant heather, with bilberry, crowberry and <i>Sphagnum</i> spp. Foxgloves are an occasional species throughout, and there are also scattered pine and spruce, including a mature dying Scots pine (<i>Pinus sylvestris</i>) at the downslope end.
18	344083	834202	Acid dry dwarf shrub heath with scattered trees	Dry heath with scattered trees, including Sitka spruce. The heathland grades into grassland further upstream. The stream at this location was very narrow and steep which presented difficulties for accurate mapping.
19	344216	834201	Wet dwarf shrub heath with scattered trees	Habitat in forestry ride located between NGR 344197 834171 and 344231 834241. Heathland species included bilberry, heather, a range of grasses and <i>Sphagnum</i> spp.

Target Note	Easting	Northing	Habitat Type	Description
20	343626	834167	Wet modified bog	Wet modified bog habitat with area of peat excavation reaching down to the substrate, with a peat depth over 1 m. Vegetation in this area includes bilberry, cowberry, cross-leaved heath, deergrass, heather and <i>Sphagnum</i> , with occasional self-seeded spruce trees.
21	344511	834167	Track	A strip to the north of the forestry track, up to 10 m wide in places. Includes bilberry, heather and <i>Sphagnum spp.</i>
22	343900	834160	Wet dwarf shrub heath	Area not accessible so classified as wet heath based on aerial photography.
23	344129	834084	Acid dry dwarf shrub heath with scattered trees	Bilberry and heather 30 - 40 % cover. The watercourse at this location is vegetated over within a steep V-shaped incision.
24	345677	834061	Scrub	Small stand of gorse dominated scrub (c. 30 x 30 m).
25	345611	833976	Running water	Waterfall on the Killin Burn. Associated vegetation includes dominant bryophytes, bramble (<i>Rubus fruticosus</i>), elder (<i>Sambucus nigra</i>) and meadow buttercup (<i>Ranunculus acris</i>).
26	344229	833932	Mixed plantation woodland	Grassland on north-east side of the Burn of Bedlaithen. With common bent, common marsh-bedstraw, red fescue (<i>Festuca rubra</i>), soft-rush, tufted hair-grass, wood-sorrel and Yorkshire-fog (<i>Holcus lanatus</i>), and a moss layer including <i>Hylocomium splendens</i> and <i>Plagiothecium undulatum</i> . The scattered trees are a mix of conifers and recent deciduous trees, with trees in tubes present alongside the watercourse.
27	344199	833863	Running water	The Burn of Bedlaithen flows through a small V-shaped incision at this point. The channel is vegetated over and is approximately 0.5 m wide.
28	345938	833844	Marshy / neutral grassland	To the north of Dry Burn is a strip of marshy grassland, with unimproved neutral grassland occurring further upslope before an area of mixed plantation. Species present include common bent, heather, <i>Polytrichum commune</i> and occasional wavy hair-grass. The burn is lined with great wood-rush (<i>Luzula sylvatica</i>).
29	344433	833839	Track	Disused and overgrown forest track now vegetated with bilberry, heather and a range of grasses and mosses. Self-set Sitka spruce are also present.
30	343886	833785	Mixed semi-natural woodland	Old overgrown ride. With old / dying Scots pine and rowan (<i>Sorbus aucuparia</i>), and a ground flora including bilberry, <i>Polytrichum commune</i> , mosses and abundant lichens.
31	344491	833770	Broad-leaved plantation woodland	Area of recent deciduous planting with self-seeded Sitka spruce throughout. Heather and moss understorey with some rushes and grasses.
32	344660	833688	Broad-leaved plantation woodland	Recent deciduous planting including oak (<i>Quercus spp.</i>), hawthorn (<i>Crataegus monogyna</i>), beech (<i>Fagus sylvatica</i>) and willow (<i>Salix spp.</i>).
33	344737	833666	Continuous scrub	Small stand of dense continuous gorse (<i>Ulex europaeus</i>) scrub.

Target Note	Easting	Northing	Habitat Type	Description
34	344047	833616	Ride	Overgrown ride with wet heath vegetation and self-seeded Sitka spruce. Species include bilberry, common bent, common marsh-bedstraw and heather, with a range of mosses including <i>Aulacomnium palustre</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> spp.
35	343525	833604	Wet dwarf shrub heath	Small area of wet heath beside track with bilberry, heather, <i>Sphagnum</i> and self-seeded Sitka spruce.
36	343065	833547	Wet dwarf shrub heath with scattered trees	Wet heath invaded by various stages of self-seeded pre-thicket and thicket-stage Sitka spruce. There are no signs of previous forestry in this area.
37	344837	833500	Watercourse	Burn of Bedlaithen is less than 0.3 m wide, and less than 0.1 m deep, with a pebbly substrate. The banks are overgrown with common nettle (<i>Urtica dioica</i>), soft-rush and tufted hair-grass.
38	344826	833355	Track	Disused and overgrown forest track vegetated with dry heath species and self-seeded Sitka spruce. Dominated by heather with additional species including bent grasses, chickweed-wintergreen (<i>Trientalis europaea</i>), cowberry, eyebright (<i>Euphrasia officinalis</i>), heath rush, stag's-horn clubmoss (<i>Lycopodium clavatum</i>), sweet vernal-grass, tormentil, sedges and <i>Cladonia</i> sp. Heath mosses and <i>Polytrichum commune</i> are also present.
39	344913	833343	Unimproved neutral grassland with scattered broad-leaved trees	Scattered broad-leaved tree planting in an area of neutral grassland. Tree species include downy birch (<i>Betula pubescens</i>), grey willow (<i>Salix cinerea</i>), hawthorn and rowan.
40	344203	833269	Unimproved neutral grassland with scattered trees	Neutral grassland on south side of new track with a few scattered mixed trees including oak sp. and Sitka spruce.
41	345694	833231	Track	Small areas of scattered scrub along edge of track.
42	343641	833201	Coniferous plantation woodland	The slope to the south of the Oxter Burn has occasional patches of dry heath, varying from 20 x 20 m to 50 x 30 m. These are dominated by bilberry and heather with occasional <i>Sphagnum capillifolium</i> .
43	343708	833201	Coniferous plantation woodland	Dry heath with heather, wood-rush sp. and mosses, with sparsely-distributed Sitka spruce throughout.
44	343606	833171	Track	Disused forestry track, now vegetated over with a dry heath community. This is dominated by heather, with frequent heath-rush and self-seeded Sitka spruce. Occasional species include bent grass and sweet vernal-grass, with the mosses <i>Hypnum cupressiforme</i> and <i>Pleurozium schreberi</i> . Other species include <i>Cladonia</i> sp., common bird's-foot trefoil (<i>Lotus corniculatus</i>), cowberry, crowberry, lesser hawkbit (<i>Leontodon saxatilis</i>), purple moor-grass (<i>Molinia caerulea</i>) and various sedges.
45	344081	833168	Unimproved neutral grassland	Small area of neutral grassland beside new track. With broad-leaved dock (<i>Rumex obtusifolius</i>), false oat-grass (<i>Arrhenatherum elatius</i>), foxglove and tufted hair-grass.

Target Note	Easting	Northing	Habitat Type	Description
46	343865	833159	Unimproved neutral grassland	Marshy grassland with some mature Sitka spruce, to 10 m tall. Soft-rush with grasses, and wood-rush sp. to the northern end.
47	344121	833142	Scattered mixed trees and tall ruderal	Former garden area associated with derelict dwelling. A mix of tall ruderal and neutral grassland species, including common nettle and creeping thistle (<i>Cirsium arvense</i>), as well as gooseberry (<i>Ribes uva-crispa</i>) and rhubarb (<i>Rheum rhabarbarum</i>). Mature planted trees are also present, including oak sp., rowan, Sitka spruce and fir sp.
48	343200	833129	Wet modified bog	Area of wet modified bog with abundant heather and deergrass, and frequent bilberry, cowberry and hare's-tail cottongrass (<i>Eriophorum vaginatum</i>). There are also occasional Sitka spruce seedlings up to 3 m in height.
49	344058	833092	Coniferous plantation woodland	High forest with native trees and a neutral grassland understorey.
50	345114	833077	Broad-leaved plantation woodland	With naturally occurring alder (<i>Alnus glutinosa</i>) and two mature cherry (<i>Prunus</i> sp.). Also areas of scattered bracken (<i>Pteridium aquilinum</i>).
51	343568	833063	Ride	Dry heath along a forest ride with abundant heather and <i>Pleurozium schreberi</i> .
52	345110	833049	Broad-leaved plantation woodland	Recent planting with birch, hawthorn and oak sp. The majority are less than 1 m tall, with three over 3 m high.
53	344515	833041	Track	Reaching approximately 10 m up steep bank along the side of track. Scattered gorse with abundant tufted hair-grass, with foxglove and soft-rush also present.
54	344406	833016	Track	Thicket stage plantation. Larch sp. (<i>Larix</i> sp.) is planted into the Sitka spruce. Small gorse bushes are present along track edges.
55	345130	833014	Running water	Burn of Bedlaithen. At this point the watercourse is fast-flowing and mainly less than 0.5 m wide (widening by the dam), and is situated in a gully approximately 2-3 m deep, with water less than 0.2 m deep. The banks are vegetated with bracken, common nettle and heather.
56	344275	832984	Broad-leaved plantation woodland	Area of alder plantation over an extensive area of neutral grassland adjacent to Dry Burn. Saplings less than 1 m high.
57	345027	832974	Track	Steep bank to the north of the track. The grassland element has abundant common bent and creeping soft-grass (<i>Holcus mollis</i>), with frequent tufted hair-grass. The dry heath has abundant heather with frequent bell heath, heath bedstraw and heath mosses. There is also an area of scattered bracken c. 5 x 10 m and scattered gorse near the track, and three mature rowan.
58	344216	832963	Running water	Confluence of the Oxter Burn and Dry Burn. The Oxter Burn is less than 1 m wide and flows over a rocky substrate, with a dense stand of waterweed sp. (<i>Elodea</i> sp.) at this location.

Target Note	Easting	Northing	Habitat Type	Description
59	345155	832958	Broad-leaved plantation woodland	Alder planting along Dry Burn, in an area with old tree stumps and brash remaining. Silver birch (<i>Betula pendula</i>) is also present, as planting and regeneration. A 2 m fence surrounds the plantation.
60	345601	832950	Track	Small areas of scattered gorse and bracken scrub alongside track.
61	344182	832933	Track	The end point of the line of beech trees where the disused track meets the current track.
62	345145	832932	Running water	Dry Burn at this point is approximately 1 m wide, with a fast flow over pebbles. Associated vegetation includes common nettle, soft-rush, rosebay willowherb (<i>Chamerion angustifolium</i>), wood-rush sp. and Yorkshire-fog.
63	342971	832921	Running water	Badilauchter Burn flows through a V-shaped gully. The watercourse is 0.5-1 m wide, with a rocky substrate. The banks of the gully support abundant hare's-tail cottongrass and soft-rush, with frequent bent grass. Downstream the burn flows through forestry, with fallen trees covering the channel in places. Upstream of this location the watercourse flows through a felled area of forestry and is visible as a thin line of soft-rush.
64	345204	832911	Track	Scattered gorse scrub upslope of track, and scattered bracken downslope.
65	343297	832887	Track	South-facing bank along edge of track. With abundant heather and mosses including <i>Hylocomium splendens</i> and <i>Pleurozium schreberi</i> , with bilberry and common bent occurring frequently, and self-seeded Sitka spruce up to 2 m high.
66	345634	832860	Unimproved neutral grassland	At this location the Lag Burn flows through a valley approximately 75-100 m wide, dominated wood-rush sp. with tufted hair-grass, frequent heath bedstraw and heather, and occasional creeping soft-grass, marsh thistle (<i>Cirsium palustre</i>) and soft-rush.
67	343811	832852	Ride	Forestry ride dominated by wood-rush sp. in an area of spruce high forest. The majority of the ride is open, with fallen trees to the south of this location.
68	343601	832830	Coniferous plantation woodland	Norway spruce (<i>Picea abies</i>) high forest. The ride at this location is dominated by wood-rush sp., although this has become covered over by the canopy. Throughout the forestry area the ground supports abundant common bent, creeping soft-grass and red fescue, with frequent sorrel sp. (<i>Rumex</i> sp.) and <i>Rhytidadelphus loreus</i> .
69	343888	832807	Running water	Dry Burn at this location is less than 0.5 m wide and flows over a pebble and rock substrate. The banks are dominated by wood-rush sp., with overhanging beech trees on the south side.
70	343060	832784	Mixed plantation woodland	South-facing bank alongside Badilauchter Burn. Predominantly acid grassland vegetation with abundant common bent, red fescue and wavy hair-grass, with occasional creeping soft-grass and tufted hair-grass. Occasional patches of dry heath with abundant heath bedstraw, heather, heath mosses and <i>Polytrichum</i> sp. Self-seeded Sitka spruce occur frequently throughout this area.

Target Note	Easting	Northing	Habitat Type	Description
71	343805	832780	Coniferous plantation woodland	Early high forest/late pole Norway spruce plantation. Abundant mosses, including <i>Mnium hornum</i> , <i>Plagiothecium undulatum</i> and <i>Hylocomium splendens</i> , with occasional wood sorrel.
72	343819	832770	Scattered broad-leaved trees	The start of a line of mature beech to either side of a disused track that crosses Dry Burn.
73	343058	832768	Mixed plantation woodland	Marshy grassland on either side of Badilauchter Burn. Dominated by soft-rush with frequent tufted hair-grass with occasional common marsh-bedstraw, creeping buttercup (<i>Ranunculus repens</i>), creeping soft-grass and Yorkshire-fog, with marsh thistle and marsh willowherb (<i>Epilobium palustre</i>) also present.
74	343071	832756	Running water	Badilauchter Burn not visible at this point. The channel is approximately 0.2 m wide and vegetated with soft-rush.
75	343468	832750	Unimproved neutral grassland	A small area of neutral grassland.
76	343454	832704	Running water	Dry Burn at this location flows through a deep V-shaped ravine. The channel is 0.5 - 1 m wide with a fast flow over pebbles. The watercourse flows through an area of pole stage spruce, and is mostly covered by windthrow. The vegetation here includes creeping buttercup, soft-rush, tufted hair-grass, wood-rush sp. and wood-sorrel.
77	342323	832671	Marshy grassland	With abundant common bent and soft-rush, and frequent <i>Sphagnum</i> . Other species present include heather, milkwort sp., marsh thistle, mat-grass (<i>Nardus stricta</i>) and tormentil.
78	343193	832649	Mixed plantation woodland	Planted sessile oak (<i>Quercus petraea</i>) (still in tree tubes) and self-seeded Sitka spruce on neutral grassland slope alongside Badilauchter Burn. Ground flora includes creeping soft-grass, tufted hair-grass and wood-rush sp.
79	342372	832639	Watercourse running water	Bogrotten Burn at this location flows through a narrow channel that is vegetated over with common bent, creeping soft-grass, soft-rush, tufted hair-grass and Yorkshire-fog.
80	342059	832627	Dry modified bog	Abundant deer-grass and heather, and frequent hare's-tail cottongrass and the mosses <i>Hylocomium splendens</i> , <i>Hypnum cupressiforme</i> and <i>Pleurozium schreberi</i> . Bilberry and <i>Sphagnum capillifolium</i> are occasional species. Other species present include cloudberry, common cottongrass, cross-leaved heath, crowberry, <i>Cladonia</i> sp. and self-seeded Sitka spruce.
81	343253	832613	Running water	Badilauchter Burn flows under road culvert and becomes Dry Burn. At this location the watercourse is approximately 1 m wide and flows over pebbles. The banks are vegetated with wood-rush sp. and self-seeded spruce sp. On the east side of the culvert the watercourse is 0.5 m wide and flows through a marshy grassland area with high banks.

Target Note	Easting	Northing	Habitat Type	Description
82	342679	832400	Running water	Bogrotten Burn at this location is 0.3 m wide with an open channel and a fast flow. The banks are vegetated with soft-rush and tufted hair-grass, with other species including common bent, common marsh-bedstraw, creeping buttercup, creeping soft-grass, marsh willowherb, sheep's-sorrel (<i>Rumex acetosella</i>) and Yorkshire-fog.
83	344428	832372	Coniferous plantation woodland	Alongside a minor watercourse (this could not be surveyed at this location due to bank steepness and dense tree coverage). This is a young coniferous plantation dominated by Sitka spruce with occasional broad-leaved species including hawthorn and rowan, with an underlying habitat of predominantly dry heath / acid grassland mosaic, and occasional patches of marshy and neutral grassland.
84	342417	832022	Running water	Blind Stripe watercourse at this location flows out of forestry and through a shallow U-shaped depression with soft-rush growth, tree planting up to the channel and a number of fallen trees. From this point the watercourse continues through a culvert with neutral grassland to either side, and down a waterfall into a further neutral grassland area with recent spruce planting. The channel is typically less than 0.5 m wide and shallow, with a pebble substrate.
85	342364	831891	Running water	A tributary of Blind Stripe. The channel is 0.5 - 1 m wide in a gully which at times is over 2 m deep, and flows through peat. The channel is mainly vegetated over by soft-rush, with bank vegetation including ferns, hare's-tail cottongrass, soft-rush and self-seeded spruce sp.
86	343718	831756	Ride	Large ride alongside watercourse within Sitka spruce plantation. A narrow strip of marshy grassland follows the burn, alongside an area of dry heath / acid grassland mosaic and scattered young Sitka spruce trees. This area has recently been restocked with coniferous trees.
87	343127	831729	Running water	At this location Bogrotten Burn is approximately 0.5 m wide with shallow banks supporting neutral grassland species such as creeping soft-grass, tufted hair-grass and Yorkshire-fog. There are large amounts of brash adjacent to the watercourse, and creeping soft-grass is an occasional species. Within the adjacent coniferous plantation (established and thicket stages) the ground flora is dominated by heather.
88	343241	831667	Running water	At this location Bogrotten Burn is approximately 1 m wide with a gravel substrate with banks supporting neutral grassland species. An extensive area of windthrow covers the stream in this area.
89	342270	831492	Marshy grassland	Tributary of Craig Water, a minor watercourse up to 5 cm deep with a silty base. The watercourse flows through marshy grassland which occurs in a strip approximately 5-6 m wide and is dominated by soft-rush with occasional foxglove, sweet-grass sp. (<i>Glyceria</i> sp.) and wavy hair-grass.

Target Note	Easting	Northing	Habitat Type	Description
90	343732	831340	Unimproved neutral grassland	Craig Water at this location flows in a channel approximately 1 wide and 0.3 m deep, with a gravel base. The banks are less than 1 m high and are dominated by neutral grassland species, and wood-rush sp. The surrounding neutral grassland habitat includes sneezewort (<i>Achillea ptarmica</i>), wild angelica (<i>Angelica sylvestris</i>) and yarrow (<i>Achillea millefolium</i>). The watercourse flows into a culvert at this location, and upstream the watercourse is generally covered by felled forestry trees, with some small scattered stands of broom (<i>Cytisus scoparius</i>).
91	344252	831339	Mosaic	Small areas of dry heath, acid grassland and scattered gorse scrub to the north of the track. Species present include foxglove and rosebay willowherb.
92	344415	830871	Wet dwarf shrub heath	Small patches of wet heath with hare's-tail cottongrass and purple moor-grass, in a ride dominated by dry heath.
93	344934	830824	Unimproved neutral grassland	This watercourse meanders through a 50-100 m wide area of neutral grassland. The channel is lined with a 5-10 m wide corridor or wood-rush sp.; beyond this is an occasionally inundated grassland area with common nettle, purple moor-grass, raspberry (<i>Rubus idaeus</i>), sedge spp., soft-rush, sharp-flowered rush (<i>Juncus acutiflorus</i>), tormentil and tufted hair-grass.
94	344440	830727	Acid dry dwarf shrub heath	Dominated by bilberry and heather with occasional heath rush and star sedge.
95	344061	830700	Acid dry dwarf shrub heath	Dominated by heather with abundant crowberry and occasional hare's-tail cottongrass, larch sp., Sitka spruce and tufted hair-grass.
96	344381	830698	Acid dry dwarf shrub heath	Dry heath dominated by bilberry and heather, with occasional cowberry.
97	343943	830482	Coniferous plantation woodland	A disused ride now overgrown by encroachment from the surrounding high forest Sitka spruce. The remaining ground flora includes the mosses <i>Polytrichum commune</i> and <i>Rhytidadelphus loreus</i> and the grasses creeping bent and wood melick (<i>Melica uniflora</i>). Bilberry and heather are also present.
98	343937	830474	Coniferous plantation woodland	High forest dominated by Sitka spruce, including many fallen trees (possibly due to thinning). The ground flora is dominated by mosses including <i>Brachythecium undulatum</i> , <i>Kindbergia praelonga</i> and <i>Rhytidadelphus loreus</i> .
99	343258	830425	Wet modified bog	Abundant hare's-tail cottongrass and heather, with frequent bilberry, cowberry and heath mosses. Crowberry and self-seeded Sitka spruce are occasional. Deergrass, heath rush and wavy hair-grass are also present.
100	344867	830424	Dry heath / acid grassland mosaic	Dry heath / acid grassland mosaic in a glade within coniferous plantation. Species present include heath bedstraw, heather, heath bedstraw and occasional Sitka spruce and larch.
101	344768	830413	Running water	Small burn with species including woodrush sp., occasional wavy hair-grass and soft-rush.

Target Note	Easting	Northing	Habitat Type	Description
102	344725	830413	Dry heath / acid grassland mosaic	Dry heath / acid grassland mosaic with Sitka spruce regeneration alongside a disused ride.
103	344627	830382	Coniferous plantation woodland	Recently felled area of woodland with coniferous restock and wavy hair-grass.
104	343903	830317	Coniferous plantation woodland	Former ride, now overgrown with mature spruce and covered by fallen trees. The ground flora is dominated by mosses including <i>Kindbergia praelongum</i> , <i>Plagiothecium undulatum</i> , <i>Polytrichum commune</i> , <i>Rhytidadelphus loreus</i> and <i>Sphagnum fimbriatum</i> .
105	343918	830238	Coniferous plantation woodland	North-west corner of an area of plantation restock. Species present include bent grasses, fescue sp., mat-grass, tufted hair-grass, wavy hair-grass and Yorkshire-fog, with abundant mosses including <i>Polytrichum commune</i> . Foxglove, heath bedstraw and soft-rush are also present.
106	343393	830165	Ride	Dry heath along a disused ride. With abundant bilberry, heather and mosses, including <i>Polytrichum commune</i> . Foxglove, heath bedstraw and soft-rush are also present.
107	344010	830146	Ride	Ride dominated by tufted hair-grass with Yorkshire-fog, in a large stand of Japanese larch (<i>Larix kaempferi</i>).
108	343863	830145	Coniferous plantation woodland	Area of high forest consisting of lodgepole pine with some larch. There are a large number of fallen trees in this area. Ground flora includes abundant grasses (mainly wavy hair-grass) and the mosses <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> and <i>Rhytidadelphus loreus</i> . Bilberry occurs occasionally. Young rowan seedlings are present.
109	344746	829850	Ride	Heath cudweed (<i>Gnaphalium sylvaticum</i>) and yellow-rattle (<i>Rhinanthus minor</i>) are present adjacent to the ride.
110	343510	829796	Recently felled coniferous woodland	Scattered gorse in an area of recently felled coniferous plantation, with neutral / acid grassland. Sitka spruce seedlings less than 20 cm high are planted throughout this area.
111	344079	829794	Watercourse	Minor watercourse within a strip of soft-rush approximately 5 m wide. Marsh thistle and marsh willowherb are also present. Neutral grassland is present between this watercourse corridor and the forestry.
112	343868	829759	Coniferous plantation woodland	Overgrown ride in area of dense thicket plantation. Many fallen trees and leaf litter.
113	344705	829747	Track	Area of neutral grassland between track and coniferous plantation (Norway spruce restock). Species present include common marsh-bedstraw, creeping thistle, harebell (<i>Campanula rotundifolia</i>), pansy sp. (<i>Viola</i> sp.), purple moor-grass and tufted hair-grass.
114	344486	829669	Building	Ruined building - fenced off. Species present inside and adjacent to fence include clover sp. (<i>Trifolium</i> sp.), common nettle, common ragwort (<i>Senecio jacobaea</i>), raspberry and yarrow.

Target Note	Easting	Northing	Habitat Type	Description
115	344178	829641	Track	Acid grassland alongside main track. With species including common mouse-ear (<i>Cerastium fontanum</i>), eyebright, pineappleweed (<i>Matricaria discoidea</i>), plantain sp. (<i>Plantago</i> sp.), red clover (<i>Trifolium pratense</i>), selfheal (<i>Prunella vulgaris</i>), white clover (<i>T. repens</i>), yellow-rattle and Yorkshire-fog.
116	344158	829640	Broad-leaved plantation woodland	Small area of broad-leaved plantation woodland, with species including birch, oak and rowan.
117	343386	829577	Running water	Minor watercourse to the north of Boganclosh Lodge, culverted under a track at this location. The channel is narrow and channel, with a detectable flow, although it is vegetated over by rosebay willowherb, soft-rush and tufted hair-grass.
118	344103	829470	Track	The line of a disused track, now vegetated with a mosaic of heath and grassland habitats and scattered self-seeded Sitka spruce. Species present include cleavers (<i>Galium aparine</i>), cross-leaved heath, soft-rush and heath mosses.
119	343671	829468	Other habitat	Close to Boganclosh Lodge, a caravan in a tree which appears to be in use as a den. Another static caravan and small building are present at the base of the tree.
120	344450	829467	Ride	Small area of acid grassland encroaching over a disused ride. Dominated by bell heather, broom, heath bedstraw, heath rush, milkwort sp. and tormentil.
121	343722	829461	Tall ruderal	Area adjacent to Boganclosh that may once have been a garden, now overgrown with tall ruderal vegetation. Includes broad-leaved dock, Oxford ragwort (<i>Senecio squalidus</i>), rosebay willowherb and tufted hair-grass, with scattered red-berried elder (<i>Sambucus racemosa</i>).
122	344286	829454	Unimproved neutral grassland	Infrequently used neutral grassland ride on the northern side of a wide valley (approximately 50 m wide) through which flows the Kirkney Burn (approximately 3-6 m wide). The grassland is dominated by false oat-grass, tufted hair-grass and Yorkshire-fog, with occasional common nettle and wood-rush sp., and small stands of gorse.
123	343749	829438	Scattered broad-leaved trees	A line of mature alder, 3-7 m tall, that appear to be self-seeded within an area of neutral grassland that is dominated by tufted hair-grass and Yorkshire-fog.
124	344209	829431	Unimproved neutral grassland	With abundant false oat-grass and tufted hair-grass. Occasional species include common nettle, foxglove, marsh thistle, sorrel sp., violet sp. (<i>Viola</i> sp.), wood-rush sp. and Yorkshire-fog.

APPENDIX 2: Quadrat Tables from the NVC Survey

Introduction

This appendix provides the quadrat data obtained during the National Vegetation Classification (NVC) survey, undertaken at the Clashindarroch II Wind Farm site from 20th September to 6th October 2016 (see Figures 9.4a and b for mapped results).

This appendix also provides a full list of vascular and non-vascular plant species recorded during the Phase 1 habitat survey (October 2015) and the NVC survey (September 2016 and 2017).

The NVC quadrat data

Species lists and estimated cover scores from the representative quadrats established during the NVC survey are provided below. These are assigned to the most closely corresponding NVC community (Tables A2.2 – A2.10).

Numbers alongside each plant species name refer to the extent of each species within the quadrat following the Domin scale of cover/abundance, with the highest number indicating the greatest cover, with the exception of the number ‘11’ which indicates species that were found outside the quadrat. The percentage cover and the Domin Value are shown in Table A2.1.

Table A2.1: The Domin number and associated percentage cover

Domin Number	Percent Cover
10	91-100
9	76-90
8	51-75
7	34-50
6	26-33
5	11-25
4	4-10
3	<4, with many individuals
2	<4, with several individuals
1	<4, with few individuals

Table A2.2: Quadrat Locations (see Figure 9.4a and b)

Quadrat Number	NVC Code	Easting	Northing
1	H10/U2	345169	834377
2	H10/U2	345068	834464
3	MG9	345097	834353
4	MG9	345118	834350
5	M19	343151	830387
6	M19	343167	830460
7	H12	343235	830478

Quadrat Number	NVC Code	Easting	Northing
8	H12	343392	830509
9	H12	343452	830504
10	H12	343567	830528
11	M19	343590	830547
12	M19	343582	830572
13	H12	343646	830607
14	H12	343852	830626
15	H12	344094	830694
16	H12	344368	830715
17	H12	344446	830586
18	H12	344385	830568
19	MG9	344077	830023
20	MG9	344066	829971
21	H12	344470	830835
22	H21	344314	830922
23	MG9	344507	833727
24	MG9	344505	833727
25	MG9	344159	833937
26	MG9	344191	833917
27	MG9	344279	833809
28	MG9	344418	833723
29	MG9	344984	833233
30	MG9	344868	833408
31	MG9	344738	833620
32	MG9	344258	833215
33	M19	343250	833059
34	M19	343265	833117
35	M19	343254	833152
36	M19	343318	833156
37	H12	342400	832722
38	H12	342398	832704
39	H12/U2	344481	831579
40	H12/U2	344457	831615
41	H12/U2	344413	831632
42	H21	343901	831118
43	H21	343940	831098
44	H21	343982	831053
45	H21	344313	830911
46	H10/U4	345313	833893
47	H10/U4	345300	833879
48	H12	344636	832541

Quadrat Number	NVC Code	Easting	Northing
49	H12	344688	832570

Table A2.3: H10/U2 *Calluna vulgaris-Erica cinerea* heath / *Deschampsia flexuosa* grassland mosaic

Quadrat	1	2
<i>Agrostis stolonifera</i>	5	4
<i>Blechnum spicant</i>	11	1
<i>Calluna vulgaris</i>	11	6
<i>Carex binervis</i>	2	
<i>Cladonia portentosa</i>	11	
<i>Deschampsia flexuosa</i>	7	7
<i>Dicranum scoparium</i>		4
<i>Digitalis purpurea</i>	11	
<i>Elytrigia repens</i>	1	
<i>Erica cinerea</i>	5	4
<i>Erica tetralix</i>	11	
<i>Galium saxatile</i>	7	6
<i>Galium uliginosum</i>	4	
<i>Holcus lanatus</i>	4	
<i>Hylocomium splendens</i>	6	
<i>Hypnum jutlandicum</i>		5
<i>Luzula campestris</i>		4
<i>Polygala vulgaris</i>	4	
<i>Pseudoscleropodium purum</i>	6	4
<i>Rhytidadelphus squarrosus</i>	4	
<i>Vaccinium myrtillus</i>	11	

Table A2.4: H10/U4 *Calluna vulgaris-Erica cinerea* heath / *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland mosaic

Quadrat	46	47
<i>Agrostis capillaris</i>	9	7
<i>Anthoxanthum odoratum</i>	4	2
<i>Calluna vulgaris</i>	7	7
<i>Calypogeia arguta</i>		6
<i>Calypogeia muelleriana</i>	5	4
<i>Carex binervis</i>	2	
<i>Cytisus scoparius</i>	5	4
<i>Deschampsia cespitosa</i>		2
<i>Deschampsia flexuosa</i>		7
<i>Dicranella rufescens</i>		6
<i>Dicranum scoparium</i>	5	
<i>Digitalis purpurea</i>	2	2
<i>Erica cinerea</i>	4	
<i>Galium saxatile</i>	5	6
<i>Holcus lanatus</i>	4	7
<i>Hylocomium splendens</i>	3	
<i>Hypnum jutlandicum</i>		5

Quadrat	46	47
<i>Juncus bulbosus</i>	1	
<i>Juncus bulbosus</i>	1	
<i>Juncus effusus</i>	5	
<i>Juncus squarrosus</i>	4	
<i>Luzula campestris</i>	4	
<i>Luzula sylvatica</i>		2
<i>Picea sitchensis</i>		2
<i>Polygala vulgaris</i>		1
<i>Polytrichum commune</i>	7	3
<i>Polytrichum strictum</i>		7
<i>Potentilla erecta</i>		1
<i>Pseudoscleropodium purum</i>	4	5
<i>Ranunculus repens</i>	2	
<i>Rhytidadelphus squarrosus</i>	3	7
<i>Trientalis europaea</i>		1

Table A2.5: H12 *Calluna vulgaris*-*Vaccinium myrtillus* heath

Quadrat	7	8	9	10	13	14	15	16	17	18	21	37	38	48	49
<i>Agrostis capillaris</i>															7
<i>Blechnum spicant</i>														11	
<i>Calluna vulgaris</i>	10	10	10	10	10	10	10	10	8	7	9	9	10	10	4
<i>Calypogeia arguta</i>												4		5	
<i>Calypogeia fissa</i>												4			
<i>Carex binervis</i>								1							1
<i>Carex echinata</i>									4	4	1				
<i>Carex nigra</i>								1							
<i>Carex panicea</i>									11						
<i>Cirsium palustre</i>														11	
<i>Cladonia portentosa</i>	6	6		8	4	7	7								
<i>Deschampsia cespitosa</i>														1	11
<i>Deschampsia flexuosa</i>									11	1	1		11		11
<i>Dicranum scoparium</i>												3			
<i>Digitalis purpurea</i>															11
<i>Empetrum nigrum</i>	5	5		4	4	4	3	6				4			
<i>Erica cinerea</i>	5	11			1	5	1					11			
<i>Eriophorum angustifolium</i>				1					1	11					
<i>Galium saxatile</i>													2		
<i>Holcus lanatus</i>															1
<i>Hylocomium splendens</i>					10	10	9	10	10	10			10	10	8
<i>Hypnum cupressiforme</i>					10								5		
<i>Hypnum jutlandicum</i>	10	10	10												4
<i>Juncus effusus</i>														1	11
<i>Juncus squarrosus</i>	1			11		1	11				1				
<i>Luzula sylvatica</i>								11							
<i>Nardus stricta</i>											5				
<i>Picea sitchensis</i>					1	1	1						11		11
<i>Pinus sylvestris</i>						11									
<i>Plagiothecium undulatum</i>													5	6	

Quadrat	7	8	9	10	13	14	15	16	17	18	21	37	38	48	49
<i>Pleurozium schreberi</i>											10				
<i>Polytrichum commune</i>				11										7	
<i>Polytrichum strictum</i>												3	3		
<i>Pseudoscleropodium purum</i>										2					
<i>Racomitrium lanuginosum</i>	1	6										5			
<i>Rhytidadelphus loreus</i>															
<i>Rhytidadelphus squarrosus</i>								5	5	5				6	
<i>Sphagnum capillifolium</i>											4				
<i>Sphagnum fallax</i>													8	1	
<i>Trichophorum germanicum</i>								11							
<i>Vaccinium myrtillus</i>	4	2	8	3	3	2	2	4	6	8	9	7	8		
<i>Vaccinium vitis-idaea</i>	4	4	6	4	2		4	4	4	2	5	11			

Table A2.6: H12/U2 *Calluna vulgaris*-*Vaccinium myrtillus* heath / *Deschampsia flexuosa* grassland mosaic

Quadrat	39	40	41
<i>Calluna vulgaris</i>	10	9	9
<i>Cephalozia bicuspidata</i>			3
<i>Deschampsia flexuosa</i>	7	5	6
<i>Dicranoweisia cirrata</i>			3
<i>Galium saxatile</i>	4		2
<i>Hypnum cupressiforme</i>	7	7	4
<i>Juncus squarrosus</i>			1
<i>Picea sitchensis</i>		11	
<i>Plagiothecium undulatum</i>	7	7	7
<i>Polytrichum commune</i>		11	2
<i>Polytrichum strictum</i>		4	
<i>Rhytidadelphus squarrosus</i>			5
<i>Vaccinium myrtillus</i>	4	6	5

Table A2.7: H21 *Calluna vulgaris*-*Vaccinium myrtillus*-*Sphagnum capillifolium* heath

Quadrat	22	42	43	44	45
<i>Blechnum spicant</i>	11				
<i>Calluna vulgaris</i>	10	9	9	9	9
<i>Carex binervis</i>	11				
<i>Carex echinata</i>		3	5	1	
<i>Deschampsia flexuosa</i>	2		1		2
<i>Empetrum nigrum</i>			3	2	5
<i>Erica cinerea</i>			4		
<i>Eriophorum vaginatum</i>				2	
<i>Hylocomium splendens</i>		9	7	7	4
<i>Molinia caerulea</i>		11	4		
<i>Picea sitchensis</i>			11		
<i>Pleurozium schreberi</i>	4	7			6
<i>Polytrichum commune</i>		4		6	
<i>Pseudoscleropodium purum</i>				4	
<i>Rhytidadelphus loreus</i>		5		4	6
<i>Sphagnum capillifolium</i>	10	5	5	9	9

Quadrat	22	42	43	44	45
<i>Sphagnum fallax</i>		8	4		
<i>Vaccinium myrtillus</i>	5		6		6
<i>Vaccinium vitis-idaea</i>	4	5	5	5	5

Table A2.8: M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire

Quadrat	5	6	11	12	33	34	35	36
<i>Calluna vulgaris</i>	10	10	10	9	9	9	8	9
<i>Calypogeia fissa</i>								3
<i>Carex nigra</i>	11							
<i>Cladonia portentosa</i>							4	
<i>Deschampsia flexuosa</i>								3
<i>Dicranum scoparium</i>	11	4						
<i>Empetrum nigrum</i>	4	4		3	5	3	4	4
<i>Erica tetralix</i>					11		5	
<i>Eriophorum vaginatum</i>	3	5	8	8	6	9	8	9
<i>Hylocomium splendens</i>	7		10	10		9	10	10
<i>Hypnum cupressiforme</i>							4	3
<i>Juncus squarrosum</i>	11	1						1
<i>Lophozia ventricosa</i>								2
<i>Molinia caerulea</i>			11					
<i>Picea sitchensis</i>							11	
<i>Pleurozium schreberi</i>	10	10			8			
<i>Pseudoscleropodium purum</i>			5					
<i>Rhytidiodelphus loreus</i>	4	5			7			
<i>Rhytidiodelphus squarrosum</i>			2					
<i>Rubus chamaemorus</i>			2	1				
<i>Sorbus aucuparia</i>								11
<i>Sphagnum capillifolium</i>						5	11	4
<i>Sphagnum fallax</i>								2
<i>Trichocolea tomentella</i>					6			
<i>Vaccinium myrtillus</i>	4	4	4	7			8	4
<i>Vaccinium vitis-idaea</i>	4	4	4	2	6	5	7	5

Table A2.9: MG9 *Holcus lanatus-Deschampsia cespitosa* grassland

Quadrat	3	4	19	20	23	24	25	26	27	28	29	30	31	32
<i>Agrostis canina</i>						5		11						
<i>Agrostis capillaris</i>			7											
<i>Agrostis stolonifera</i>				8						4		5		5
<i>Alnus glutinosa</i>											1			
<i>Anthoxanthum odoratum</i>			5	11										
<i>Calluna vulgaris</i>										11	11			
<i>Calypogeia fissa</i>													5	
<i>Cardamine hirsuta</i>								1						
<i>Carex echinata</i>		1												
<i>Cirsium palustre</i>	3	4			1	1	3		2	1				1
<i>Dactylis glomerata</i>			2											
<i>Deschampsia cespitosa</i>	9	8	7	8	9	8	10	10	10	10	10	10	10	10

Quadrat	3	4	19	20	23	24	25	26	27	28	29	30	31	32
<i>Deschampsia flexuosa</i>						4						4		
<i>Dicranum scoparium</i>			3											
<i>Digitalis purpurea</i>	4	4	11	11			11		1	2	1	1	2	
<i>Epilobium palustre</i>		3			1		2							
<i>Festuca rubra</i>			4											
<i>Festuca vivipara</i>					4									
<i>Galium palustre</i>					4	5	11	2	2	2	6		2	6
<i>Galium saxatile</i>			6	5							5	4		
<i>Galium uliginosum</i>			1											
<i>Holcus lanatus</i>	6		8	4		7	4	4	5	4		1	7	5
<i>Holcus mollis</i>					4									
<i>Hylocomium splendens</i>		6					6	4	2	3				7
<i>Hypnum cupressiforme</i>			7	3										
<i>Juncus effusus</i>		4	11		2	4	5	2		11		6	6	
<i>Juncus squarrosum</i>					11									
<i>Luzula sylvatica</i>							2							
<i>Oxalis acetosella</i>	6	3					2	1	2		4	3		
<i>Picea sitchensis</i>								11			11			
<i>Pleurozium schreberi</i>	5		7											
<i>Polygala serpyllifolia</i>						3	3							
<i>Pseudoscleropodium purum</i>		4										8		
<i>Racomitrium lanuginosum</i>			11											
<i>Ranunculus repens</i>		6					4		4					
<i>Rhytidadelphus squarrosus</i>	4			4	7		7						5	
<i>Rumex acetosa</i>	7	4												
<i>Sphagnum capillifolium</i>						6								
<i>Urtica dioica</i>			11				11	11	4					

APPENDIX 3: Full Plant Species List

Table A3.1 provides a full list of higher and lower plant species recorded during all habitat and botanical surveys at Clashindarroch II.

Table A3.1: Phase 1 habitat survey and NVC plant species list

Species	Common Name
<i>Acer pseudoplatanus</i>	Sycamore
<i>Achillea millefolium</i>	Yarrow
<i>Achillea ptarmica</i>	Sneezewort
<i>Agrostis canina</i>	Velvet bent
<i>Agrostis capillaris</i>	Common bent
<i>Agrostis stolonifera</i>	Creeping bent
<i>Agrostis vinealis</i>	Brown Bent
<i>Alnus glutinosa</i>	Alder
<i>Angelica sylvestris</i>	Wild Angelica
<i>Anthoxanthum odoratum</i>	Sweet vernal-grass
<i>Arrhenatherum elatius</i>	False oat-grass
<i>Aulacomnium palustre</i>	Bog bead-moss
<i>Betula pendula</i>	Silver birch
<i>Betula pubescens</i>	Downy birch
<i>Blechnum spicant</i>	Hard-fern
<i>Brachythecium rivulare</i>	River feather-moss
<i>Calluna vulgaris</i>	Heather
<i>Calypogeia arguta</i>	Notched pouchwort
<i>Calypogeia fissa</i>	Common pouchwort
<i>Calypogeia muelleriana</i>	Mueller's pouchwort
<i>Campanula rotundifolia</i>	Harebell
<i>Cardamine hirsuta</i>	Hairy bitter-cress
<i>Carex binervis</i>	Green-ribbed Sedge
<i>Carex echinata</i>	Star Sedge
<i>Carex nigra</i>	Common sedge
<i>Carex panicea</i>	Carnation sedge
<i>Cephalozia bicuspidata</i>	Two-horned pincerwort
<i>Cerastium fontanum</i>	Common mouse-ear
<i>Chamerion angustifolium</i>	Rosebay willowherb
<i>Cirsium arvense</i>	Creeping thistle
<i>Cirsium palustre</i>	Marsh thistle
<i>Cladonia portentosa</i>	Cup lichen sp.
<i>Corylus avellana</i>	Hazel
<i>Crataegus monogyna</i>	Hawthorn
<i>Cytisus scoparius</i>	Broom
<i>Dactylis glomerata</i>	Cock's-foot
<i>Deschampsia cespitosa</i>	Tufted hair-grass

Species	Common Name
<i>Deschampsia flexuosa</i>	Wavy hair-grass
<i>Dicranella rufescens</i>	Rufous forklet-moss
<i>Dicranoweisia cirrata</i>	Common pincushion
<i>Dicranum scoparium</i>	Broom fork-moss
<i>Digitalis purpurea</i>	Foxglove
<i>Elodea</i> sp.	Waterweed sp.
<i>Elytrigia repens</i>	Common couch
<i>Empetrum nigrum</i>	Crowberry
<i>Epilobium palustre</i>	Marsh willowherb
<i>Erica cinerea</i>	Bell heather
<i>Erica tetralix</i>	Cross-leaved heath
<i>Eriophorum angustifolium</i>	Common cottongrass
<i>Eriophorum vaginatum</i>	Hare's-tail cottongrass
<i>Euphrasia officinalis</i>	Eyebright
<i>Fagus sylvatica</i>	Beech
<i>Festuca rubra</i>	Red fescue
<i>Festuca vivipara</i>	Viviparous sheep's-fescue
<i>Galium aparine</i>	Cleavers
<i>Galium palustre</i>	Common marsh-bedstraw
<i>Galium saxatile</i>	Heath bedstraw
<i>Galium uliginosum</i>	Fen bedstraw
<i>Glyceria</i> sp.	Sweet-grass sp.
<i>Gnaphalium sylvaticum</i>	Heath cudweed
<i>Holcus lanatus</i>	Yorkshire-fog
<i>Holcus mollis</i>	Creeping soft-grass
<i>Hylocomium splendens</i>	Glittering wood-moss
<i>Hypnum cupressiforme</i>	Cypress-leaved plait-moss
<i>Hypnum jutlandicum</i>	Heath plait-moss
<i>Juncus bulbosus</i>	Bulbous rush
<i>Juncus effusus</i>	Soft-rush
<i>Juncus squarrosum</i>	Heath rush
<i>Kindbergia praelonga</i>	Common feather-moss
<i>Larix decidua</i>	European larch
<i>Larix kaempferi</i>	Japanese larch
<i>Larix x eurolepis</i>	Hybrid larch
<i>Leontodon saxatilis</i>	Lesser hawkbit
<i>Lotus corniculatus</i>	Common bird's-foot-trefoil
<i>Lophozia ventricosa</i>	Tumid notchwort
<i>Luzula campestris</i>	Field wood-rush
<i>Luzula sylvatica</i>	Great wood-rush
<i>Lycopodium clavatum</i>	Stag's-horn clubmoss
<i>Matricaria discoidea</i>	Pineappleweed

Species	Common Name
<i>Melica uniflora</i>	Wood melick
<i>Mnium hornum</i>	Swan's-neck thyme-moss
<i>Molinia caerulea</i>	Purple moor-grass
<i>Nardus stricta</i>	Mat-grass
<i>Oxalis acetosella</i>	Wood-sorrel
<i>Viola sp.</i>	Pansy sp.
<i>Picea abies</i>	Norway spruce
<i>Picea sitchensis</i>	Sitka spruce
<i>Pinus contorta</i>	Lodgepole pine
<i>Pinus mugo</i>	Mountain pine
<i>Pinus sylvestris</i>	Scots pine
<i>Plagiothecium undulatum</i>	Waved silk-moss
<i>Plantago sp.</i>	Plantain sp.
<i>Pleurozium schreberi</i>	Red-stemmed feather-moss
<i>Polygala serpyllifolia</i>	Heath milkwort
<i>Polygala vulgaris</i>	Common milkwort
<i>Polytrichum commune</i>	Common haircap Moss
<i>Polytrichum strictum</i>	Strict haircap
<i>Populus tremula</i>	Aspen
<i>Potentilla erecta</i>	Tormentil
<i>Prunella vulgaris</i>	Selfheal
<i>Prunus avium</i>	Wild cherry
<i>Pseudoscleropodium purum</i>	Neat feather-moss
<i>Pteridium aquilinum</i>	Bracken
<i>Quercus petraea</i>	Sessile oak
<i>Racomitrium lanuginosum</i>	Woolly fringe-moss
<i>Ranunculus acris</i>	Meadow buttercup
<i>Ranunculus repens</i>	Creeping buttercup
<i>Rheum rhabarbarum</i>	Rhubarb
<i>Rhinanthus minor</i>	Yellow-rattle
<i>Rhytidiodelphus loreus</i>	Little shaggy-moss
<i>Rhytidiodelphus squarrosus</i>	Springy turf-moss
<i>Ribes uva-crispa</i>	Gooseberry
<i>Rubus chamaemorus</i>	Cloudberry
<i>Rubus fruticosus</i>	Bramble
<i>Rubus idaeus</i>	Raspberry
<i>Rumex acetosa</i>	Common sorrel
<i>Rumex acetosella</i>	Sheep's sorrel
<i>Rumex obtusifolius</i>	Broad-leaved dock
<i>Salix cinerea</i>	Grey willow
<i>Sambucus nigra</i>	Elder
<i>Sambucus racemosa</i>	Red-berried elder

Species	Common Name
<i>Senecio jacobaea</i>	Common ragwort
<i>Senecio squalidus</i>	Oxford ragwort
<i>Sorbus aucuparia</i>	Rowan
<i>Sphagnum capillifolium</i>	Red bog-moss
<i>Sphagnum fallax</i>	Flat-topped bog-moss
<i>Sphagnum fimbriatum</i>	Fringed bog-moss
<i>Trichocolea tomentella</i>	Handsome woollywort
<i>Trichophorum germanicum</i>	Deergrass
<i>Trientalis europaea</i>	Chickweed-wintergreen
<i>Trifolium pratense</i>	Red clover
<i>Trifolium repens</i>	White clover
<i>Tsuga heterophylla</i>	Western hemlock
<i>Ulex europaeus</i>	European gorse
<i>Ulmus glabra</i>	Wych elm
<i>Urtica dioica</i>	Common nettle
<i>Vaccinium myrtillus</i>	Bilberry
<i>Vaccinium vitis-idaea</i>	Cowberry
<i>Viola</i> sp.	Violet sp.