



Appendix 9B

Phase 1 Habitat and National Vegetation Classification Survey 2011



Stornoway Wind Farm Phase 1 and NVC Habitat Survey, 2011

**A Report for Royal Haskoning
Commissioned by Lewis Wind Power**

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1 Introduction

1.1 Background, aims and objectives

A vegetation/habitat assessment was requested as part of the scoping for the proposed Stornoway Wind Farm - Document No. 1690_PRO_010.

A Phase 1 habitat survey for the whole development area plus a detailed National Vegetation Classification (NVC) survey extending to an envelope of 100m around any proposed wind farm structures was requested in this document in order to inform the Environmental Impact Assessment (EIA) process in identifying any possible impacts on ecological receptors.

Highland Ecology (HE) were approached by Royal Haskoning, through Waterside Ecology, in June 2010 to carry out the survey work.

Field surveys were scheduled for September 2010. At this time there was no detailed design for the wind farm and it was agreed that HE would therefore carry out an NVC survey of the whole development area in addition to the Phase 1 survey - see section 2 below for details of methods used.

In addition to the Phase 1 and NVC surveys, it was proposed that we would also gather further information on blanket bog condition, particularly relating to the “activity” status of the blanket bog resource. This was following a review by HE of a previous NVC survey, and the papers surrounding the planning application for the previous Lewis Wind Farm in 2003-2004.

The field survey was carried out by Tim Rafferty (TR) and Kate Proctor (KP) of Highland Ecology. Both TR and KP were surveyors on the Lewis Peatlands SAC survey carried for Scottish Natural Heritage in 2002-2003 (Dayton 2003) and also have extensive experience, since 1994, of surveying and assessing vegetation types in the Outer Hebrides and throughout Scotland in general.

1.2 Non-technical summary of habitat types

The following brief summary of the survey area is intended as non-technical and refers only to Phase 1 habitat types.

Blanket bog

The vast part of the survey area is covered by blanket bog vegetation on deep peat. Blanket bog is generally regarded as very important and is listed in Annex 1 of the EU Habitats Directive (92/43/EEC). It is inevitable that any development will result in some loss of this habitat.

The blanket bog in the survey area conforms well to the documented NVC types and it is considered to be in good condition throughout, except where drained for the planting of conifers. The habitat has formed over thousands of years and almost the whole resource is “active”, meaning that new peat is still continuing to form and slowly deepen from the component mire species. Activity is considered to be relatively high over the survey area, with virtually no grazing over most of it, and the bog supports a very spongy and lush surface of mosses and lichens with vascular plants growing through it.

Parts of the blanket bog have undergone erosion in the past, resulting in dendritic gullying of the blanket bog. Although there is still some erosion in parts of the blanket bog many of

these areas now support actively re-generating vegetation and there is very little bare peat here compared to other areas of blanket bog on the Isle of Lewis and Scotland in general.

Although all the blanket bog is considered important, there are some areas that are particularly sensitive in nature, being generally much wetter, often with extensive pool systems. These have therefore been highlighted.

Some areas of blanket bog have been previously drained and planted with conifers. This has resulted in a more modified type of blanket bog that is generally drier and botanically of less value. These areas are more suited to development and compensatory restoration.

Around the edges of the blanket bog, where access is easier, there are many areas of peat cuttings. This is where peat has historically, been cut by the local community. As a result, the peat is generally less deep but blanket bog species continue to grow and re-generate and are therefore also to be considered as currently active, forming new blanket bog. Sustainable small scale peat cutting continues in the modern day. In the eastern part of the survey there is an area of industrial scale peat cutting which took place in the 19th century. These are also very active and re-generating.

Dwarf shrub heath

Dwarf shrub heath is much less extensive than blanket bog and occurs on shallower peat, less than 50cm deep, over the steeper slopes of knolls and banks, as well as in peat cuttings and other small areas within the blanket bog where the peat thins. Heaths are considered important and are also listed in Annex 1 of the EU Habitats Directive (92/43/EEC).

There are two types of heath; wet and dry. Dry heath occurs where the peat is free-draining and is characterised by a dense cover of heather and an absence of *Sphagnum* moss. Wet heath often looks very much like blanket bog but the peat depth is less than 50cm and has patchier *Sphagnum* moss and lacks a few other blanket bog species.

Grasslands

Where improvement through agricultural management has taken place semi-improved acid grassland and marshy grassland occur. These are all very common habitats through the marginal uplands in Scotland and are generally regarded as of low conservation value.

Larger stands of acid grassland are confined to the edges of the survey area as well as roadsides and to the area north of the landfill site. In the more improved parts these grasslands are transitional to more Mesotrophic grassland types. Small patches of, usually quite rank, acid and marshy grassland occur frequently within the survey alongside watercourses and other channels. Marshy grassland also occurs within the main blanket bog in botanically bland patches and it is also common in areas of modified bog which has been drained and planted.

Other habitats

Acid flushes are frequent alongside the channels of watercourses and soakways within the blanket bog. They are generally common in upland Scotland and of low conservation value.

Other habitats found as small isolated stands were gorse scrub, planted broadleaved woodland and basic flush.

2 Methods

2.1 Satellite Imagery Analysis

Prior to field survey a GeoEye satellite image (details below) of the survey area was used in order to identify and mark off distinct areas, or polygons. See Fig. 1.

- Acquisition date of image: 17.03.2009
- Resolution: 0.5m
- Spectral format true colour

Areas were distinguished by examining a combination of colouring and texture/surface patterning.

In carrying out this exercise and subsequent early ground-truthing it was possible to identify:

- Areas of blanket bog that have been previously drained or planted with conifers (linear disturbance lines easily visible)
- Areas of blanket bog that are distinctly wetter with pool systems and wet hollows (dark speckled or blotchy patterning)
- Areas of blanket bog with gullying (dendritic darker patterning). These are often very complex in outline and also variable depending on the degree of gullying so a simplified approach was necessary
- Areas of blanket bog or marshy grassland that have a high *Molinia* content (white/pale)
- Areas of semi-improved grassland (green) and dry dwarf shrub heath (dark)
- Watercourses, soakways and other channels (linear)

The boundaries of these areas were then loaded into Magellan MobileMapper6 handheld units, which combine Geographical Information Systems (GIS) software with Global Positioning System (GPS). The satellite image itself was also loaded into the units and the lines overlaid on top of it.

In this way we were able to accurately monitor (to an accuracy of 1 metre) our live survey progress over these maps in the field.

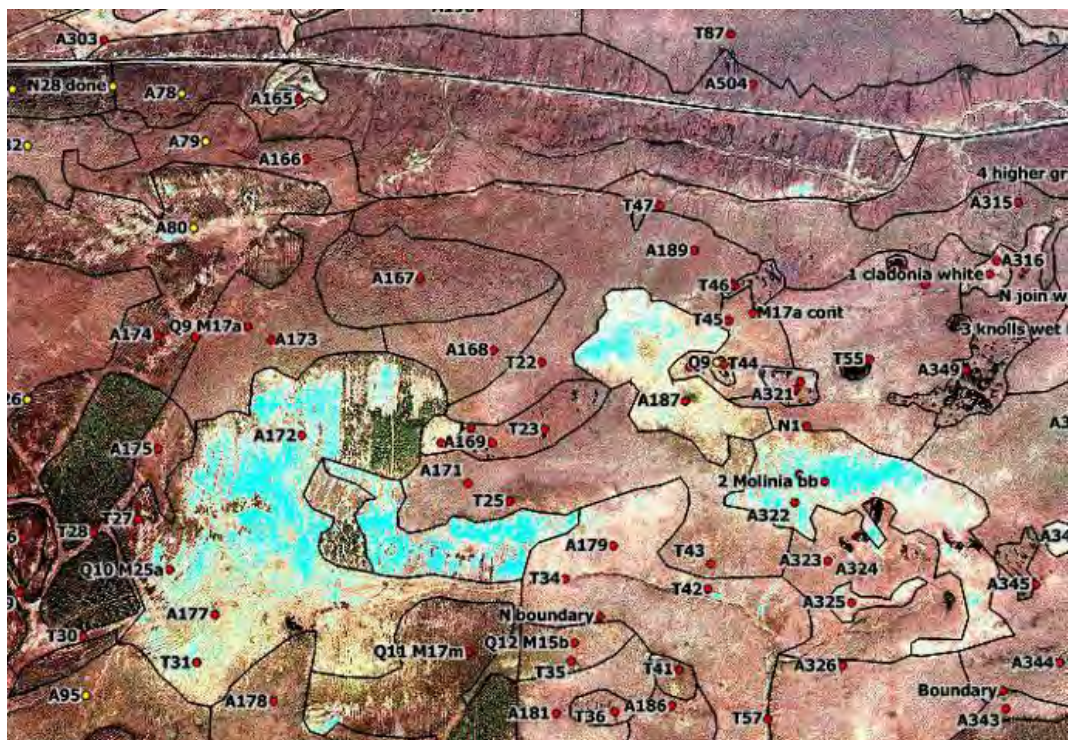


Plate 1: GeoEye satellite image with pre-mapped boundaries overlaid and loaded into handheld GIS/GPS system. The boundaries were checked,adjusted and NVC areas and target notes added in the field. The above image shows blanket bog and heath communities in shades of brown, with Molina grassland communities in shown in blue

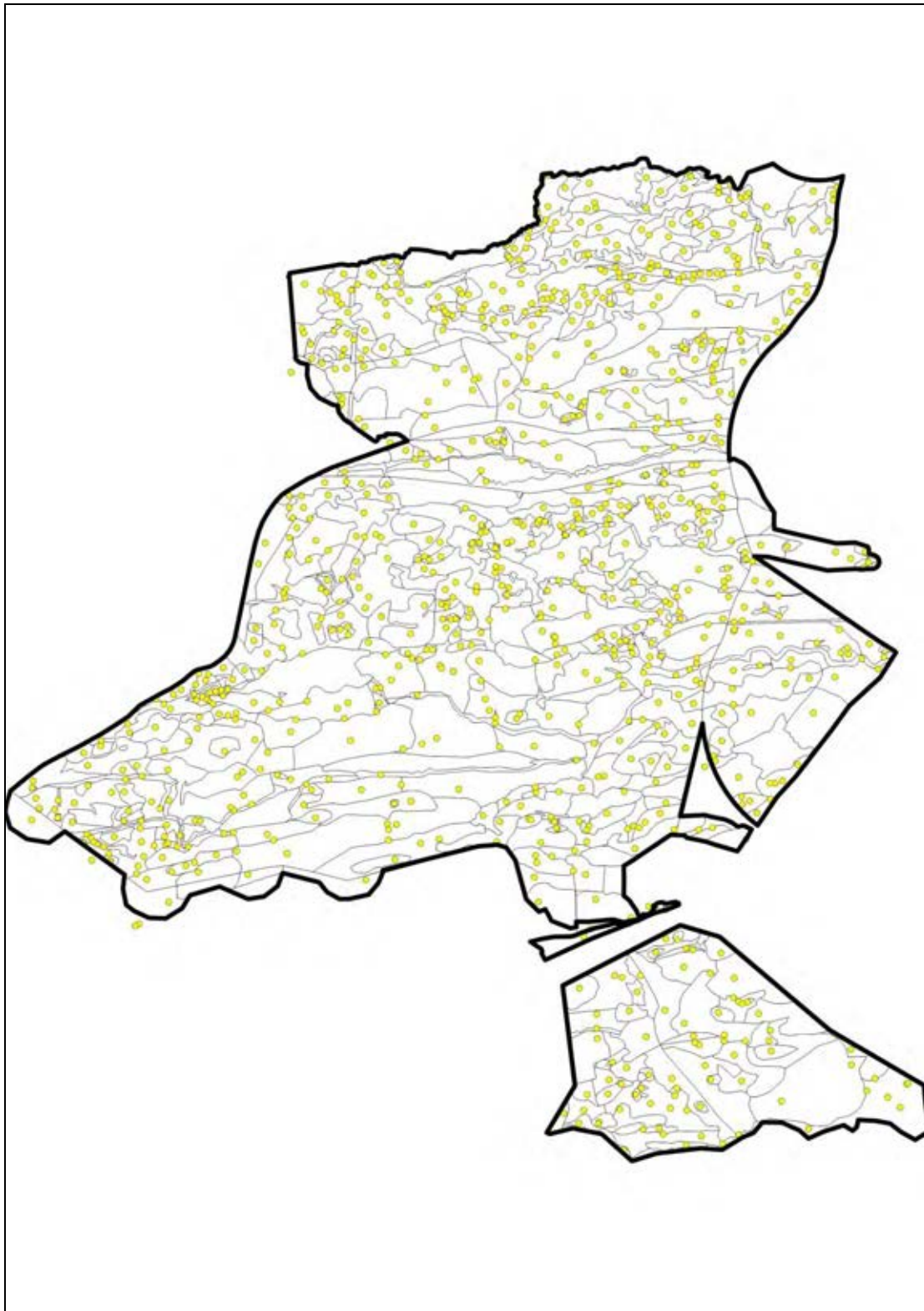


Figure 1: Coverage of survey area, showing polygons mapped and surveyed with distribution of notated points – NVC data, target notes, photography etc.

2.1 Field survey

NVC

A NVC survey was carried out to cover the proposed wind farm site including buffers beyond the turbine envelope. The extent of the surveyed areas and detailed coverage is shown in Figure 1 and in Appendix 3, Figure 1.

Detailed envelope NVC survey was carried out at a rate of approx. 1km of area per day and included recording of quadrat data (5 for each important NVC sub-community).

Field survey was carried out according to the NVC methodology outlined in British Plant Communities Volumes 1 – 5 (Rodwell, 1990, 1991, 1992, 1995, 2000).

Distribution maps for each community are included in the detailed NVC descriptions in section 3.

Phase 1 Habitat Survey

Phase 1 habitat codes were also assigned to the polygons mapped based on the NVC communities present using the methodology described in the Handbook for Phase 1 Habitat Survey (NCC 2010).

A Phase 1 habitat map is shown in ES Figure 12.2a-f. Target notes and a location map are shown in Appendix 1 of this report.

In addition to NVC data additional information was gathered on the extent and degree of erosion and blanket bog condition within each polygon/NVC type.

Surveyors walked over the proposed site in such a way as to see all habitats present within the site. Each vegetation type encountered was recorded using handheld GIS devices – pre-mapped boundaries were examined and differences in terms of vegetation communities were noted.

All areas were mapped to NVC sub-community level wherever possible and at least to community level when the vegetation did not easily fit any of the documented sub-communities. All such assessments were carried out by eye, based on the surveyors' extensive experience of the NVC classification system.

Where it was not possible to map areas as an NVC community (e.g. landfill or other habitats not covered by the NVC), then Phase 1 Habitat Survey codes were used instead.

Where two or more vegetation types occurred closely together in a repeating pattern they were mapped as a mosaic with an approximate ratio indicative of the amount of each vegetation type within that polygon. Often communities occur as small fragments, 5% or less, and these were recorded separately as a list.

An example would be **M17b/60 M17a/30 M1/10 (M3/M19a/M25a)** meaning the area is composed of approximately 60% dry M17b blanket bog, 30% wet M17a, 10% M1 wet hollows pools with standing water and smaller fragments of M3 bare peat, M19a tussocky blanket bog and M25a *Molinia*-dominated grassland/mire.

Where the vegetation in a mappable area appeared to be transitional between two different NVC types, and was not easily classifiable as either, it was mapped as a transitional type, e.g. M6d/M23a, and a target note made.

Target notes, referencing NVC community types, were made of all features of nature conservation interest, including important plant species, condition of the vegetation and management practices. All target notes were referenced using a handheld GPS and given an 8 figure grid reference. Target notes and a location map are shown in Appendix 1 of this report.

Sufficient supporting data was gathered for the more important vegetation types: blanket bog, wet heath, dry heath, modified bog, marshy grassland and acid flush.

These consist of standard NVC quadrat data sets, 5 for each community or sub-community where possible, with a DOMIN rating for each species present. Quadrat data is shown in Appendix 2 of this report. Less important habitats such as rank acid grassland and mesotrophic grassland were not sampled but target notes with species lists were taken.

Additional supporting data on blanket bog activity

For blanket bog habitat additional information was recorded on the activity of the bog and also on the activity within gullies, where these were prominent.

In the absence of a standard system for recording blanket bog activity, a recording methodology was devised by Highland Ecology during a similar survey in 2008 for the Viking Energy wind farm on Shetland. For each blanket bog unit mapped an activity grade was recorded as follows:

Active vs. Inactive blanket bog

Grading system 1 to 5 (vegetated shallow peat = acid grassland/heath and/or vegetated substrate in hag bottoms derived through erosion of former deep peat):

1 More or less totally inactive, poor condition, 80-100% bare peat (or vegetated shallow peat)

- Widespread bare peat, stony substrate or wet heath/acid grassland on v. shallow peat.
- Very little cover, if any, of *Sphagnum*.
- Current erosion of remaining peat block edges and surfaces.
- Maybe occasional fragments of remnant blanket bog but these not of any great size and usually eroding further.

2 Largely inactive, 50%-80 bare peat (or vegetated shallow peat)

- A large part of the area consists of bare peat, substrate or wet heath/grassland derived from former deeper peat.
- >50% bare surface or shallow peat.
- Within this there might be some areas of active peat formation, either as existing blocks of uneroded blanket bog or as new active accumulation in the bottom of hags. These are not usually extensive.
- Condition may well be unfavourable (i.e. not recovering, or declining) due to ongoing erosion and/or trampling/grazing effects.

3 Intermediate, widespread larger scale peat erosion, 20-50% bare peat (or vegetated shallow peat)

- Typically a mosaic/patchwork of active and inactive areas, difficult to class as 2 or 4.
- There may be widespread haggling and bare peat or substrate, bare peat often in networks up to several metres wide
- 20-50% Bare peat surfaces or sparse re-vegetation.
- There might also be small areas of new build-up of mire species, most importantly *Sphagnum* spp. (e.g. U6a *Juncus squarrosus* acid grassland with *Sphagnum* building, small patches M17a and M1).
- These areas may be in current unfavourable condition due to trampling or they may be favourable and seen to be recovering.
- If exactly 50%-50% then judge by amount of re-vegetating surfaces vs. bare peat.

4 Areas of broadly intact bog with smaller scale but frequent bare peat erosion, 5-20% bare peat (or vegetated shallow peat)

- A large proportion of ground supports typical mire and peat-forming species, notably *Sphagnum* spp., though it may naturally not be prominent in the drier blanket bog types.
- Hags and bare peat etc. usually present and frequent, covering 5-20% of the ground as very frequent channels within peat but not usually wide or deep, 0.5 to 2m.
- Blanket bog may be continuing to erode in parts but better re-vegetating bare peat surfaces are more widespread here, along with areas of active building of *Sphagnum* etc. (U6a, M17a, M1) which can occupy hag bottoms, hollows and naturally damned channels in the peat.
- May be recoverable with reduced grazing.

5 More or less fully active, good, stable condition blanket bog, <5% bare peat overall

- Widespread deep peat with little haggling and erosion, although there will usually be at least some.
- Continuously vegetated over large extents with typical mire species. In wetter stands there will be extensive unbroken *Sphagnum* carpets.
- Drier stands (e.g. M17b) may quite naturally have less *Sphagnum* but here there will be extensive cover of *Racomitrium lanuginosum* and *Cladonia* spp. lichens and other typical associates. Where there are pools these will usually be well-vegetated with *Sphagnum cuspidatum* and/or *S. denticulatum* or *S. fallax* and typical vascular associates.

A figure was also recorded for active vegetation in gully bottoms based on the above percentages bands. Gully bottom NVC communities were also recorded where appropriate.

Timetable of survey

Fieldwork was carried out by Tim Rafferty and Kate Proctor of Highland Ecology at an average rate of 1km²/day.

The survey was carried out in 4 phases:

- **18th – 30th September 2010** this phase covered the whole of the main development area.
- **14th – 16th November 2010** this phase covered 3 areas south of the main development area: approx. 300 ha around the 3 existing turbines at Arnish, approx. 150 ha to the east of the main development area alongside the River Creed and an area alongside proposed to the east of the development area from the A859 opposite Marybank Quarry.
- **21st – 24th February 2011** this phase was to cover an area for potential site access alongside the A859 plus buffers around 4 turbines close to the edge of the development area in the south (Turbines 31, 35, 36 and 38).
- **11th – 19th May 2011** a few small refinements to the survey data were made whilst TR was on-site advising on the installation of 3 meteorological masts. Further occurrences of an important *Sphagnum* species were also found.

Nomenclature

Nomenclature used in this report follows Stace (1997) for vascular plants and Smith (2004) for bryophytes.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

SEPA issued a Land Use Planning System SEPA Guidance Note 4, SEPA LUPS GU4, in August 2010. This was too late to consider in our vegetation survey but it was applied to our NVC data by carrying out queries on our GIS system.

2.2 Sources of error and limitations

The following factors influence the accuracy of mapping and classification of vegetation in a walkover survey of this nature:

- Different NVC communities and sub-communities frequently occur in fine-grained repeating patterns of two or more types and only a rough estimate of the composition of these can be made in the field along the path taken in the field.
- Transitional vegetation is frequent and it is not always possible to confidently assign it to a single NVC community or sub-community. E.g. purple moor-grass is frequently of high cover in M17 blanket bog, especially modified bog or at the edges of blanket bog and where it is particularly high it can be difficult to judge whether the vegetation should be assigned to M17 or M25.
- Although as much of the survey area was walked as was possible much of the ground was scanned and proportions of various communities were estimated. Use of satellite image and the pre-mapped boundaries helped to focus survey effort in order to optimise use of time.
- Errors can occur in mapping boundaries when viewing sloping 3D surfaces from a low viewpoint and this is especially the case on the current survey where much of the ground is relatively flat or very gently sloping.
- Weather conditions can adversely affect survey quality. Survey was carried out in varying conditions, typical of the Outer Hebrides, from dry, still and sunny to cloudy and wet, but always with good visibility. Heavy rain affected the survey on one day in Sept. 2010 when watercourses quickly became very full and survey was abandoned. Frost occurred during the November survey but it was not heavy enough to persist and hinder identification of species.

3 NVC Communities – technical descriptions

The following is a technical description of all the NVC communities and sub-communities recorded. EC habitats Directive Annex 1 and UKBAP status are listed where applicable. An indicative list of the main species encountered, along with DAFOR rating, is also given for each NVC type - this was compiled during report writing in order to combine target note information with DOMIN ratings from the quadrat tables.

3.1 Blanket bog/mire communities

Phase I classification: blanket bog (BB)

EC Habitats Directive 7130 Blanket bogs, UKBAP Priority Habitat

M1 Sphagnum denticulatum bog pool

EC Habitats Directive 7130 Blanket bogs, UKBAP Priority Habitat

Sphagnum cuspidatum A, *Sphagnum denticulatum* F, *Sphagnum papillosum* F, *Eriophorum angustifolium* F, *Erica tetralix* F, *Trichophorum cespitosum* F, *Calluna vulgaris* O, *Eriophorum vaginatum* O, *Menyanthes trifoliata* O, *Utricularia minor/Utricularia* spp. O, *Potamogeton polygonifolius* O



Plate 2: A well vegetated M1 pool grading at the edges into M17a

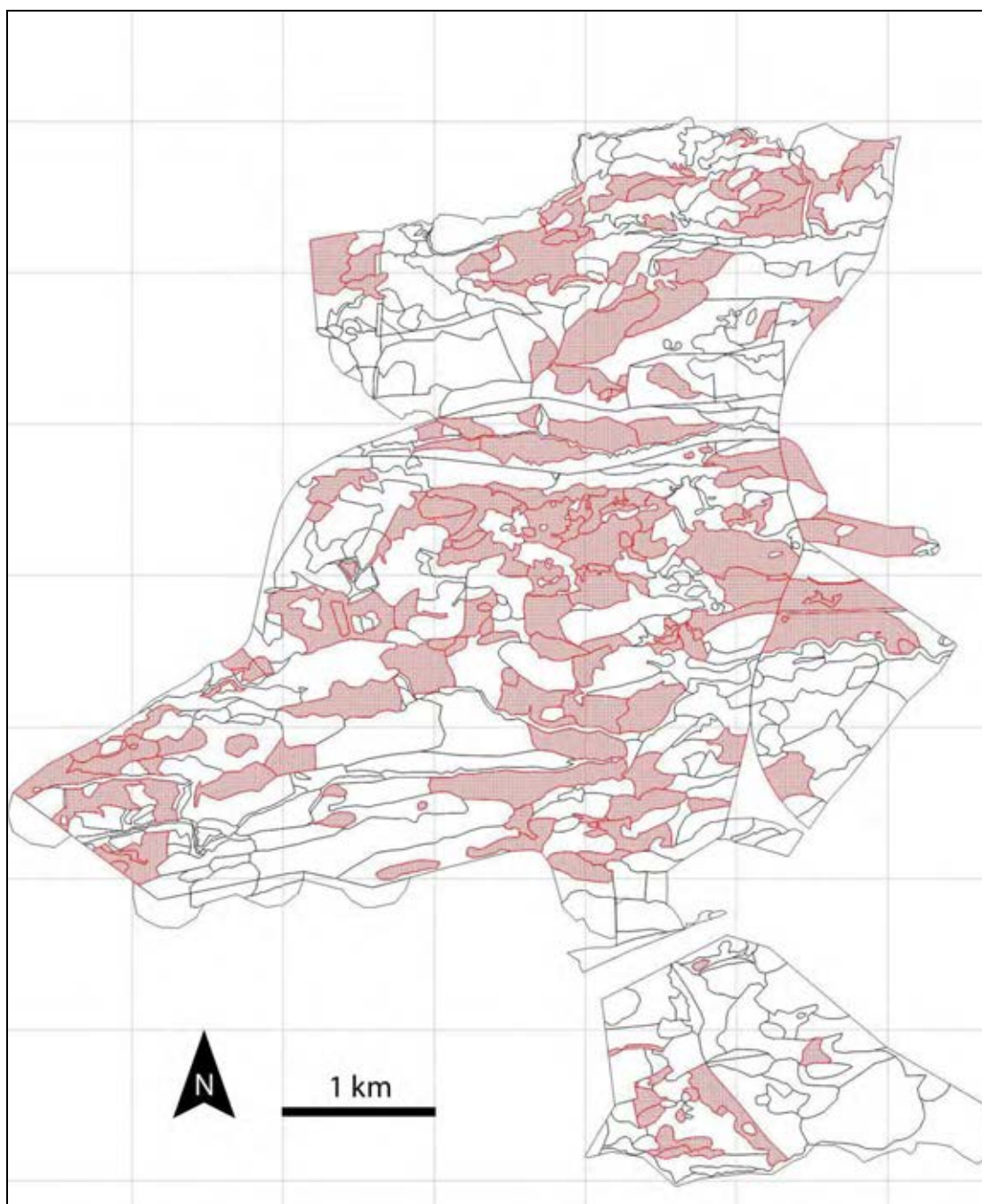


Figure 2: M1 *Sphagnum denticulatum* bog pool – map shows polygons where M1 is primary, secondary or tertiary component

This community occurs on wet hollows and depressions in the peat surface or at the margins of deeper pools. Although widespread through the survey area it is less frequent than the other main blanket bog communities, occurring where the water table is at the surface for much of the year. As such it tends to occur mainly within the more waterlogged blanket bog community M17a or forming the hollow component within hummock/hollow bog systems with M17b and M17a. It is also found in eroded bog where new active bog formation is taking place in gully bottoms, in peat cuttings and, less frequently, drained modified bog with planted conifers.

The distribution map shows polygons where M1 makes up a substantial percentage of the vegetation, over 5%. It can also frequently occur in any blanket bog polygon as smaller fragments forming less than 5% total. As this community can occupy very small areas compared to the main blanket bog type of the drier peat surfaces (M17b) 5% for a polygon is regarded as substantial.

This community is one of the most sensitive to disturbance as well as being the blanket bog community of the least abundance in terms of cover percentages within mosaics, almost absent in the driest areas of bog but up to around 30% or more locally in the wettest tracts.

The main visual constant here is *Sphagnum cuspidatum*, which can be abundant in vegetated hollows, and there is often some associated *Sphagnum denticulatum*, which distinguishes this community from M2. As it is generally found in the wetter areas it is more frequently associated with M17a into which it grades via a transitional zone of *Sphagnum cuspidatum*/*Sphagnum denticulatum* to *Sphagnum capillifolium*/*Sphagnum papillosum*.

Vascular associates are typically sparse but there is usually some *Eriophorum angustifolium* and one or more of *Erica tetralix*, *Calluna vulgaris*, *Eriophorum vaginatum* and, sometimes in deeper pools, *Menyanthes trifoliata*.

The submerged *Utricularia minor* occurs quite frequently in this community. It is possible that other *Utricularia* spp. also occur here but identification needs close examination and it was often out of reach - as a result, only a proportion of occurrences were positively identified and all these were *Utricularia minor*.

M1 vegetation often forms new, active blanket bog in the bottom of erosion gullies, the extent and amount being dependent on local topography and drainage. The community also occurs in the flat bottoms in areas of old peat cuttings where drainage is impeded between the linear drier ridges and can here form quite extensive patches. Even in areas of modified bog drained for conifer planting, M1 vegetation can be found regenerating in the bottoms of ditches in the wetter parts, exhibiting how more natural blanket bog may build up and re-generate well in parts.

Larger and deeper pools, easily visible on satellite imagery, are more lacking in *Sphagnum* although *Menyanthes trifoliata* can still be frequent and there can be some *Utricularia minor*. *Sparganium angustifolium* can also occur in some of the larger pools. The bigger pools are often absent of vegetation - in those cases pools were recorded as open standing water.



Plate 3: Close-up of M1 hollow with abundant *Sphagnum cuspidatum* and some *Menyanthes trifoliata*



M1 vegetation in waterlogged drain bottoms in areas of bog drained for conifer planting

M3 *Eriophorum angustifolium* bog pool

EC Habitats Directive 7130 Blanket bogs

Eriophorum angustifolium F, *Carex panicea* F, *Sphagnum cuspidatum* O, *Juncus squarrosus* O, *Narthecium ossifragum* R.



Plate 4: M3 *Eriophorum angustifolium* bog pool in an area with erosion gullies and bare peat which is some of the most severe for the site

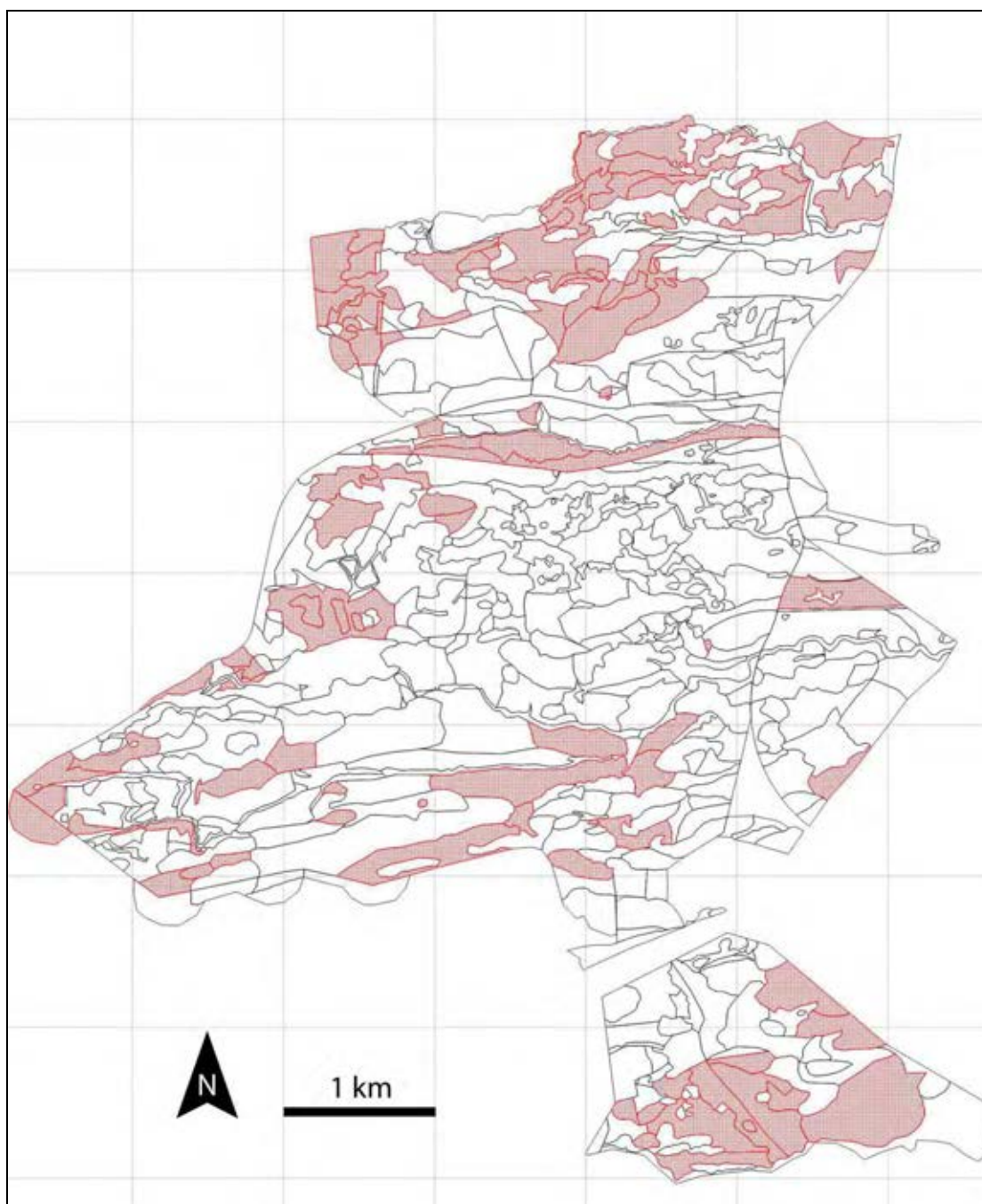


Figure 3: M3 *Eriophorum angustifolium* bog pool – map shows polygons where M3 was recorded significantly

This is a community associated with bare peat surfaces, which can be either permanently wet or intermittently dried out, depending on season and weather. Large areas of bare peat are uncommon over the Stornoway Wind Farm site and it is quite rare to see any patches larger than 2m x 2m. It is most frequently found along the bottoms and the near-vertical sides of dendritic gully networks in areas of previously eroded or currently eroding blanket bog. It is frequently overtopped by mats of the moss *Racomitrium lanuginosum* growing over from the drier M17b community of the higher peat surfaces of the gullies or peat cuttings.

The most frequent pioneer species which colonises bare peat is *Eriophorum angustifolium* along with a few other associates, notably *Narthecium ossifragum* and *Carex panicea*, and sometimes a little sparse *Erica tetralix*, *Trichophorum cespitosum*, *Calluna vulgaris*,

Pleurozia purpurea. In the wettest examples, there can be some *Sphagnum cuspidatum* and/or *Sphagnum denticulatum* but it is usually very sparse compared to the lush M1 bog pool community. The non-native moss *Campylopus introflexus* was also recorded occurring in this community.

M3 is more noticeable in some areas, such as around Arnish where stock trampling is more intensive, around Beinn Thulabaigh and the area north – east of Loch Garbhaig. Otherwise it is quite often inconspicuous over large tracts. Areas that have previously eroded can often have gully sides which are well vegetated with M17b species as well as being active in gully bottoms. The amount of M3 and bare peat could be decreasing in these areas under the reduced grazing levels of recent years.



Plate 5: Extensive trampled M3 bare peat surface in the Arnish area where stock levels are much higher. *Eriophorum angustifolium* and *Carex panicea* are the main species



Eroded blanket bog gully with *Eriophorum angustifolium* and sparse *Sphagnum* and an eroding hummock of *Racomitrium lanuginosum* (M17b)

M17a *Trichophorum cespitosum*-*Eriophorum vaginatum* blanket mire *Drosera rotundifolia* - *Sphagnum* spp. sub-community

EC Habitats Directive 7130 Blanket bogs, UKBAP Priority Habitat

Sphagnum papillosum A, *Sphagnum capillifolium* A, *Eriophorum angustifolium* F, *Calluna vulgaris* F, *Eriophorum vaginatum* F, *Pleurozia purpurea* F, *Trichophorum cespitosum* F, *Erica tetralix* F, *Narthecium ossifragum* F, *Potentilla erecta* F, *Drosera rotundifolia* O, *Sphagnum tenellum* O, *Empetrum nigrum* ssp. *nigrum* O.



Plate 6: M17a *Trichophorum cespitosum*-*Eriophorum vaginatum* mire *Drosera rotundifolia*-*Sphagnum* sub-community – map shows polygons where M17a is primary, secondary or tertiary component (Figure 4 shows polygons where M17a is primary, secondary or tertiary component)

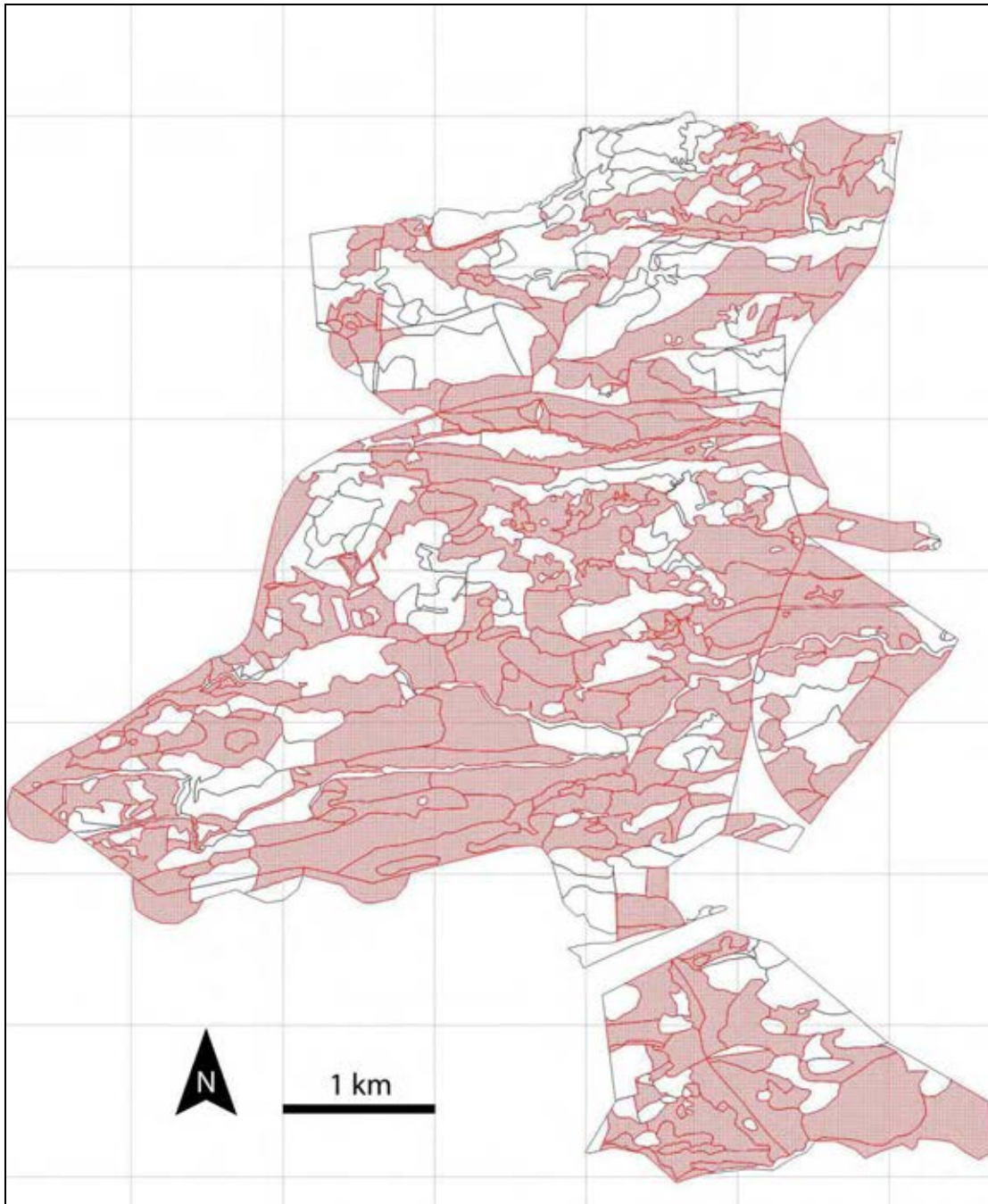


Figure 4: Polygons where M17a is primary, secondary or tertiary component

This is a community of more or less permanently waterlogged peat and is usually characterised by an abundance of *Sphagnum* spp. and *Drosera rotundifolia*. It usually occurs in mosaics with the other main blanket bog type, M17b, occupying ground where the peat surface is kept more or less waterlogged throughout the year and it often grades into M1 bog pools and hollows with standing water. It also occurs in more extensive stands in its own right on particularly flat ground and in large depressions where water does not drain away.

Over the proposed Stornoway Wind Farm site this mire type is fairly typical of that described in the NVC with an abundance of ochre *Sphagnum papillosum* and red *Sphagnum*

capillifolium, often in extensive carpets and forming a surface that is soft and spongy underfoot. Amongst these two prominent mosses there can also be some *Sphagnum tenellum*, *Sphagnum cuspidatum* and *Pleurozia purpurea*. Hypnoid or “feather” mosses are rather lacking here compared to drier blanket bog types such as M19 and M17b.

The bulk of the vascular component here is comprised of *Trichophorum cespitosum*, *Molinia caerulea*, *Eriophorum angustifolium*, *Calluna vulgaris*, *Erica tetralix*, *Eriophorum vaginatum*, *Narthecium ossifragum* and *Molinia caerulea*. *Molinia caerulea* and associated dead leaf litter can be quite prominent in some tracts of M17a – here the *Sphagnum* component is reduced and patchier and the vegetation can be viewed as transitional to the M25a *Molinia caerulea*-*Potentilla erecta* mire.



Plate 7: *Sphagnum magellanicum* is a component of M17a which is rather infrequent through the survey area

Sphagnum austinii (formerly *S. imbricatum*) is a rare hummock-forming species of undisturbed blanket bog. It was found in one location in M17a

M17a differs from the drier M17b in having much more extensive *Sphagnum papillosum* and *S. capillifolium* and, correspondingly, a much reduced amount of *Racomitrium lanuginosum* and *Cladonia* spp. compared to that community. The hypnaceous bryophyte element of M19a here is typically absent or much reduced and the lack of prominent *Eriophorum vaginatum* tussocks also marks it out from that community. *Eriophorum vaginatum* still occurs as a constant throughout the vegetation but as sparser smaller amounts.

The rare *Sphagnum austinii* (formerly *S. imbricatum*) was found in one location in M17a. This species is an indicator of undisturbed blanket bog habitat and was once the prime constituent of blanket bog vegetation, having declined severely over time and continues to decline with loss of blanket bog habitat. It should be noted that this species was found as three hummocks close together in one location and is quite likely to occur elsewhere in the survey area.

The dark red *Sphagnum magellanicum* also grows in M17a. It is not as rare as *Sphagnum austinii* but it is infrequent in the survey area and therefore should be considered to be of some local importance.

The condition of this community is generally good over the site and represents some of the least disturbed and best condition blanket bog where it occurs as intact stands over large areas of flatter or depressed ground with wet M1 pools and hollows.

M17b *Trichophorum cespitosum*-*Eriophorum vaginatum* blanket mire *Cladonia* spp. sub-community

EC Habitats Directive 7130 Blanket bogs, UKBAP Priority Habitat, UKBAP Priority Habitat
Cladonia portentosa A, *Racomitrium lanuginosum* A, *Eriophorum angustifolium* F, *Calluna vulgaris* A,
Molinia caerulea F, *Eriophorum vaginatum* F, *Sphagnum capillifolium* F, *Erica cinerea* F,
Trichophorum cespitosum F, *Erica tetralix* F, *Cladonia uncialis* F



Plate 8: M17b *Trichophorum cespitosum*-*Eriophorum vaginatum* mire *Cladonia* spp. sub-community (Figure 5 shows polygons where M17b is primary, secondary or tertiary component)

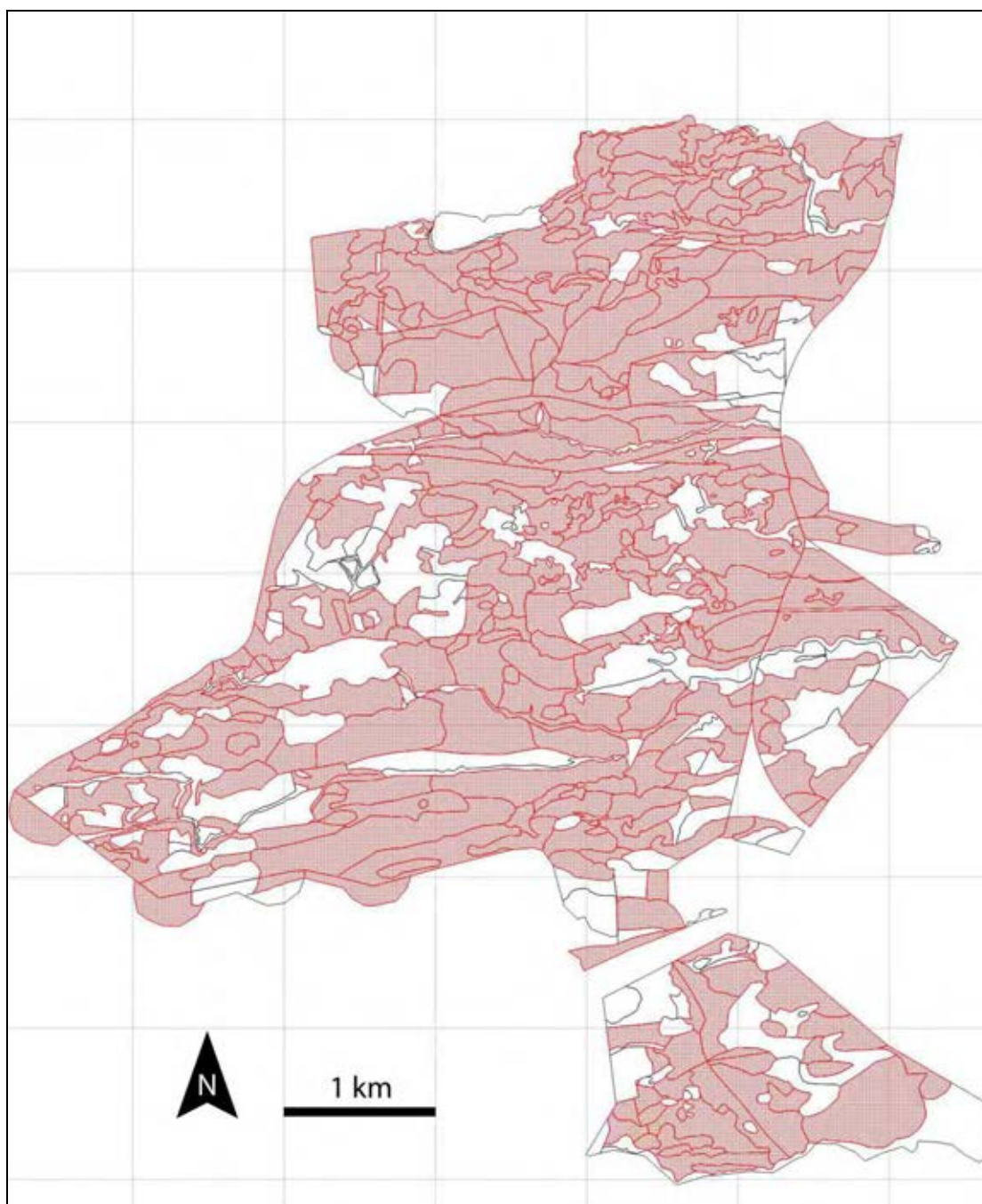


Figure 5: Polygons where M17b is primary, secondary or tertiary component

This is a community of the drier peat surfaces found within large areas of blanket bog and is present as the main blanket bog type throughout the whole survey area.

This sub-community is characterised by an abundance of *Racomitrium lanuginosum* and *Cladonia* spp. and a generally reduced cover of *Sphagnum* compared to the M17a sub-community. The lush abundance of both *Racomitrium lanuginosum* and *Cladonia portentosa* is conspicuous over most of the survey area and may be a result of decreased trampling/poaching of the ground through stock grazing. The cover of *Cladonia portentosa* is so prominent that the component shows up as light/white on satellite imagery.

The vascular associates *Eriophorum vaginatum*, *Calluna vulgaris*, *Trichophorum cespitosum*, *Erica tetralix*, *Molinia caerulea* and *Eriophorum angustifolium* are constant or very frequent. Marking out this blanket bog type is the frequency and abundance of the dwarf shrub *Erica cinerea* which can be particularly conspicuous on the driest edges of peat, for example above gullies.

The lack of tussocky *Eriophorum vaginatum* and carpet of hypnaceous mosses distinguish this vegetation from M19 blanket bog. It is different from its wetter M17a counterpart by the abundance of *Racomitrium lanuginosum*/*Cladonia portentosa*/*Erica cinerea* and the relative lack of *Sphagnum*, particularly *Sphagnum papillosum*, though *Sphagnum capillifolium* can be quite prominent in M17b.

It occurs commonly in mosaics with M17a and M1 often in a natural hummock/hollow structure where the silvery and white hummocks (as seen in the diagram above) are visually distinctive. The dry cushions of *Racomitrium lanuginosum*/*Cladonia portentosa* grade gently through carpets of *Sphagnum papillosum*/*Sphagnum capillifolium* (M17a) to wet hollows with standing water and an abundance of *Sphagnum cuspidatum* and *Sphagnum denticulatum*. These areas of hummock/hollow are very often quite pristine and natural-looking but there are also areas which look like they may have previously eroded into gully formation and are now recovering. In these instances the transition zones between hummock and hollow are more vertical and there is usually less M17a in the transition zone.

It is usually very prominent where there has been previous erosion of the blanket bog in areas of gully networks where it occupies virtually all the raised peat surfaces with the wetter M1 and M17a often more prominent in the gully bottoms. Sometimes M17b can also dominate the hollows and gully bottoms in the driest parts of blanket bog and it can also form more uniform flat stands where the surface of the bog is not so differentiated into hummock/hollow.

In areas of old peat cuttings M17b is particularly prominent along the straight dry ridges.



Plate 9: Close-up of lushly growing *Racomitrium lanuginosum* and *Cladonia portentosa*



Previously eroded dry blanket bog with gullies, now recovering well, this area relatively dry and dominated by M17b

M17mod modified *Trichophorum cespitosum*-*Eriophorum vaginatum* blanket mire

EC Habitats Directive 7130 Blanket bogs, UKBAP Priority Habitat

Molinia caerulea A, *Calluna vulgaris* F, *Erica tetralix* F, *Potentilla erecta* F, *Cladonia portentosa* F, *Hylocomium splendens* F

This is not a documented NVC community but a variant that was devised for this survey in order to categorise areas of blanket bog that have been drained and modified for conifer planting. Although much of the drained areas are planted with poorly growing pine or spruce there are also many drained areas that remain unplanted.

It is visibly different from the more natural blanket bog types with abundant, or dominant, *Molinia caerulea*, along with much reduced or complete absence of *Sphagnum* mosses, *Racomitrium lanuginosum* and *Cladonia portentosa* in the bryophyte layer. Instead there is abundant litter and/or carpets of the hypnaceous moss *Hylocomium splendens*. Although *Molinia caerulea* usually predominates here there can also be prominent growth of bushy *Calluna vulgaris*.

This vegetation type occupies the tops and sides of the drains often with the wetter blanket bog types (M1, M17a) in more typical condition in the waterlogged drain bottoms. Much of the vegetation classed as M17mod could be included in Phase 1 terms under modified wet bog but there is quite a range of variation in this drained mire type, transitional at one end to the more natural M17b and M17a and at the other end to the *Molinia caerulea*-dominated M25a.

This modified form of blanket bog is considered to be of relatively lower conservation value than the natural forms and, therefore, more suited to development. These areas would no doubt revert to a more natural composition over a long period of time and regeneration/enhancement of these areas could be accelerated by the blocking of drains with excavated peat. Within the drained areas where this community occurs there are also networks of undrained “rides” which support more natural blanket bog (M17a, M17b, M1) in a mostly unaltered state.



Plate 10: M17mod modified *Trichophorum cespitosum*-*Eriophorum vaginatum* mire (Figure 6 shows where M17mod is a component)

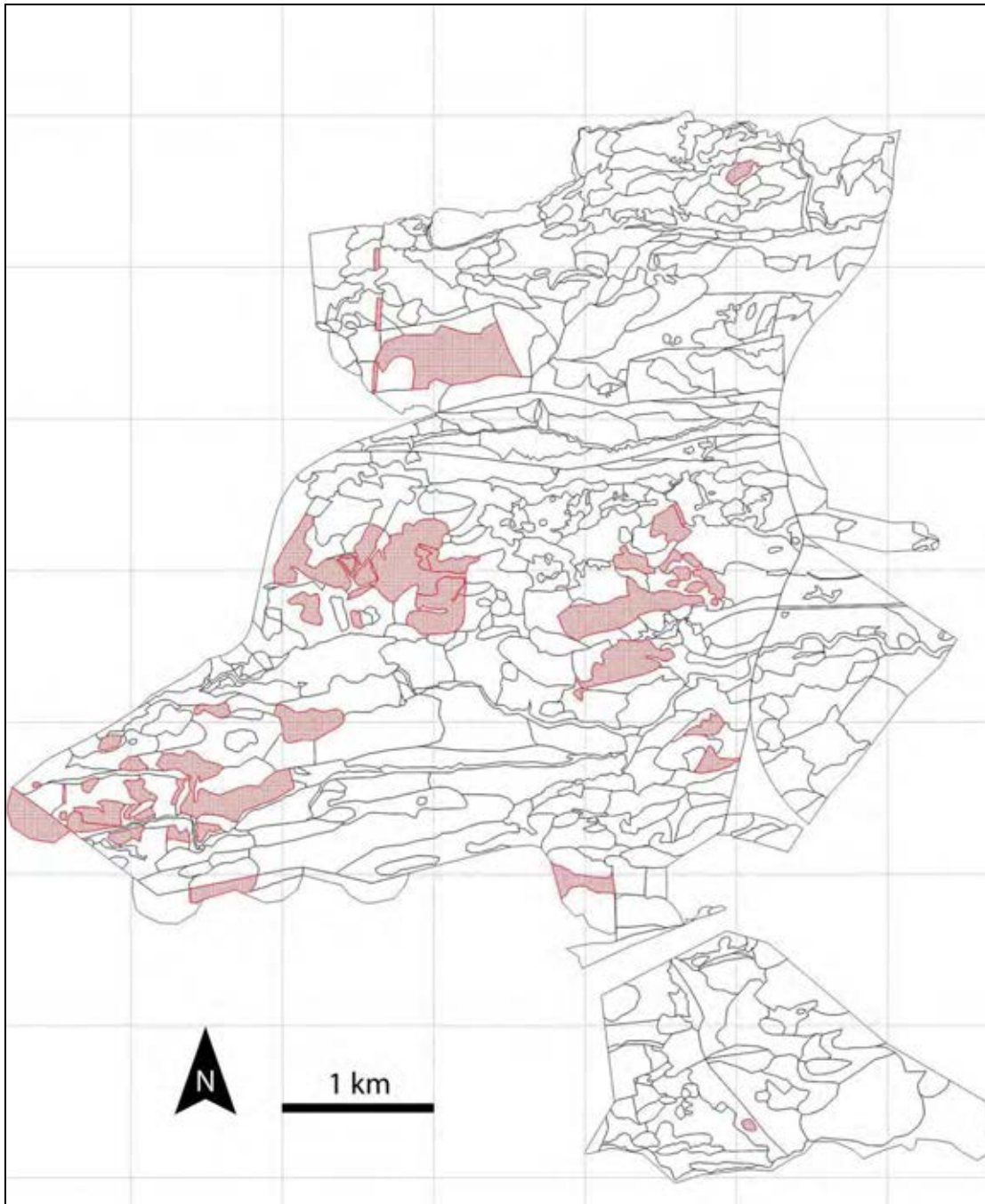


Figure 6: Polygons where M17mod is a component

M19a Calluna vulgaris-Eriophorum vaginatum blanket mire Erica tetralix sub-community

EC Habitats Directive 7130 Blanket bogs, UKBAP Priority Habitat

Eriophorum vaginatum A, *Calluna vulgaris* A, *Erica tetralix* F, *Empetrum nigrum* ssp. *nigrum* F, *Eriophorum angustifolium* F, *Rhytidiadelphus loreus* A, *Hylocomium splendens* A, *Pleurozium schreberi* F, *Sphagnum capillifolium* O.



Plate 11: M19a *Calluna vulgaris*-*Eriophorum vaginatum* mire (Figure 7 shows polygons where M19a is primary, secondary or tertiary component)

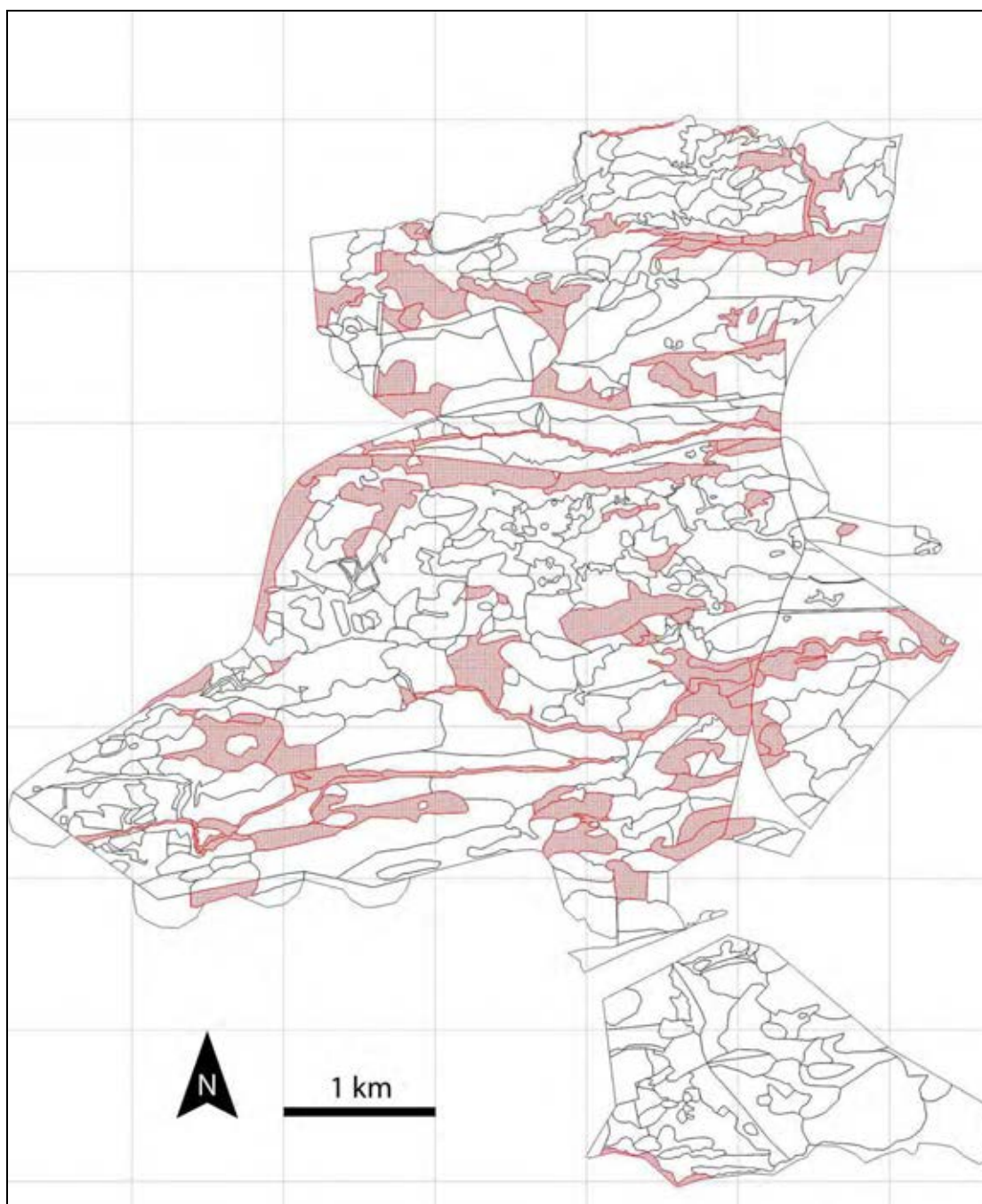


Figure 7: Polygons where M19a is primary, secondary or tertiary component

This is a community of more aerated peat than the M17a community and less subject to waterlogging. It is not particularly extensive over the survey area but where it does occur it tends to occupy the gentler slopes of banks and around knolls which shed water more easily. This community often occurs as small stands in the transition between M17 blanket bog and communities of shallower peat (i.e. M15), e.g. around knolls or hillocks. It is also a component of mosaics alongside watercourses and along the banks of smaller soakways.

The community is usually at once visually distinguished from other blanket bog types by a predominance of *Eriophorum vaginatum* which grows quite abundantly here in pronounced tussocks, and usually co-dominant with conspicuous bushy *Calluna vulgaris*. *Vaccinium*

myrtilus, unusually for this community, was virtually absent but *Erica tetralix* was sparsely frequent. *Empetrum nigrum* can be found occasionally here also.

The bryophyte layer in this community is characterised by an abundance of hypnaceous mosses with *Hylocomium splendens* and *Pleurozium schreberi* particularly prominent along with very frequent *Rhytidiadelphus loreus*. Although *Sphagnum* cover in general is much reduced compared to M17a, *Sphagnum capillifolium* is frequent here and even some *Sphagnum papillosum* in transitions to wetter M17a blanket bog.

Patches of M19 are subtly different in colour to M17 on the satellite imagery.

3.2 Marshy grassland/rush-pasture

M25a *Molinia caerulea*-*Potentilla erecta* mire *Erica tetralix* sub-community

Molinia caerulea D, *Calluna vulgaris* F, *Potentilla erecta* F, *Hylocomium splendens* F

Included in SEPA LUPS-GU4 as a GWDTE



Plate 12: M25a *Molinia caerulea*-*Potentilla erecta* mire (Figure 8 shows polygons where M25a is primary, secondary or tertiary component)

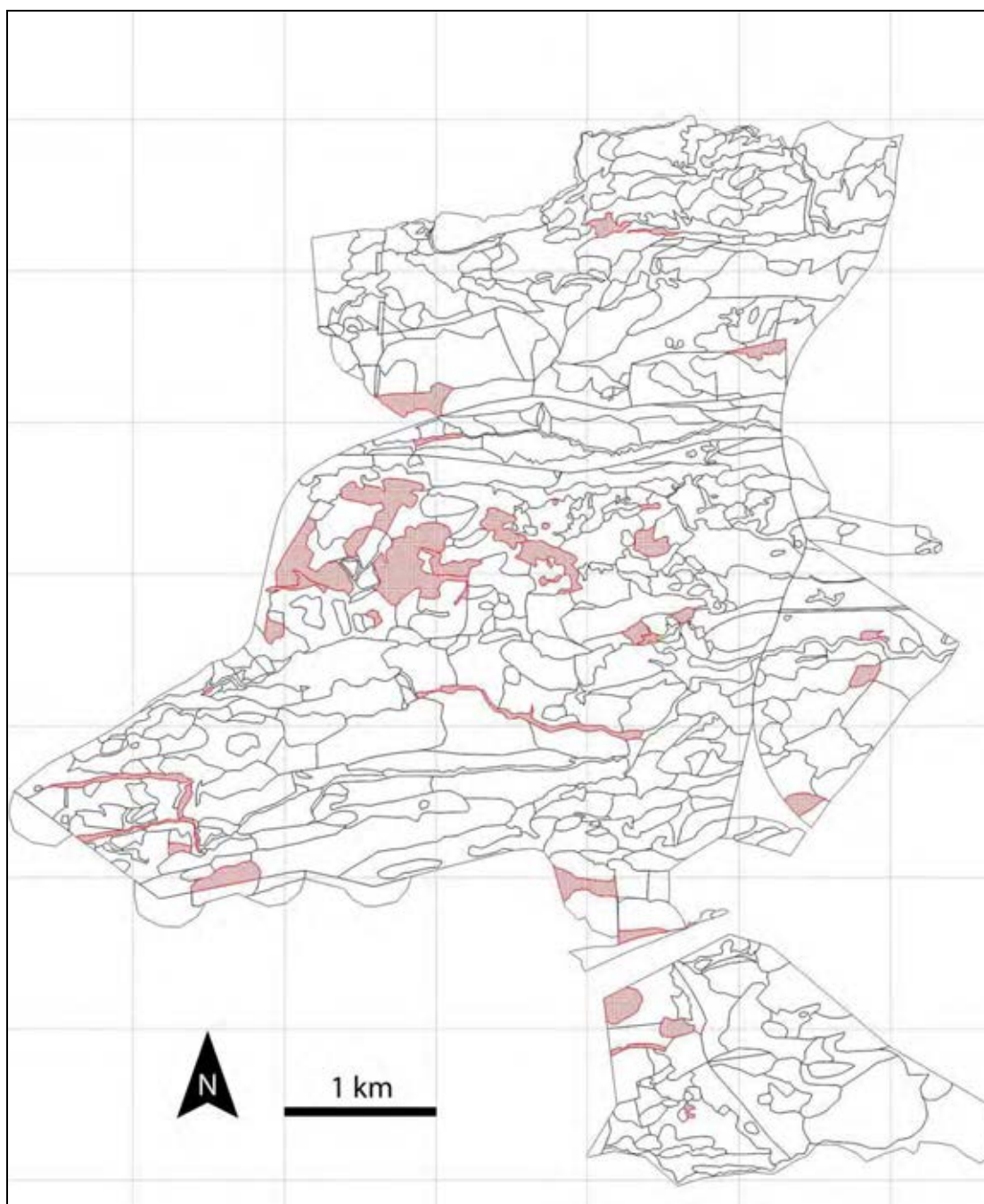


Figure 8: Polygons where M25a is primary, secondary or tertiary component

Molinia caerulea-*Potentilla erecta* mire is a very bland and botanically uninteresting vegetation type that is totally dominated by the grass *Molinia caerulea*, with a few other sparse associated mire species. There is usually a high cover of dead litter and the bryophyte layer is impoverished with *Sphagnum* very much reduced or absent compared to M1/M17/M19 blanket bog.

The map above shows the areas where it comprises a significant percentage of the vegetation. It is nowhere near as extensive as the more desirable blanket bog types that cover most of the survey area but where it does occur it stands out as quite different. It is a vegetation type which occurs on aerated peats with some water movement and is present

throughout the whole survey area and it is particularly common alongside channels / soakways where it can be found along with M6 acid flush and M19 blanket bog.

It is also very common within areas that have been drained for planted conifers. Here it has spread and dominates along the drier ridges of the ploughed drains. Where *Molinia caerulea* is completely dominant it has often been classed as M25a but there is also an intermediate type that we have mapped as M17mod which contains other mire species such as *Calluna vulgaris* but which remains very different from untouched blanket bog in the amount of *Molinia caerulea* and the lack of *Sphagnum*. Large areas of *Molinia caerulea* are clearly visible on the satellite image as white and white/blue.

It also sometimes occurs as uniform stands on undrained, more intact blanket bog, forming patches up to 100 metres or so across and which also stand out as white on the aerial imagery.

M23b Juncus effusus/acutiflorus-Galium palustre mire Juncus effusus sub-community

Juncus effusus A, *Agrostis canina* O, *Potentilla erecta* O, *Anthoxanthum odoratum*, *Polytrichum commune* O, *Rumex acetosa* O.

Included in SEPA LUPS-GU4 as a GWDTE

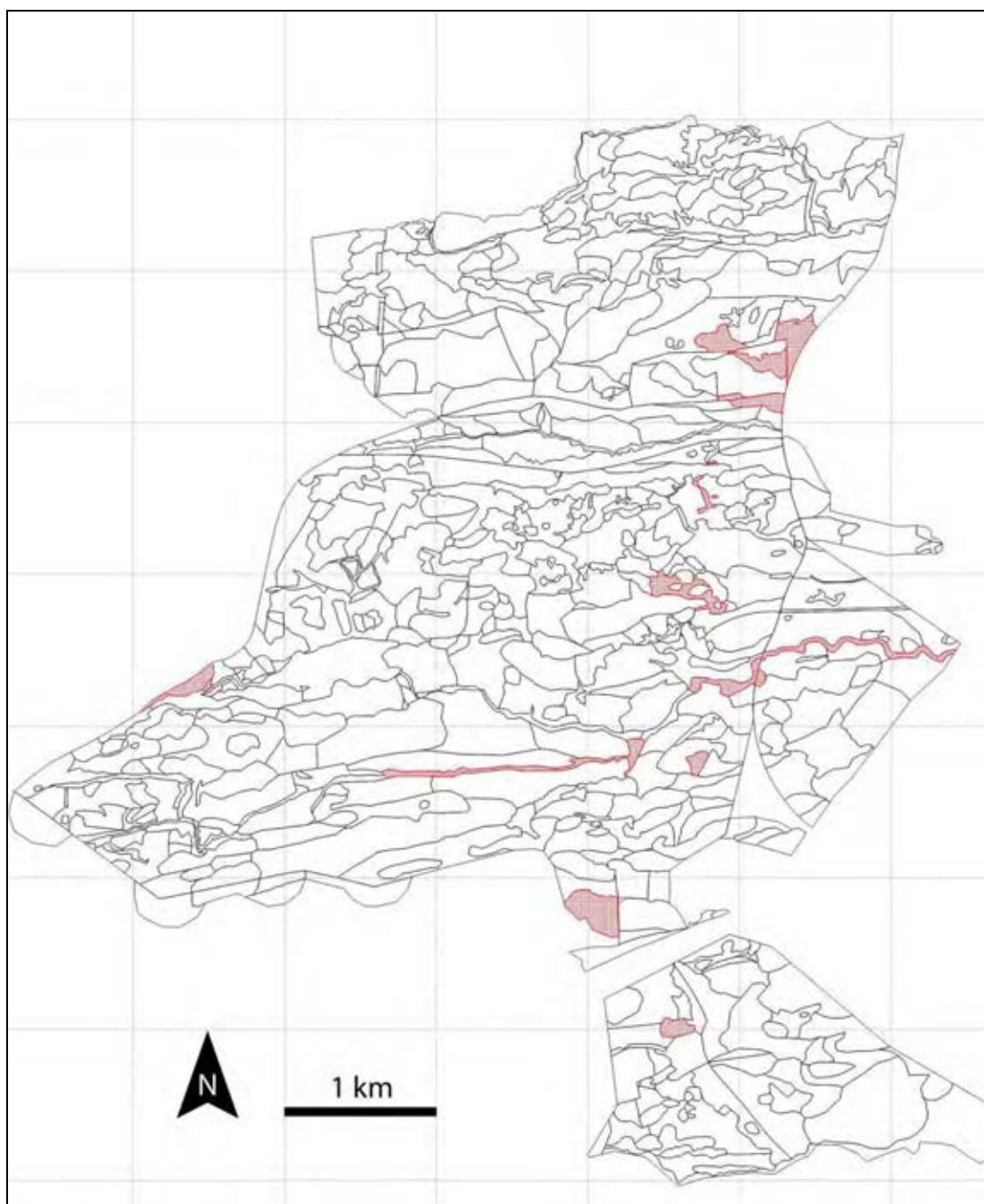


Figure 9: Polygons where M23b *Juncus effusus/acutiflorus* –*Galium palustre* mire *Juncus effusus* sub-community was present

This is usually a very common upland community, of wet, peaty mineral soils of acid to neutral pH, but it occurs infrequently over the survey area. It is found mostly alongside channels, where it looks like and blends with M6c acid flush habitat. It is also found amongst semi-improved grassland communities to the east of the survey area close to the landfill.

An abundance of the rush *Juncus effusus* with a range of marshy herbs such as *Ranunculus ficaria*, *Cirsium palustre*, *Viola palustris* and the grasses *Agrostis canina*, *Anthoxanthum odoratum*, *Holcus lanatus* is characteristic. There is a general absence of *Sphagna*, which marks it out from acid flush vegetation.

3.3 Flushes, soakways and springs: acidic and base-rich

Flushes occur throughout the survey area as small, usually linear, stands where there is some associated soligenous influence. These are mainly acid *Sphagnum* dominated flushes and soaks.

M4 Carex rostrata - Sphagnum fallax mire

Included in SEPA LUPS-GU4 as a GWDTE

Found as a small stand, in only one location in the survey area (target note KP/T52) north of Loch Uisg an t-Soluis.

Carex rostrata is prominent over a carpet of *Sphagnum fallax*. Other associate species here are *Empetrum nigrum*, *Menyanthes trifoliata*, *Erica tetralix*, *Sphagnum palustre*, *Pedicularis sylvatica* and *Aulacomnium palustre*.

M6ci Carex echinata-Sphagnum fallax mire **Juncus effusus sub-community Sphagnum fallax variant**

Juncus effusus F, *Carex echinata* F, *Sphagnum palustre* F, *Sphagnum fallax* F, *Molinia caerulea* F, *Polytrichum commune* F, *Potentilla erecta* F, *Agrostis stolonifera* O

Included in SEPA LUPS-GU4 as a GWDTE



Plate 13: M6c *Carex echinata*-*Sphagnum fallax* mire (Figure 10 shows polygons where M6c is primary, secondary or tertiary component)

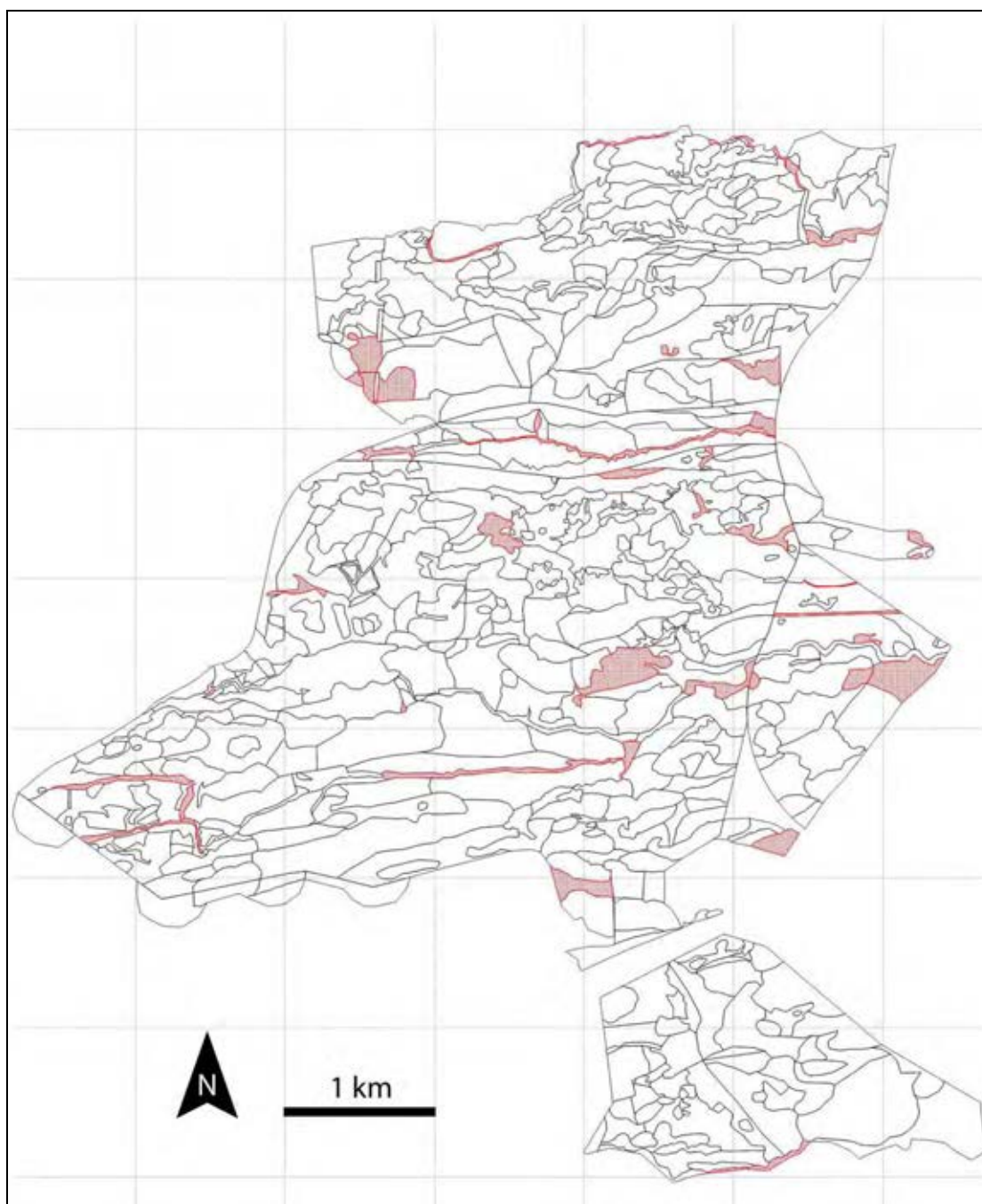


Figure 10: Polygons where M6c is primary, secondary or tertiary component

This community occurs in zones of flushing where there may be some slight nutrient enrichment but where water chemistry remains acid. The peat can be deep and is usually quite wet. It is common as linear stands in soakways and patchily along the sides of more prominent watercourses where it forms mosaics with the M19a and M25a communities.

This soligenous vegetation is distinguished by a high frequency of *Juncus effusus* along with several associates at low cover: mainly *Molinia caerulea*, *Carex echinata*, *Potentilla erecta* and *Agrostis stolonifera*. *Sphagnum* is a distinguishing component of this vegetation type, usually *Sphagnum fallax* and *Sphagnum palustre* which tend to occur only in this community. There may also be some *Sphagnum denticulatum* but *Sphagnum fallax* is always the main

component of the carpet, which places this vegetation type in the M6ci sub-community variant.

M6di Carex echinata-Sphagnum fallax mire

Juncus acutiflorus sub-community Sphagnum fallax variant

Juncus acutiflorus D, *Sphagnum fallax* A, *Sphagnum palustre* A, *Juncus effusus* F, *Potentilla erecta* F, *Eriophorum angustifolium* O, *Molinia caerulea* O.

Included in SEPA LUPS-GU4 as a GWDTE

As with the *Juncus effusus* sub-community, M6d occurs in zones of flushing where there may be some slight nutrient enrichment but where water chemistry remains acid. The peat can be deep and is usually quite wet. Over the survey area it was only recorded at one location in the western part of the site in association with the M19a and M25a communities.

This flushed vegetation is distinguished by a high frequency of *Juncus acutiflorus* interspersed with *Juncus effusus*, *Agrostis stolonifera* and *Molinia caerulea* over abundant *Sphagnum fallax* and *Sphagnum palustre* which are a characteristic component of this community. *Sphagnum fallax* is always the main component of the carpet and there places this vegetation type in the M6ci sub-community variant.

M10 Carex dioica-Pinguicula vulgaris mire

EC Habitats Directive 7230 Alkaline fens

Scorpidium scorpioides A, *Carex viridula* ssp. *oedocarpa* A, *Eriophorum angustifolium* F, *Carex panicea* O, *Pinguicula lusitanica* O, *Pinguicula vulgaris* O, *Carex dioica* O, *Carex nigra* O, *Breutelia chrysocoma* O

Included in SEPA LUPS-GU4 as a GWDTE

This type of flush is irrigated by relatively more base-rich waters and tends to occur as small linear stands or patches. Vegetation forms an open stand over a wet gravel substrate with very little/no peat. This community was found as a single small stand towards just west of Loch a' Clachain.

The most distinctive elements of the vegetation are the frequent presence of a variety of sedges, in particular the small yellow sedge *Carex viridula* ssp. *oedocarpa*, with the dark moss *Scorpidium scorpioides*. Amongst the vascular component *Pinguicula vulgaris* and *P. lusitanica* are also present and characteristic along with some *Eriophorum angustifolium*. Bryophytes are also represented here by *Breutelia chrysocoma* and *Campylopus introflexus*.

3.4 Dry Heath communities

EC Habitats Directive 4030 European dry heaths, UKBAP Priority habitat

H10a *Calluna vulgaris*-*Erica cinerea* heath Typical sub-community

H10b *Calluna vulgaris*-*Erica cinerea* heath *Racomitrium lanuginosum* sub-community

H12a *Calluna vulgaris*-*Vaccinium myrtillus* heath *Calluna vulgaris* sub-community

H12c *Calluna vulgaris*-*Vaccinium myrtillus* heath *Galium saxatile*-*Festuca ovina* sub-community



Plate 14: Dry heath (H10, H12) (Figure 11 shows areas where dry heath is a primary, secondary or tertiary component).

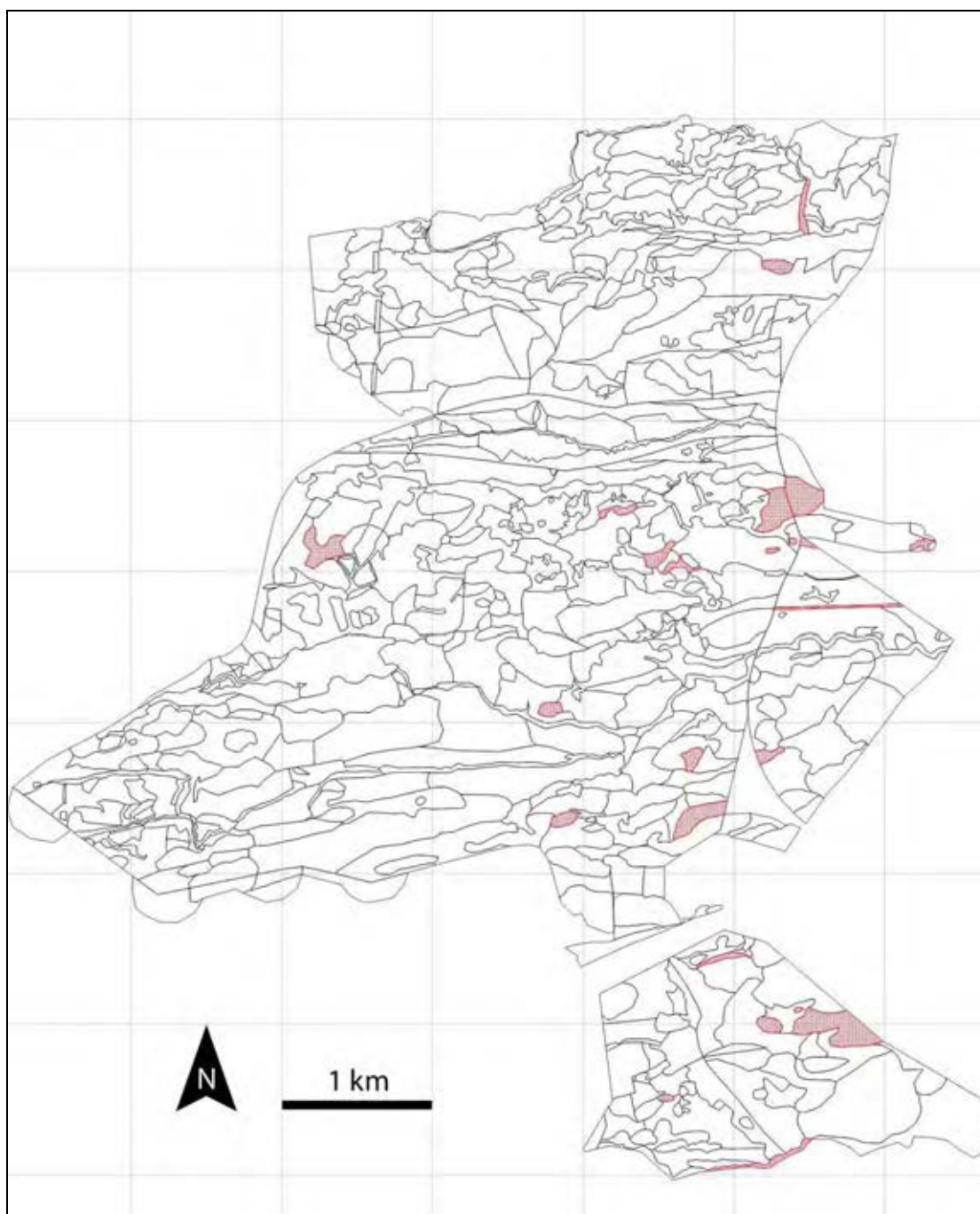


Figure 11: Areas where dry heath is a primary, secondary or tertiary component

Dry heath is restricted to the shallowest well-drained peats and can be found occasionally throughout the survey area where there are undulations in the underlying substrata sufficient to protrude through the blanket peat. Areas are therefore never very extensive as well as being quite localised and variable, so it was not possible to collect enough data to fully categorise and map dry heath as individual sub-communities.

The vegetation is characterised by a dominance of *Calluna vulgaris* forming an extensive uniform short canopy over a carpet of the hypnaceous mosses *Hylocomium splendens*, *Pleurozium schreberi* and *Hypnum jutlandicum*. *Potentilla erecta* is usually constant and sparsely dotted through the heather. Where the heath also had some *Erica cinerea* it most resembled the H10 community and where *Racomitrium lanuginosum* was also present it

could be classified as H10b. Where *Vaccinium myrtillus* was present and no *Erica cinerea* the heath could be classed as H12a and a few grassier patches with some were noted as H12c.

3.5 Wet Heath communities

EC Habitats Directive 4010 Northern Atlantic wet heaths with *Erica tetralix*.

M15b *Trichophorum cespitosum*-*Erica tetralix* wet heath

Typical sub-community

EC Habitats Directive 4010 Northern Atlantic wet heaths with *Erica tetralix*, UKBAP Priority habitat

Trichophorum cespitosum A, *Calluna vulgaris* A, *Eriophorum angustifolium* F, *Molinia caerulea* F, *Erica tetralix* F, *Narthecium ossifragum* F, *Sphagnum capillifolium* A

Included in SEPA LUPS-GU4 as a GWDTE



Plate 15: M15b *Trichophorum cespitosum*-*Erica tetralix* wet heath Typical sub-community (Figure 12 shows polygons where M15b is primary, secondary or tertiary component)



Figure 12: Polygons where M15b is primary, secondary or tertiary component

This sub-community is found on shallow peats with more impeded drainage compared to those supporting dry heath. It occurs throughout the survey area around knolls and steeper banks where the blanket peat thins. It is frequently transitional to M15c where *Erica cinerea* is more prominent. The distribution map shows areas where M15b is most prominent but it is also recorded as much smaller fragments (less than 5%) throughout much of the blanket bog. In Arnish, to the south of the survey area, there is more undulating terrain and there are greater extents of wet heath on the steeper slopes.

Calluna vulgaris, *Eriophorum angustifolium*, *Erica tetralix* and *Trichophorum cespitosum* are the main vascular species here and, along with frequent patchy *Sphagnum capillifolium* this habitat can grade into and look very much like blanket bog vegetation except that it is found

on shallower peat. It differs from M15c in lacking *Erica cinerea* and much *Racomitrium lanuginosum*/*Cladonia* spp. but it is frequently transitional to M15c where *Erica cinerea* is more prominent.

M15c Trichophorum cespitosum-Erica tetralix wet heath

Cladonia spp. sub-community

EC Habitats Directive 4010 Northern Atlantic wet heaths with *Erica tetralix*, UKBAP Priority habitat

Calluna vulgaris F, *Trichophorum cespitosum* F, *Erica cinerea* F, *Racomitrium lanuginosum* F, *Eriophorum angustifolium* F, *Potentilla erecta* F, *Molinia caerulea* F, *Cladonia portentosa* F, *Cladonia uncialis* F

Included in SEPA LUPS-GU4 as a GWDTE

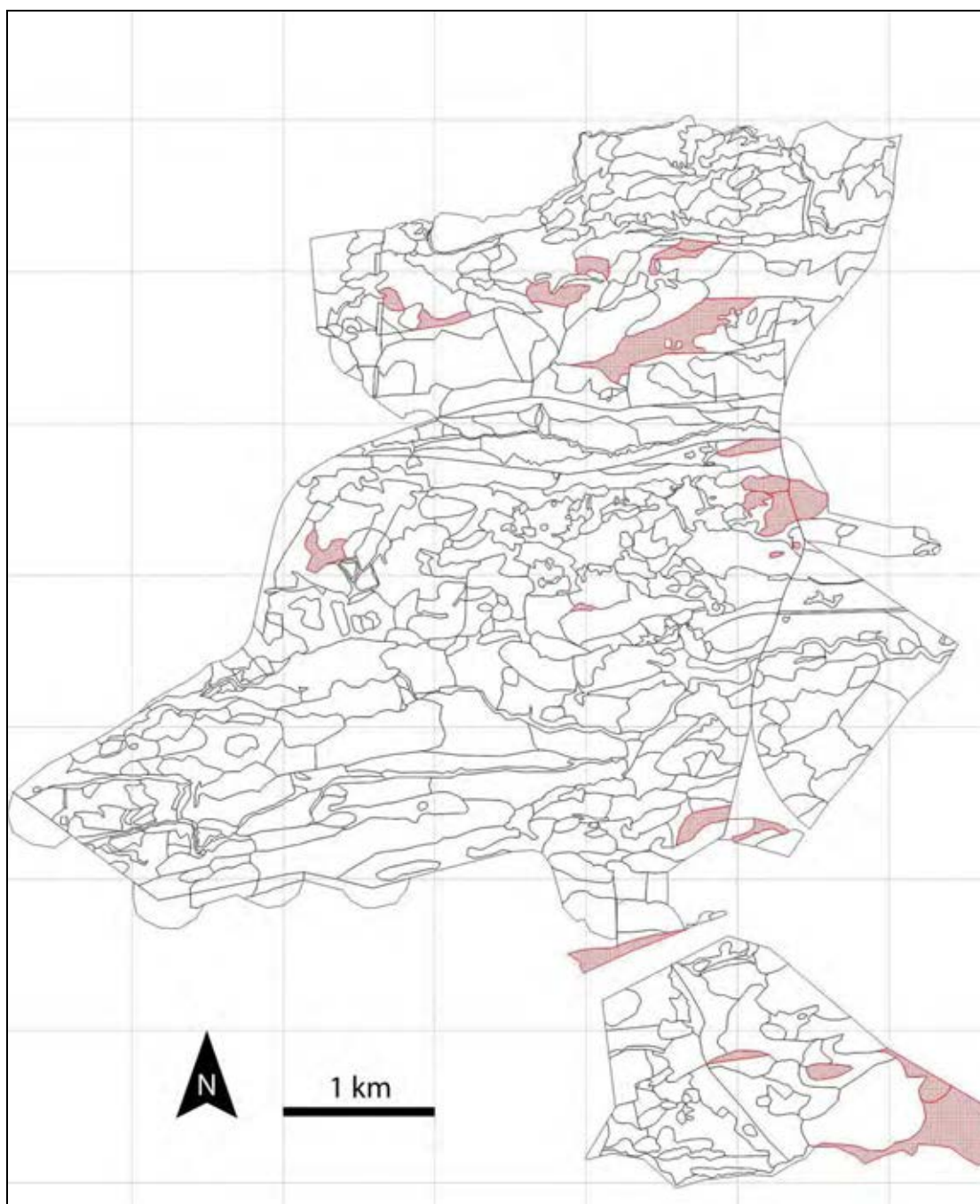


Figure 13: Polygons where M15c *Trichophorum cespitosum*-*Erica tetralix* wet heath *Cladonia* sub-community is primary, secondary or tertiary component

Although not covering large areas of ground this sub-community was encountered fairly frequently over the site on thin wet peats where there is often some exposed rock or mineral substrate.

Marking this type of wet heath out is the presence of *Erica cinerea* along with *Racomitrium lanuginosum*, *Cladonia portentosa* and *Cladonia uncialis* as constants along with a variety of vascular species found in the other sub-community, i.e. *Calluna vulgaris*, *Trichophorum cespitosum*, *Eriophorum angustifolium*, *Molinia caerulea*, *Potentilla erecta*, *Hylocomium splendens* and *Hypnum jutlandicum*. *Sphagnum* cover is usually lacking here compared to M15b.

3.6 Acid Grassland communities

U4b *Festuca ovina*-*Agrostis capillaris*-*Galium saxatile* grassland *Holcus lanatus*-*Trifolium repens* sub-community

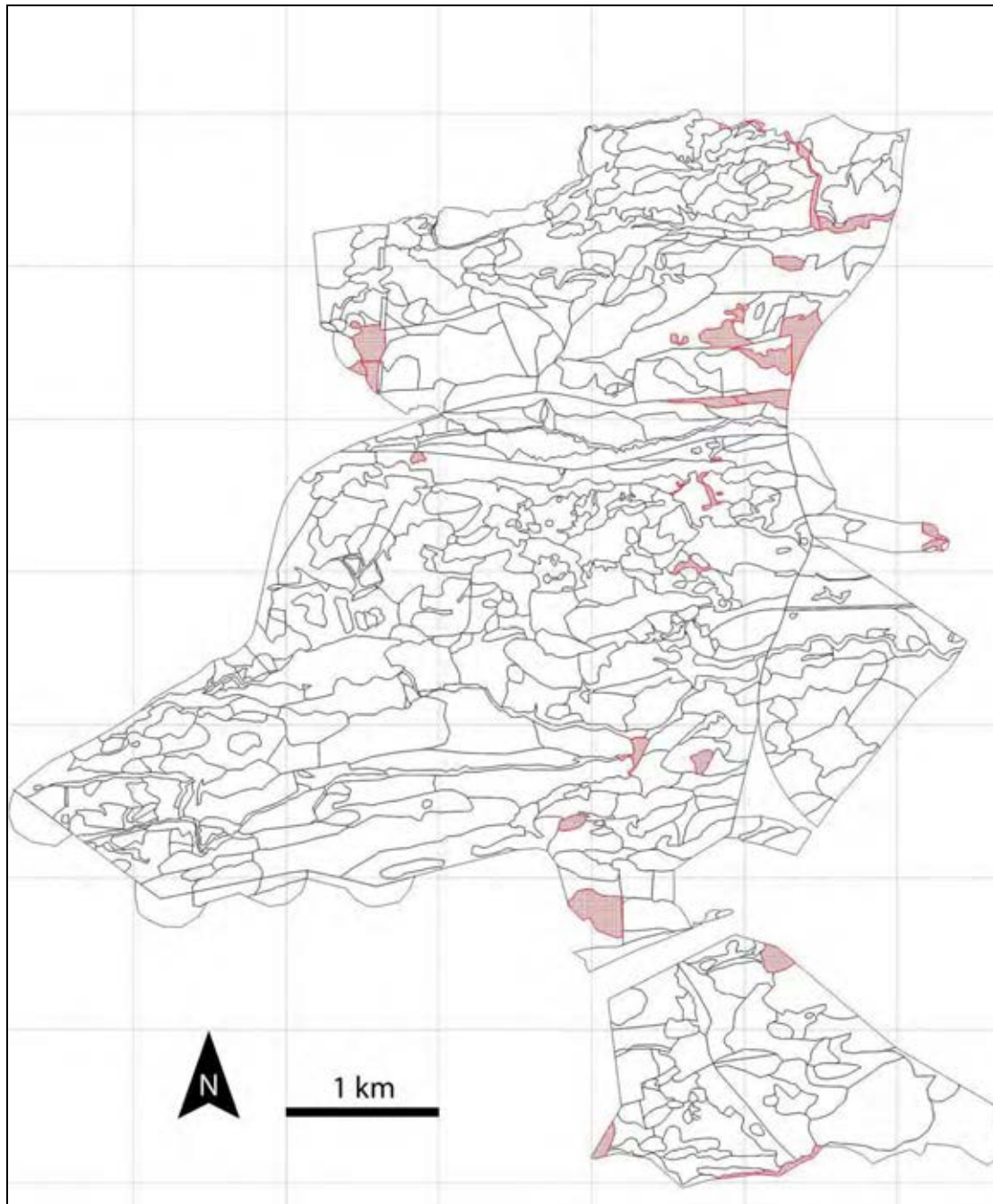


Figure 14: Polygons where U4b *Festuca ovina*-*Agrostis capillaris*-*Galium saxatile* grassland *Holcus lanatus*-*Trifolium repens* sub-community is primary, secondary or tertiary component

Semi-improved U4 acid grasslands, generally common in the marginal uplands of Scotland, are a rare feature over the site but occur around the edges of the survey area where there

has been intensive grazing in the past and also as small patches as part of vegetation mosaics alongside channels. Where still grazed the turf can be quite short and typical but often there is a rank sward with a build-up of litter and few mosses.

This bland and botanically uninteresting vegetation is composed of a few typical and common species such as *Anthoxanthum odoratum*, *Holcus lanatus*, *Agrostis canina*, *Potentilla erecta*, *Galium saxatile*, *Rhytidiadelphus squarrosus* and *Pseudoscleropodium purum*. In the more improved stands, transitional to MG6b, there can be some *Lolium perenne* and *Cynosurus cristatus*.

3.7 Mesotrophic Grassland communities

MG10a *Holcus lanatus*-*Juncus effusus* rush-pasture typical sub-community

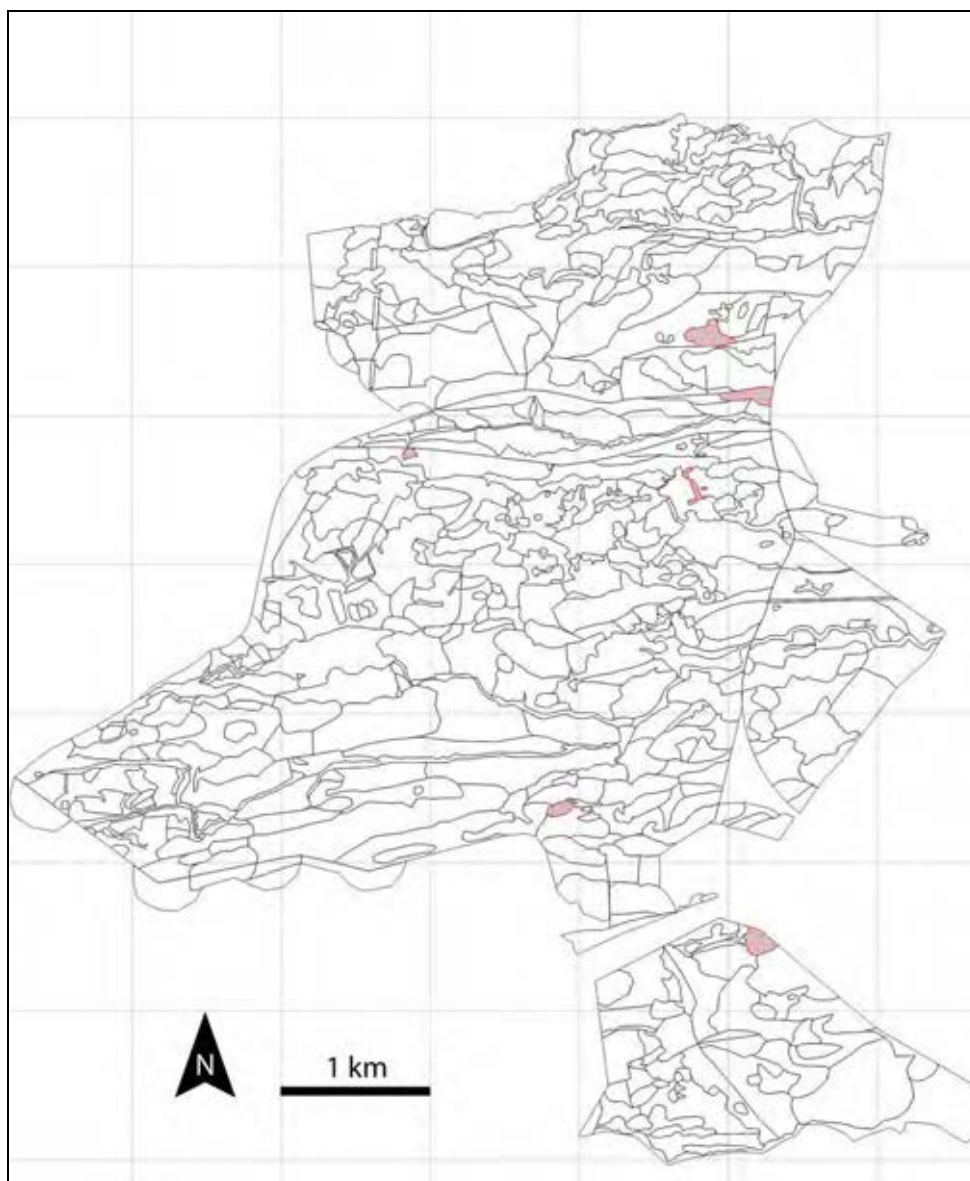


Figure 15: All polygons where MG10a *Holcus lanatus*-*Juncus effusus* rush-pasture typical sub-community was recorded.

This community occurs quite rarely in the most improved areas of ground around the edges of the main blanket bog. It is a community that is common in the more agriculturally improved areas of Scotland.

This bland vegetation type is characterised by tussocks of *Juncus effusus* which occur with a low diversity of common grasses and other species such as *Holcus lanatus*, *Agrostis capillaris* and the moss *Rhytidiadelphus squarrosus*.

3.8 Rare species and species of locally restricted distribution

Species recorded during the survey

One very notable species was recorded on the survey, *Sphagnum austinii*. This important species is an indicator of undisturbed blanket bog. Three hummocks were recorded in a single location in M17a blanket bog (Target note TR/T64). Each hummock was marked out using marker canes during a repeat visit in May 2011.

Other species, although not rare generally, were recorded in only a few locations and should therefore preferably be avoided when micro-siting turbines and other infrastructure. These species are all target noted with specific locations and are as follows:

Sphagnum magellanicum – found rarely in M17a blanket bog (TR/T7, TR/T70)

Scorpidium scorpioides – recorded twice (KP/T65, TR/T79)

Schoenus nigricans – occurs rarely in M17a blanket bog or pool edges where there is some water movement (TR/T3, TR/T5, TR/T79)

Sparganium angustifolium – occurs in larger deeper pools within blanket bog (TR/T40, TR/T36a)

Rhynchospora alba – recorded several times locally in blanket bog TR/T3, KP/T101, KP/T105, KP/T108

Carex dioica – recorded once in isolated M10a basic flush (Target note KP/T65)

Pinguicula lusitanica - recorded once in isolated M10a basic flush (Target note KP/T65)

Pinguicula vulgaris - recorded once in isolated M10a basic flush (Target note KP/T65)

It is quite possible that the important *Sphagnum austinii* and other localised species may occur elsewhere in the survey area.

Species not recorded during the survey

Another restricted species of undisturbed blanket bog is *Sphagnum fuscum* and, although this was not recorded, it may also occur within the survey area.

Campylopus shawii, a hyperoceanic moss species mainly restricted to the Outer Hebrides, where it can be frequent. From our previous experience of finding it in its range, this is a quite distinctive species and not easily missed. Therefore it is thought that it is unlikely to occur in the development area.

4 Discussion and evaluation of vegetation types

The following is a more general discussion of the habitats relating to their perceived ecological value and particularly their condition. A map showing the distribution of differently valued areas of habitat in relation to the wind farm layout is given in Appendix 3.

Blanket bog

Almost the whole of the survey area is covered by blanket peat, usually at least 1 metre deep and often well over 2 metres deep, supporting several recognisable NVC blanket bog vegetation communities. There were just a few areas without any blanket bog at all. The majority of this Annex 1 habitat was considered to be in good condition with good cover values of typical species and was usually quite confidently classifiable in NVC terms. Good condition blanket bog is shown as orange/light brown on the habitat evaluation map in Appendix 3.

Activity of the blanket bog

Blanket bog activity is often referred to as a key factor in valuing them. The EC Habitats Directive priority habitat 7130 applies to “active” blanket bog, activity being defined as „still supporting a significant area of vegetation that is normally peat forming”.

We consider all the blanket bog in the survey area to be active and there are no large areas of bare peat. Even areas of eroded bog with gullies have re-generating vegetation in the gully bottoms and former peat cuttings are also mostly fully active.

A very striking feature of much of the blanket bog in the survey area is the lushness of the vegetation on the bog surface, with abundant mosses and lichens forming a very soft and spongy surface which can make walking quite tiring. Often the abundance of white *Cladonia* lichens is such that the blanket bog can appear pale on the satellite image. As a result one gets the impression that the bog may be healthily re-generating and re-generation is quite likely as there has been a wide reduction in grazing levels in the area in recent years.

Sensitive areas of wet bog with pool systems

Although all undrained blanket bog in the survey area is considered to be in good condition there are some areas that are to be valued relatively higher. This applies particularly to areas which support greater amounts of the wetter blanket bog type (M17a) with abundant pool systems or wet hollows.

There are several such areas and these have been marked as red on the sensitivities map in Appendix 3. A very large tract of bog, just south of the Pentland road running through the middle of the site, supports extensive areas of wetter bog with several pool systems.

Hummock/hollow blanket bog with peat mounds

Other areas of blanket bog are important for their hummock/hollow microtopography. This is a physical, billowy, structuring of the bog surface with large free draining hummocks (M17b) grading into wetter hollows or pools via gently sloping sides (M1, M17a, M17b).

A large area of this type of bog occurs in the south-west of the site just south-west of Loch a Clachain. This area also has frequent and prominent peat mounds, to over 1 metre high, which do not occur frequently elsewhere in the survey area. Also found here is the important moss, *Sphagnum austinii* - an indicator of undisturbed peat bogs, which has been identified by paleoecologists as being a species which formed much of the blanket peat in Scotland but which, for some unknown reason, has declined to its current rare status. The mounds occur though out the whole area but the *Sphagnum* was found in only one location in three separate hummocks.

Hummock/hollow topography also occurs in other parts of the survey area but not as extensively as the south-west.

Erosion

Although much of the blanket bog in the survey area is uniformly intact, erosion has clearly taken places in some areas in the past. This notably occurs in the area of bog around Beinn Thulabaigh and tracts north-east of Loch Dubhaig in the north of the survey area. Here, pronounced gullying of the peat can be seen up to around 1.5m deep. Despite this, it appears that, under the low grazing levels on the bog, the bottoms of the hags are actively re-generating and bare peat surfaces are confined mainly to the steeper sides of gullies and even these are frequently being protected from further erosion by overhanging mats of *Racomitrium lanuginosum* moss.

Contrastingly in Arnish to the south of the survey area, sheep numbers are obviously higher and grazing here more intense. As a result, the vegetation here is much less lush and there are more frequent and extensive patches of bare peat with the usual signs of trampling.

Drained and planted, modified bog

Within the overall matrix of good condition blanket bog types there are some large areas where the blanket bog has been previously drained and planted with conifers. These areas are shown as green on the habitat evaluation map in Appendix 3.

The vegetation here is still classified as blanket bog but it is modified to varying degrees, being very dried out along the tops and sides of the ploughed ridges but with water filled drains and often some *Sphagnum*, similar to M1 pool vegetation.

On the dried out surfaces there is sometimes a total dominance of *Molinia caerulea* and, frequently, pronounced *Calluna vulgaris* as well. *Sphagnum* is absent along the ridges, its place being taken by abundant litter of *Molinia caerulea* and carpets of the moss *Hylocomium splendens*.

The trees here are quite often growing very poorly and, in older plantations, are dead or dying.

It should be noted that even in the plantations there can be plentiful good condition, unmodified vegetation in the “rides” between the drained patches. Also in some areas where the water table is extensively high there is good active re-generation of blanket bog communities in the interconnected drains.

Peat cuttings

In addition to the modification caused by planting, there are also extensive areas of disturbance through old peat cutting. These areas are shown as yellow on the habitat evaluation map in Appendix 3.

This historic practice seems to have been much more sustainable and these areas, usually found alongside old access routes, support blanket bog vegetation that is almost as lush as the undisturbed bog, albeit structured into linearised patches which are clearly visible on satellite imagery. They are also generally on less deep peat, sometimes less than 50cm, when it can be classifiable in Phase 1 terms as wet heath.

Although these areas have been previously disturbed they are in fact often more diverse than some of the drier, uniform intact blanket bog. This is due to the structural variation with elongated straight dry ridges of M17b and lower lying, cut ground supporting wet M17a and M1 communities as well.

There is a large area of industrial scale peat cuttings with associated canal and access tracks, deriving from a former chemical works, on the eastern side of the survey area west of Creed Bridge. The blanket bog here too is healthily re-generating and very similar to that found in the smaller scale peat cuttings.

Dry and wet dwarf shrub heath

Where the blanket peat thins to less than 50cm deep around knolls and hummocks there is usually some wet heath (M15) and, less frequently, dry heath (H10/H12). These areas are shown as orange/light brown on the habitat evaluation map in Appendix 3.

The dry heath is always dominated by heather but wet heath is more variable and looks like and grades into blanket bog. Areas of wet/dry dwarf shrub heath can occur throughout the blanket bog but they are not usually extensive, although at Arnish in the south the slopes are more undulating and there is more dwarf shrub heath.

These are both Annex 1 habitats and, where they occur, are considered to be in good condition supporting a typical range of species and with no or very light grazing.

Around Arnish to the south of the survey area grazing levels are higher but impacts are only low to moderate.

Acid flush

This is a vegetation type which occurs in linear soakways within the blanket bog and alongside more prominent channels and streams. It occurs throughout the survey area although never of great extent. These areas are shown as green on the habitat evaluation map in Appendix 3.

Although it is listed as a GWDTE, (see description below) by SEPA (Scottish Environment Protection Agency) it is rather bland botanically, consisting mainly of rushes over a carpet of *Sphagnum* moss and is usually regarded as of low conservation value.

Marshy grassland

These areas are shown as green on the habitat evaluation map in Appendix 3.

This habitat type includes areas of mire totally dominated by purple moor-grass (M25a), dense with dead litter and with only a few sparse associates. This is common around the areas of bog that have been drained for tree planting. Some areas of blanket bog also have a high cover of purple moor-grass which can resemble M25a and are transitional to it.

Also included here are areas of rush-pasture (M23) which look like acid flush but are more neutral and lack the *Sphagnum* carpet.

Both these habitats are considered as GWDTE's by SEPA but they are usually considered of low value in ecological value assessments.

Acid and mesotrophic grasslands

These areas are shown as green on the habitat evaluation map in Appendix 3.

Acid grassland (U4b) occurs where the effects of grazing have been more intense, mainly at the edges of the survey area but also as small fragments along the sides of watercourses. Where more improved and rushes are prominent the vegetation is classed as mesotrophic (MG10). Alongside roads and other areas where the acid grassland is rank it could be considered as transitional to mesotrophic grassland.

These habitats are very common throughout the upland fringes and are composed of a range of very common species of little botanical interest. MG10 however is listed by SEPA

as a GWDTE. All these habitats are usually regarded as of low or negligible value in assessments.

4.1 Summary of criteria for nature conservation evaluation

The following table describes the site habitats in relation to various criteria, based on Ratcliffe, D.A. (1977). A Nature Conservation Review, Cambridge University Press.

Criteria	Description
Size	Large, continuous areas of habitat are considered to be of greater importance than small or fragmented areas. The majority of the survey area (over 80%) is covered by valued blanket bog or upland heath habitats.
Diversity	Species and habitat diversity, including variations in topography and wetness, increase the value. The diversity of NVC communities and the species within them is typical of good quality blanket bog and upland heath habitats.
Naturalness	This reflects man's intervention or management of the habitat. Generally a less modified area results in an increase in the nature conservation value. Approx. 30% of the survey area is considered to be modified. This applies to areas of blanket bog that have been drained and planted with conifers – these are considered to be relatively highly modified. There are also extensive areas of peat cuttings where the modification level is considered to be low - mainly structural and sustainable with active blanket bog communities re-generating naturally. The most sensitive areas, with more extensive wet blanket bog and pool systems, and the large area of hummock/hollow bog with peat mounds and rare <i>Sphagnum austinii</i> in the south-west are considered to be the most undisturbed and natural parts of the survey area and of relatively highest value on the site. It is the opinion of the surveyors that these most valued areas, although undesignated, are easily of SSSI value – TR and KP were two of the main surveyors for the Lewis Peatlands SAC survey, carried out in 2003.
Rarity	Most of the valued habitat in the survey area is very frequent in Scotland in general and on the Isle of Lewis in particular.
Fragility	The wettest and most undisturbed areas of blanket bog described above are highly fragile – if these are disturbed/drained they are gone forever. Draining bog for planting highly modifies the vegetation and recovery will occur only very slowly over hundreds or thousands of years. Peat cutting can be sustainably carried out as seen in the survey area, where active blanket bog re-generation is very good and a good diversity of key mire species and NVC types is supported.
Typicalness	All blanket bog and upland heath vegetation in the survey conforms very well to the documented NVC types.
Position in an	The survey area is very close to the Lewis Peatlands

Criteria	Description
ecological/geographical unit	SAC and SPA. The SAC was surveyed to NVC level by the current surveyors, TR and KP, who consider the blanket bog and heath in the survey area as at least equal in value to the SAC.
Recorded history	Not known
Potential wildlife value	There is potential for an increase in value if previously drained and planted blanket bog is restored.
Intrinsic appeal	Distinctive flora with insect-eating plants and many colourful Sphagnum mosses.

4.2 SEPA GWDTE groundwater dependent terrestrial ecosystems

All NVC data gathered were assessed against the NVC communities listed as groundwater dependent in SEPA's land use planning system (LUPS) guidance note 4 GU4. The following GWDTE communities are the main ones present in the survey area:

GWDTE	Distribution in survey area	Botanical status
M6	Acid flushes are frequent throughout the survey area along linear soakways, drains and the sides of watercourses. Often in fragmentary small amounts.	Very common throughout Scotland. Usually low diversity and composed of a few very common species. Considered rather bland and of low botanical value.
M15	Frequent throughout the survey area where the peat is less than 50cm deep. Found, along with dry heath, over steeper slopes and knolls, many of which have been identified as potential borrow pits. Also found as small patches within flat blanket bog where the peat thins.	Common throughout Scotland but important and listed in Annex 1 of EC Habitats Directive 4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> .
M23	Found in small patches alongside channels and soakways along with M6. Also found in larger stands close to the edge of the blanket bog where the ground is more improved.	Common throughout Scotland on circum-neutral damp ground. Variable in species diversity and botanical value. M23 can be rich but all occurrences in the survey area consist of a few very common species.
M25	Occurs commonly in areas that have been previously drained for planting conifers. Also occurs as stands in small to medium sized stands within blanket bog. Stands out clearly as white/blue on satellite imagery.	Common throughout large parts of Scotland. Dominated by one species and generally regarded as of low botanical value except where it is fed by base-enriched waters or is wet enough to be transitional to swamp. All occurrences in the survey area are very poor in species.
MG10	Occurs in a few locations around the edges where previous grazing levels have been high and the ground improved.	Common in improved farmland throughout Scotland. Composed of very common species. And usually regarded as of lowest botanical value.

M4 and M10 also occur in the survey area in single locations well away from the development footprint (target notes KP/T52 and T65).

The following figure shows the distribution of all the GWDTE communities in relation to the envelopes required, i.e. 100m for tracks and 250m for turbines, borrow pits etc.

4.3 Suggestions for mitigation of impacts

It is inevitable that a wind farm development will result in some loss of valued blanket bog and heath habitat. The following are just a few options suggested by HE in order to mitigate through avoidance of most sensitive areas and compensation for loss.

Avoidance

Much of the following advice on avoidance of valued habitats has already been used in the design of the wind farm layout. TR provided early versions of habitat maps and was also present as an ecological advisor to a team of engineers whilst micro-siting each wind turbine and other infrastructure during February 2011.

- Avoid Annex 1 blanket bog and heath habitats wherever possible. Site all infrastructure within areas of low value improved or marshy grassland, or modified blanket bog if possible. This applies mainly to areas of modified blanket bog that have been previously drained for the planting of conifers.
- Where it is not possible to avoid Annex 1 habitats, site infrastructure on wet and dry heath habitats in preference to unmodified blanket bog. These occur on shallower peat and are much more easily restored, by carefully re-using cut peat turves, than blanket bog on deep peat. Areas of search for borrow pits are naturally disposed to these areas of shallower peat with some outcropping of bedrock.
- Where it is not possible to site on shallow peat habitats, then site infrastructure on areas of peat cuttings which have been previously disturbed but are re-generating and support active blanket bog and wet heath habitats.
- Where it is not possible to avoid unmodified bog, then site infrastructure on eroded or extensive uniform blanket bog with low percentages of wetter blanket bog and pools.
- Always completely avoid the most sensitive areas of extensive wet blanket bog with pool systems.
- Avoid sites with rare or restricted species – one location with *Sphagnum austinii*, other locations for *Schoenus nigricans* etc (see species section 3.8).

Restoration

- Carefully cut and store surface peat turves in the appropriate manner. Re-use as quickly as possible and water frequently during storage. Use to re-instate areas of bare peat to dwarf shrub heath. This applies to areas including around turbine bases and track sides.
- Negative impacts can be compensated for by using excavated peat to block drains and restore blanket bog in the areas which have been drained and planted. See Anderson (2010) Restoring afforested peat bogs (Forestry Commission Research Note).
- If an area of afforested bog as large as, or bigger than, the area of habitat lost to the wind farm, is restored then it is possible for there to be a much reduced net effect.

- Any excess peat should be carefully stored in the designated peat storage areas sited on low value habitat and afforested areas. It should not be stored in areas of peat cuttings as these support actively re-generating and diverse blanket bog and heath communities.

5 Conclusion

This report concludes that the great majority of the survey area is consists of important blanket bog and upland heath habitat, both included in Annex 1 EC Habitats Directive.

Within this background matrix of valued habitat there are small amounts of low or negligible value habitat and there are also afforested areas of blanket bog that have been modified by draining for conifer planting.

It is possible to design the Stornoway Wind Farm so as to avoid the most sensitive and highly valued areas and to locate some of the infrastructure on the least valued habitats.

Where avoidance is not possible there will be an inevitable loss of good condition blanket. This could be compensated for by restoring afforested areas back to higher blanket bog using excavated peat.

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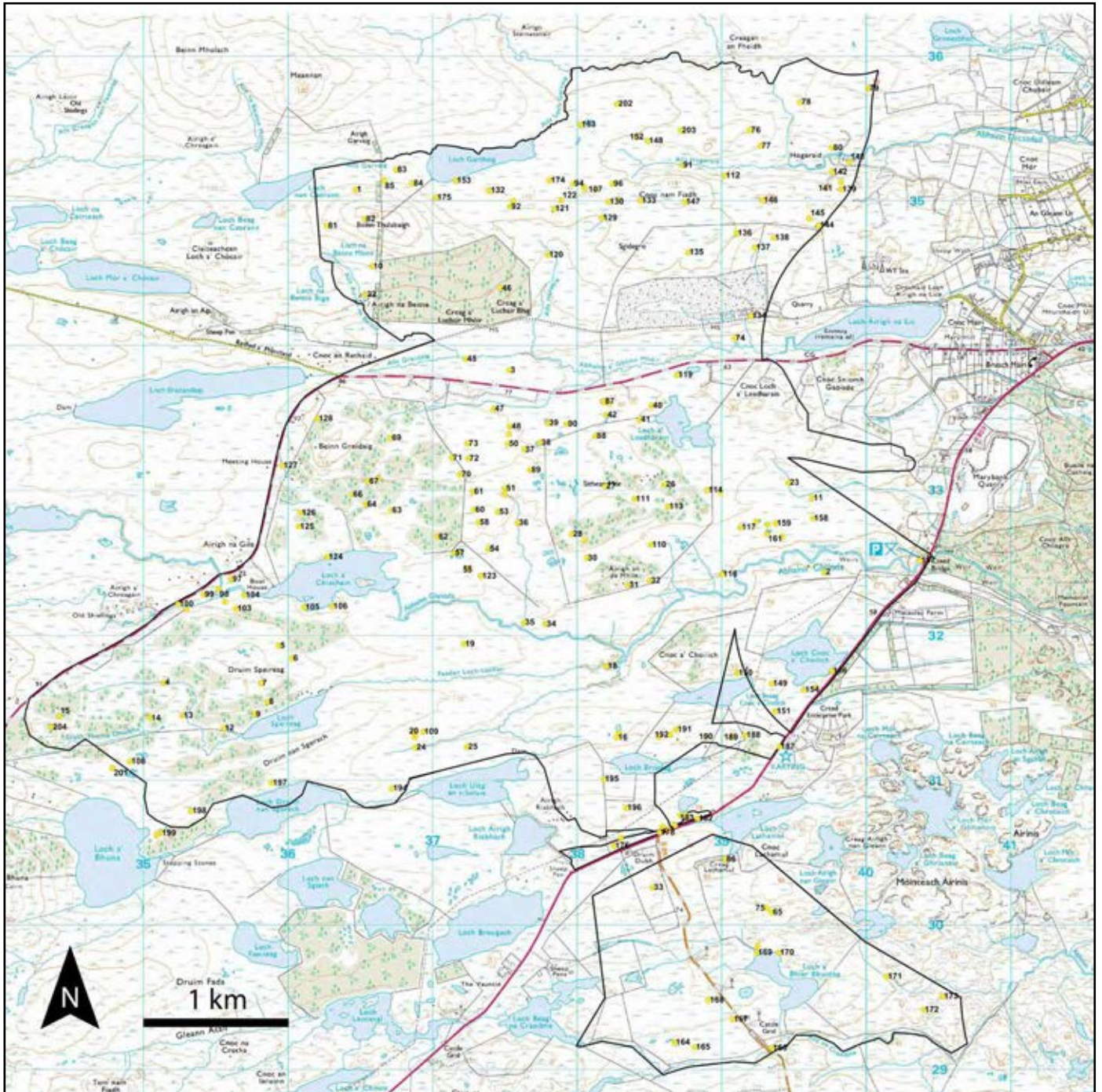
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Target Notes



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	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
1	136468.6	935077.9	TR	T9	21/09/2010	Burning (photo)
2	139712.3	932438.6	TR	T-9		Edge of ridge of shallower peat with M15b wet heath. Flats by the river to the north are M17a blanket bog
3	137531.8	933828.1	TR	T87	29/09/2010	More intact here - M17a
4	135141.7	931675.2	TR	T86	29/09/2010	M25a and M6ci along the channel here
5	135939.2	931929.5	TR	T85	29/09/2010	Peat dome 20m diameter, 3m high supporting M19a vegetation
6	136029.1	931842.4	TR	T84	29/09/2010	The RARE <i>Sphagnum austinii</i> (<i>S. imbricatum</i>) (photo)
7	135814	931671	TR	T83	29/09/2010	One of several areas of M19a
8	135860.7	931540.9	TR	T82	29/09/2010	Shallow peat and M15b wet heath here.
9	135770.1	931454.1	TR	T81	29/09/2010	Large open area drained with modified M17 dominated by <i>Molinia caerulea</i>
10	136583.5	934546.6	TR	T8	21/09/2010	Burning
11	139627.6	932945.6	TR	T-8		Wet ditch along here is the old canal from industrial peat workings. Now supporting M1 blanket bog pool and M6c acid flush vegetation (photo)
12	135554.9	931360	TR	T79	29/09/2010	Very good pool vegetation <i>Nymphaea</i> , <i>Menyanthes trifoliata</i> , <i>Equisetum fluviatile</i> , <i>Carex rostrata</i> , <i>Sphagnum denticulatum</i> carpets. Also very notable here are <i>Schoenus nigricans</i> and <i>Scorpidium scorpioides</i> , not seen elsewhere on the current survey
13	135270	931446.6	TR	T78	29/09/2010	More eroded here with increased cover of bare peat (M3) but still plenty of M17a and M1
14	135046.1	931428.9	TR	T77	29/09/2010	No drains with M17b, M17a and M1 vegetation
15	134417.5	931442.6	TR	T76	29/09/2010	Trampling of bog here resulting in more bare peat than normal in the survey area generally
16	138275.6	931295	TR	T75	28/09/2010	M17 has a large cover of <i>Molinia caerulea</i> and <i>Calluna vulgaris</i>
17	138292	931324.2	TR	T74	28/09/2010	Large pool <i>Menyanthes trifoliata</i> , <i>Equisetum fluviatile</i> , <i>Carex rostrata</i> . M19a at edges
18	138204.2	931787.4	TR	T73	28/09/2010	Patch of U4b
19	137218.6	931940.6	TR	T72	28/09/2010	Good amounts of M1 wet hollow vegetation here
20	136872.1	931337.6	TR	T71	28/09/2010	Patch of M19a dominated by <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i>
21	136879.3	931299.3	TR	T70	28/09/2010	<i>Sphagnum magellanicum</i> in M17a here
22	136538.7	934351.7	TR	T7	21/09/2010	Old settlement M15b shallow peat <i>Calluna vulgaris</i> , <i>Trichophorum cespitosum</i> , <i>Juncus squarrosus</i> , <i>Sphagnum capillifolium</i>

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
23	139462.4	933051.9	TR	T-7		M6ci/80 M25a/20
24	136881.1	931226.2	TR	T69	28/09/2010	Channel with a narrow band of M6ci, M25a and M19a
25	137238.8	931229.8	TR	T68	28/09/2010	Patch of M17a with high <i>Molinia caerulea</i> and much litter. Sparse <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Potentilla erecta</i> and a little <i>Sphagnum capillifolium</i>
26	138606	933038.7	TR	T67	27/09/2010	Open areas here have knolls with acid grassland U4 and some MG10a. There is also some H12 <i>Calluna vulgaris</i> -dominated dry heath and modified <i>Molinia caerulea</i> -dominated blanket bog
27	138194.2	933027.1	TR	T66	27/09/2010	M1 vegetation in drains in planted coniferous woodland
28	137963.5	932695.5	TR	T65	27/09/2010	Nice hummock/hollow bog with M1/M17b in open undrained ride here
29	138053.6	932652.7	TR	T64	27/09/2010	Some drains in the wetter parts of the plantation, such as here, have abundant M1 vegetation and are regenerating well (photo). Undrained open ride has M17a, M1 and M17b
30	138066.3	932530.1	TR	T63	27/09/2010	<i>Rhynchospora alba</i> here – rare in the survey area
31	138353	932349.3	TR	T62	27/09/2010	Dark patches of dry acid heath are H12a with dominant <i>Calluna vulgaris</i> with <i>Potentilla erecta</i> and <i>Hylocomium splendens</i> . Peat is 20cm deep. To the north of here, where drained there is abundant <i>Calluna vulgaris</i> along the dry ridges between drains (photo)
32	138503.1	932380.1	TR	T61	27/09/2010	Area of shallower peat running west
33	138523.4	930258.5	TR	T-6	29/09/2010	Intact uniform blanket bog but here it has a strange, shallow, artificial ridge/furrow structure
34	137781.5	932079	TR	T59	27/09/2010	Series of knolls to the north-east here with dwarf shrub heath and acid grassland: H12a, M15b and U4
35	137632.7	932089.6	TR	T58	27/09/2010	Channels have M6ci/M23b borders with <i>Juncus effusus</i> and some M19a. Acid grassland is patchy and also M25a in places
36	137589.6	932773.7	TR	T57	27/09/2010	M6ci/M19a 50:50
37	137633	933279.9	TR	T56	27/09/2010	M1 hollows/pools – plentiful <i>Sphagnum cuspidatum</i> and <i>Menyanthes trifoliata</i> , <i>Juncus bulbosus</i> , <i>Eriophorum angustifolium</i> and <i>Utricularia minor</i> (photo)
38	137745	933327.2	TR	T55	27/09/2010	Deep pool generally bare of <i>Sphagnum</i> but with <i>Menyanthes trifoliata</i> and <i>Utricularia</i> sp.
39	137798.1	933463.6	TR	T54	27/09/2010	Deep pool with M1 vegetation – <i>Menyanthes trifoliata</i> . (photo)
40	138516.9	933583.3	TR	T53	27/09/2010	Grassy knolls with shallow peat, 20-50cm deep, supporting wet heath (M15b, M15c)
41	138433.7	933487.4	TR	T52		Well vegetated M1 hollows with <i>Sphagnum cuspidatum</i> on shallow peat, 10-20cm deep, here

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
42	138202.1	933518.9	TR	T51	27/09/2010	Pool with <i>Menyanthes trifoliata</i> and <i>Utricularia</i> sp. Also shallower pools with plentiful <i>Sphagnum cuspidatum</i> and <i>Sphagnum denticulatum</i>
43	138218.8	933597.8	TR	T50	27/09/2010	Peat depth is frequently less than 50cm deep in the old peat cuttings here
44	139248.6	929853.5	TR	T-5		<i>Schoenus nigricans</i> in flush here with sp and a high cover of <i>Molinia caerulea</i>
45	137231.4	933906.5	TR	T49	25/09/2010	Narrow band of M19a/M6ci along watercourse, about 8m wide
46	137472.8	934394.7	TR	T8	25/09/2010	Drained modified bog with planted conifers. <i>Molinia caerulea</i> is dominant with some <i>Calluna vulgaris</i> , <i>Cladonia portentosa</i> , <i>Sphagnum capillifolium</i> , <i>Racomitrium lanuginosum</i> , <i>Campylopus introflexus</i> and <i>Campylopus atrovirens</i>
47	137422.7	933562.5	TR	T47	24/09/2010	Here hummock/hollow structure well defined. Pale <i>Racomitrium lanuginosum</i> hummocks and well-vegetated M1 hollows
48	137538.8	933439.9	TR	T46	24/09/2010	More pools here: <i>Sphagnum cuspidatum</i> , <i>Menyanthes trifoliata</i> , <i>Utricularia minor</i> (photo)
49	137529.4	933387.3	TR	T45	24/09/2010	Well vegetated M1 pools with <i>Sphagnum cuspidatum</i> (photo)
50	137522	933319.5	TR	T44	24/09/2010	Deep pools with <i>Sphagnum cuspidatum</i> and <i>Menyanthes trifoliata</i> surrounded by M17a with abundant <i>Sphagnum papillosum</i>
51	137501.2	933012.1	TR	T43	24/09/2010	M19a/M6ci
52	137497.2	932972.1	TR	T42	24/09/2010	M6ci
53	137453.4	932849.6	TR	T41	24/09/2010	M19a patch within tract of M17b
54	137387	932593	TR	T40	24/09/2010	Pool with <i>Sparganium angustifolium</i> . Lush M17a edges (photo)
55	137244.2	932453.3	TR	T38	24/09/2010	Series of shallow peat knolls to the north of here.
56	137336	932410.9	TR	T8	24/09/2010	Patch of M19a, noted to see if visible on satellite imagery
57	137147.8	932565.4	TR	T7	24/09/2010	<i>Sphagnum magellanicum</i> here – rare in the M17a in the survey area
58	137318.4	932776.5	TR	T36a	24/09/2010	Pools here largely deep and bare of <i>Sphagnum</i> but there is much aquatic <i>Menyanthes trifoliata</i> and <i>Sparganium angustifolium</i> (photo)
59	137186.9	932566	TR	T36	24/09/2010	Pool has abundant <i>Sphagnum cuspidatum</i> with <i>Eriophorum angustifolium</i> , graded M17a transition zone with <i>Sphagnum papillosum</i> and <i>Sphagnum capillifolium</i>
60	137287.9	932863.5	TR	T35	24/09/2010	Several small grassy knolls with shallower peat
61	137279.7	932988.8	TR	T34	24/09/2010	A band of M19a along soakway to around 10m wide. <i>Eriophorum vaginatum</i> is conspicuous with <i>Calluna vulgaris</i> , <i>Trichophorum cespitosum</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Molinia caerulea</i> . The bryophyte layer has <i>Hylocomium splendens</i> with <i>Cladonia portentosa</i> and <i>Pleurozium schreberi</i>

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
62	137035.2	932677.3	TR	T32	24/09/2010	Planted coniferous woodland. Trees (pine and spruce) are very ill and look to be dying. Ground flora is dominated by <i>Molinia caerulea</i> with some <i>Calluna vulgaris</i> , <i>Cladonia portentosa</i> and <i>Hylocomium splendens</i> and has been classed as modified M17 blanket bog
63	136713.7	932859.4	TR	T31	24/09/2010	Drained area. Here very much like M25a with dominant <i>Molinia caerulea</i> and only sparse <i>Calluna vulgaris</i> , <i>Cladonia portentosa</i> , <i>Racomitrium lanuginosum</i> (M17 remnants). In drain bottoms there is <i>Sphagnum fallax</i> , <i>Sphagnum cuspidatum</i> and <i>Sphagnum papillosum</i>
64	136539.2	932900.6	TR	T30	24/09/2010	Ride – very wet, spongy, unmodified bog – M17a: <i>Sphagnum papillosum</i> , <i>Molinia caerulea</i>
65	139346.8	930086.4	TR	T-3		<i>Schoenus nigricans</i> and <i>Rhynchospora alba</i> in M17a here
66	136442.2	932969.4	TR	T29	24/09/2010	Ride. Not drained – M17a but has high <i>Molinia caerulea</i> content
67	136555.3	933060.5	TR	T28	24/09/2010	Ride here is undrained and has unmodified M17a: <i>Sphagnum papillosum</i> , <i>Sphagnum capillifolium</i> , <i>Trichophorum cespitosum</i> , <i>Molinia caerulea</i> , <i>Eriophorum angustifolium</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Potentilla erecta</i>
68	136623.8	933080.5	TR	T27	24/09/2010	Drains. Modified bog - high <i>Molinia caerulea</i> and litter, <i>Potentilla erecta</i> sparse bryophytes: <i>Hylocomium splendens</i> , <i>Sphagnum capillifolium</i> , <i>Polytrichum commune</i> . <i>Sphagnum fallax</i> in drains (M6)
69	136711.8	933360.4	TR	T26	24/09/2010	Drain with <i>Utricularia minor</i> and <i>Sphagnum cuspidatum</i> , <i>Sphagnum denticulatum</i> , <i>Eriophorum angustifolium</i> and <i>Potamogeton polygonifolius</i>
70	137193	933108.5	TR	T25	24/09/2010	Broad knoll here with some shallower peat 40-80cm deep
71	137133.9	933221.1	TR	T24	24/09/2010	Typical good condition M17a blanket bog with abundant <i>Sphagnum papillosum</i> along with <i>Sphagnum capillifolium</i> , <i>Pleurozia purpurea</i> , <i>Sphagnum cuspidatum</i> , <i>Sphagnum tenellum</i> , <i>Drosera rotundifolia</i> , <i>Calluna vulgaris</i> , <i>Trichophorum cespitosum</i> , <i>Erica tetralix</i> and sparse <i>Eriophorum vaginatum</i> and <i>Eriophorum angustifolium</i> (photo)
72	137247.2	933218.4	TR	T23	24/09/2010	Large pools in this polygon have plentiful <i>Sphagnum cuspidatum</i> and <i>Menyanthes trifoliata</i> (photo).
73	137242.7	933321.5	TR	T22	24/09/2010	Large flat wet area of bog with pools. Hummocks are well vegetated with <i>Cladonia portentosa</i> , <i>Racomitrium lanuginosum</i> , <i>Trichophorum cespitosum</i> , <i>Eriophorum vaginatum</i> . Pools and hollows have plentiful <i>Sphagnum papillosum</i> , <i>Sphagnum capillifolium</i> and <i>Sphagnum cuspidatum</i>

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
74	139089.1	934050	TR	T21	23/09/2010	U6a acid grassland consisting of <i>Juncus squarrosus</i> , <i>Erica tetralix</i> , <i>Molinia caerulea</i> , <i>Agrostis canina</i> , <i>Calluna vulgaris</i> , <i>Hylocomium splendens</i> , <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> , <i>Sphagnum papillosum</i>
75	139310.7	930114.8	TR	T-2		deleted
76	139195.8	935486.2	TR	T19	23/09/2010	<i>Sphagnum compactum</i> on gully bottom with <i>Sphagnum cuspidatum</i>
77	139267.7	935379.8	TR	T18	23/09/2010	Old peat cuttings on slopes here. Peat depth 20-50cm in many places
78	139544.2	935682.6	TR	T17	22/09/2010	Stony substrate visible on gully bottom
79	140014.5	935777.1	TR	T16	22/09/2010	Shallow peat knoll with M15b. <i>Calluna vulgaris</i> is prominent and there is a ring of M19a <i>Eriophorum vaginatum</i> / <i>Calluna vulgaris</i> mire
80	139764.7	935365.6	TR	T15	22/09/2010	Flats by the river are generally less than 50cm deep peat but looks like blanket bog vegetation/re-generation: plenty <i>Sphagnum papillosum</i> , <i>Sphagnum capillifolium</i> with <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Racomitrium lanuginosum</i> etc
81	136269.8	934826.5	TR	T13	21/09/2010	Intense burning damage to M17b hummock vegetation (photo)
82	136532.4	934872.4	TR	T12	21/09/2010	M17b dry edge has <i>Racomitrium lanuginosum</i> , <i>Erica cinerea</i> , <i>Cladonia portentosa</i> , <i>Cladonia uncialis</i> , <i>Calluna vulgaris</i> , <i>Trichophorum cespitosum</i> , <i>Eriophorum angustifolium</i> , <i>Molinia caerulea</i> (photo)
83	136748.4	935214.7	TR	T11	21/09/2010	Severe burning of <i>Racomitrium lanuginosum</i> hummocks
84	136861.2	935120	TR	T11	21/09/2010	Protruding knoll in blanket bog, peat depth 50-75cm has M19a vegetation: <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Empetrum nigrum</i> , <i>Trichophorum cespitosum</i> , <i>Molinia caerulea</i> , <i>Hylocomium splendens</i> , and <i>Pleurozium schreberi</i>
85	136663.2	935136.4	TR	T10	21/09/2010	Small area M19a with prominent <i>Eriophorum vaginatum</i> tussocks and <i>Calluna vulgaris</i> , <i>Empetrum nigrum</i> , <i>Potentilla erecta</i> , <i>Agrostis canina</i> . Moss layer dominated by <i>Hylocomium splendens</i> with <i>Sphagnum capillifolium</i> , <i>Polytrichum commune</i> . (Photo)
86	139024.4	930451.4	TR	T-1	15/11/2010	Burning of <i>Calluna vulgaris</i> in dry heath at the top of the slope here
87	138185.6	933612.9	TR	T4	20/09/2010	higher ground here
88	138128	933372.7	TR	T3	20/09/2010	knolls of wet heath
89	137675.6	933138.4	TR	T2	20/09/2010	<i>Molinia caerulea</i> -dominated blanket bog
90	137928.8	933456.8	TR	T1	20/09/2010	Abundant lush <i>Cladonia portentosa</i> on blanket bog shows up as white on satellite imagery
91	138726.2	935246.4	KP	Tz M6ci	9/22/2010	Narrow strip of M6ci along minor watercourse
92	137537.7	934957.8	KP	Ty	9/24/2010	Poaching by red deer adjacent to fence-line

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
93	137560.4	934996.4	KP	Tx	9/24/2010	Small area of deeper haggling to 1m high and 2m wide with a mixture of M1 and M3 in gully bottoms most of which are revegetating with <i>Eriophorum angustifolium</i> and <i>Sphagnum cuspidatum</i>
94	137973.3	935118.1	KP	T'9	9/22/2010	Small outcrop of M15c.
95	138048.9	935090.7	KP	T8	9/22/2010	Scattered M15c where rock is close to the surface or outcropping
96	138244.9	935117.4	KP	T7	9/22/2010	Small ridge of wet heath (M15c) with some exposed bedrock. M15c is mainly a mixture of <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Cladonia arbuscula</i> , <i>C. uncialis</i> , <i>Trichophorum cespitosum</i> , <i>Racomitrium lanuginosum</i> , <i>Narthecium ossifragum</i> , <i>Succisa pratensis</i> and <i>Sphagnum capillifolium</i>
97	135608.7	932389.7	KP	T69	9/29/2010	Increased <i>Molinia caerulea</i> through M17a adjacent to track
98	135519.2	932319.9	KP	T68	9/29/2010	Narrow strip of burn-side vegetation is a mixture of acid grassland (U4b) and marshy grassland (M23b) dominated by <i>Juncus effusus</i> . In the channel itself is some <i>Carex rostrata</i> , <i>Caltha palustris</i> and <i>Callitriche</i> sp.
99	135416.5	932283.2	KP	T67	9/29/2010	Area of hummock/hollow blanket bog with some erosion (A4.G4) and M1 hollows
100	135241.5	932217.3	KP	T66	9/29/2010	Roadside bank is a mix of acid grassland (U4b) and dry heath (H12c) with fragments of <i>Juncus effusus</i> (M6ci and M23b)
101	135298	932180.4	KP	T65	9/29/2010	Small M10 flush with <i>Carex viridula</i> ssp. <i>oedocarpa</i> , <i>Carex panicea</i> , <i>Scorpidium scorpioides</i> , <i>Carex dioica</i> , <i>Carex nigra</i> , <i>Pinguicula lusitanica</i> , <i>Pinguicula vulgaris</i> , <i>Eriophorum angustifolium</i> , <i>Breutelia chrysocoma</i> , <i>Campylopus introflexus</i> and <i>Sphagnum subnitens</i>
102	135566.4	932234.6	KP	T64	9/29/2010	Small system of M1 pools at end of this wet polygon. Majority of bare peat is found towards the eastern end as can be seen on aerial imagery
103	135641.8	932186.4	KP	T63	9/29/2010	Narrow band of wet heath (M15b/c) over steep slopes with fragments of M25a and H12a. <i>Calluna vulgaris</i> provides the dark colouring visible on aerial photograph and tends to grow in association with <i>Molinia caerulea</i> and <i>Trichophorum cespitosum</i> . In parts there is a high cover of <i>Racomitrium lanuginosum</i> and <i>Cladonia</i> spp. with frequent <i>Erica cinerea</i> and generally appearing most similar to M15c although not typical
104	135699.5	932279.4	KP	T62	9/29/2010	Narrow strip of <i>Juncus effusus</i> dominated acid flush vegetation (M6ci) interspersed by <i>Molinia caerulea</i> dominated (M25a) stands

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
105	136112.6	932195.3	KP	T61	9/29/2010	Small stand of vegetation which is does not easily fir with NVC classification. <i>Molinia caerulea</i> is abundant with frequent <i>Carex rostrata</i> , <i>Sphagnum fallax</i> , <i>Sphagnum palustre</i> and <i>Sphagnum papillosum</i> . Also present are a mix of <i>Calluna vulgaris</i> , <i>Potentilla erecta</i> and <i>Juncus effusus</i>
106	136306.3	932200.6	KP	T60	9/29/2010	Bank of steeper ground around southern shores of the loch are predominantly M15b/M19 with fragments of <i>Molinia caerulea</i> dominated M25a and dry heath (H12)
107	138128.1	935077.9	KP	T6	9/22/2010	Small ridge of wet heath (M15c) with some exposed bedrock
108	134908.6	931128.9	KP	T57	9/29/2010	Smaller pools here than in polygons to north and south with scattered <i>Rhynchospora alba</i> . NVC percentages M17b (40); M17a (30); M1 (30)
109	136934.8	931334.6	KP	T52	9/28/2010	Small stand of <i>Carex rostrata</i> (M4) with <i>Sphagnum fallax</i> , <i>Empetrum nigrum</i> , <i>Menyanthes trifoliata</i> , <i>Erica tetralix</i> , <i>Sphagnum palustre</i> , <i>Pedicularis sylvatica</i> and <i>Aulacomnium palustre</i>
110	138511.1	932621.6	KP	T51	9/27/2010	<i>Potamogeton polygonifolius</i> soakway with <i>Sphagnum denticulatum</i> , <i>Potamogeton polygonifolius</i> , <i>Carex nigra</i> , <i>Carex echinata</i> , <i>Juncus bulbosus</i> and <i>Eriophorum angustifolium</i>
111	138398.4	932937.8	KP	T50	9/27/2010	Hummock/hollow structured blanket bog (M17b/M1) with a network of M1 pools vegetated by <i>Sphagnum denticulatum</i> , <i>Sphagnum cuspidatum</i> , <i>Potamogeton polygonifolius</i> , <i>Menyanthes trifoliata</i> and <i>Eriophorum angustifolium</i>
112	139021.2	935174.2	KP	T5	9/22/2010	Steep bank with rock outcrop supporting tiny fragments of H21a. <i>Calluna vulgaris</i> dominates over <i>Sphagnum capillifolium</i> , <i>Erica cinerea</i> , <i>Rhytidiadelphus loreus</i> , <i>Blechnum spicant</i> , <i>Cladonia</i> spp., <i>Agrostis capillaris</i> , <i>Festuca ovina</i> , <i>Pleurozium schreberi</i> , <i>Hypnum jutlandicum</i> and <i>Nardus stricta</i> . Becomes transitional to M15b in parts with a localised increase in <i>Trichophorum cespitosum</i>
113	138628.9	932887	KP	T49	9/27/2010	Small hill with patches of acid grassland (U4b), marshy grassland (M23b) and dry heath (H10)
114	138900.1	932999.9	KP	T48	9/27/2010	Group of intact M1 bog pools which support a mixture of species including <i>Sphagnum cuspidatum</i> , <i>Sphagnum denticulatum</i> , <i>Eriophorum angustifolium</i> , <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Utricularia minor</i> , <i>Carex nigra</i> and <i>Sphagnum papillosum</i> . Patches of M17a/b blanket bog form islands within the pools
115	138992.5	932985.8	KP	T47	9/27/2010	Small hillocks support wet heath vegetation (M15c/b) within wider blanket bog communities

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
116	139002.1	932423.8	KP	T46	9/27/2010	Ridge of higher ground supporting a range of vegetation types including blanket bog, wet heath, acid flush and acid grassland. At this location is a collapsed hut
117	139130.6	932742.5	KP	T45	9/27/2010	Old tramway across bog which is associated with old industrial peat cuttings. This is now vegetated by M19a/M6ci/M17a/M17b
118	139236.8	932782	KP	T44	9/27/2010	Intact pool systems (M1) vegetated by <i>Sphagnum cuspidatum</i> and <i>S. auriculatum</i> with small M17 islands
119	138692	933795.8	KP	T42	9/27/2010	M1 pools dominated by <i>Sphagnum cuspidatum</i> , <i>Menyanthes trifoliata</i> and some <i>Juncus effusus</i> at margins. Surrounding blanket bog is spongy M17a/M1 mainly
120	137797.9	934625.9	KP	T41/N45	9/25/2010	Small area of peat hags within otherwise fairly smooth bog. The hollows are mainly revegetating with a gully score of 5. Bare peat is at low cover
121	137840.2	934945.4	KP	T40/P37	9/25/2010	Large unvegetated pool
122	137891	935001.4	KP	T39	9/25/2010	Small group of M1 pools with <i>Sphagnum cuspidatum</i> , <i>Sphagnum denticulatum</i> and <i>Eriophorum angustifolium</i> surrounded by M17a/b blanket bog
123	137336	932410.9	KP	T38	9/24/2010	Narrow, linear stand of M6ci which continues down to the river/burn. Immediately to the east of here are two small rocky knolls supporting wet heath vegetation (M15b/c)
124	136273.1	932537.5	KP	T37	9/20/2010	Loch banks are steep and support tall <i>Calluna vulgaris</i> over deep peat in parts. There is also some localised <i>Molinia caerulea</i> dominated vegetation (M25a) and M19a occurring in a narrow strip
125	136074.9	932747.2	KP	T36	9/20/2010	Bog pool (photograph #30) which is approximately 0.8m deep and vegetated by <i>Utricularia minor</i> and <i>Sphagnum denticulatum</i> at the margins. There are frequent pools in this area between the two plantations
126	136086.4	932842.8	KP	T35	9/24/2010	Area of bog outwith plantation which has been drained in association with plantation but is still in fairly good condition despite this
127	135961.1	933170.2	KP	T34	9/24/2010	Small stream with narrow linear stand of M6ci and M25a
128	136204.5	933493.8	KP	T33	9/24/2010	Small pool system heavily vegetated by <i>Utricularia minor</i> , <i>Eriophorum angustifolium</i> and <i>Sphagnum cuspidatum</i> . Photograph #24
129	138171.5	934880.8	KP	T32	9/23/2010	Bog pool (M1) with <i>Menyanthes trifoliata</i> , <i>Molinia caerulea</i> , <i>Utricularia minor</i> , <i>Sphagnum cuspidatum</i> etc
130	138217.3	934992.4	KP	T31	9/23/2010	M1 pool systems within very wet blanket mire (M17a) vegetated by <i>Utricularia minor</i> , <i>Menyanthes trifoliata</i> , <i>Sphagnum cuspidatum</i> , <i>Sphagnum denticulatum</i> and <i>Eriophorum angustifolium</i>

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
131	138287.1	935007.4	KP	T30	9/23/2010	Area of pools. Photograph #21 (north-west)
132	137394.8	935071.5	KP	T3	9/21/2010	Small peat mound vegetated with M19a (<i>Calluna vulgaris</i> , <i>Empetrum nigrum</i> , <i>Trichophorum cespitosum</i> , <i>Eriophorum vaginatum</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i>)
133	138440.6	935000.4	KP	T28	9/23/2010	Small fragments of M15b/c where peat thins over rocks
134	139203.1	934204.2	KP	T27	9/23/2010	Narrow strip of improved and marshy grassland (MG6/M23b) between track and fenceline
135	138768.9	934644.3	KP	T26	9/23/2010	M1 bog pool vegetated by abundant <i>Menyanthes trifoliata</i> and <i>Sphagnum cuspidatum</i> within wider area of intact blanket bog with frequent wet M1 hollows. Photograph #17 and #18
136	139103.1	934776.7	KP	T25	9/23/2010	Small ridge of wet heath (M15c) over peat 20-30cm deep
137	139230.2	934677.1	KP	T24	9/23/2010	Linear stand of acid flush vegetation dominated by <i>Juncus effusus</i> (M6ci) alongside litter-ridden drain/burn
138	139360.8	934745.3	KP	T23 / A58	9/23/2010	Deep active drain flowing through blanket bog (M17a with localized <i>Molinia caerulea</i>)
139	139826.5	935079.4	KP	T22	9/23/2010	Small pool system supporting <i>Utricularia minor</i> , <i>Sphagnum cuspidatum</i> and <i>Eriophorum angustifolium</i> . Scattered rubbish from landfill
140	139827.9	935129	KP	T21	9/23/2010	Small hillock with M9a/M15 communities
141	139718.2	935085.6	KP	T20	9/23/2010	Area of more recent peat cuttings which are clearly visible as red areas on A/P. <i>Eriophorum angustifolium</i> dominates with frequent <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Trichophorum cespitosum</i> , <i>Sphagnum capillifolium</i> , <i>Sphagnum papillosum</i> and <i>Erica tetralix</i> . Peat depth in bottoms is generally >0.5m
142	139762.7	935199.4	KP	T19	9/23/2010	Old peat cuttings which are mainly M17b with fragments of M17a in bottoms. Peat is occasionally <0.5m deep but vegetation most similar to blanket bog (M17/M19)
143	139883.5	935267	KP	T18	9/23/2010	Area of old peat cuttings adjacent to track
144	139671.3	934831	KP	T17	9/22/2010	Small area of pools which are fenced from the surrounding bog. These support a mixture of <i>Menyanthes trifoliata</i> , <i>Sphagnum cuspidatum</i> , <i>Sphagnum denticulatum</i> and <i>Eriophorum angustifolium</i> . Surrounding bog is very wet M17a with a high cover of <i>Sphagnum papillosum</i>
145	139606.5	934877.8	KP	T16	9/22/2010	Good condition blanket bog made up of a fine mosaic of M17a, M17b and scattered M1 hollows with <i>Sphagnum cuspidatum</i> and <i>Eriophorum angustifolium</i> . <i>Sphagnum papillosum</i> is generally more abundant towards the eastern end of this polygon

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
146	139283.5	935003.6	KP	T15	9/22/2010	Small rock outcrop supporting fragments of acid grassland (U4b/U5b) with some M19a through adjacent bog
147	138745.4	934993.2	KP	T14	9/22/2010	Small rock outcrop supporting M15c over shallower peat.
148	138489.2	935414.2	KP	T13	9/22/2010	System of pools (M1) within M17a blanket bog support <i>Menyanthes trifoliata</i> , <i>Sphagnum cuspidatum</i> and <i>Eriophorum angustifolium</i>
149	139347.6	931667.7	KP	T121	11/16/2010	Increased frequency of M1 pools and hollows at this location where the bog is slightly lower lying between the two lochs.
150	139108.5	931741	KP	T122	11/16/2010	Shallower soils around over rocky knoll support acid grassland (rank U4) with marshy grassland (M23b) and patchy wet and dry heath. Grazing pressures are more obvious through these more palatable vegetation types
151	139372.3	931475.6	KP	T120	11/16/2010	M1 pools with <i>Sphagnum denticulatum</i> , <i>Trichophorum cespitosum</i> , <i>Eriophorum angustifolium</i> , <i>Menyanthes trifoliata</i> , <i>Carex rostrata</i> , <i>Potamogeton polygonifolius</i> and <i>Equisetum palustre</i> . These pools continue to the north and are clearly visible on satellite imagery through this polygon
152	138413.2	935441	KP	T12	9/22/2010	<i>Menyanthes trifoliata</i> growing through relatively dry area of blanket bog with <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Cladonia</i> spp. and <i>Narthecium ossifragum</i> etc
153	137160.8	935138.7	KP	T12	9/21/2010	Areas of blanket bog communities adjacent to the loch are often on peats of <0.5m. <i>Sphagnum papillosum</i> is frequent with all M17a associates (<i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Trichophorum cespitosum</i> , <i>Eriophorum vaginatum</i> , <i>Eriophorum angustifolium</i> , <i>Drosera rotundifolia</i> etc
154	139568.4	931625	KP	T119	11/16/2010	Linear stand of M6ci where there is some soligenous influence through the bog. This shows up as a pale strip on satellite imagery
155	139658	931641	KP	T118	11/16/2010	System of bog pools adjacent to public road.
156	139762.7	931755.9	KP	T117	11/16/2010	Some of the vegetation between the road and loch here is most similar to the blanket bog M17b community although occurring on peat <0.5m deep. This is probably as a result of past peat cutting
157	140371.3	932514.6	KP	T116	11/15/2010	Area of young planted trees (<i>Alnus glutinosa</i> , <i>Pinus contorta</i>) over <i>Molinia caerulea</i> and <i>Calluna vulgaris</i> adjacent to the river. Immediately to the east (pale area on A/P) is a mosaic of M25a and M15 with <i>Juncus effusus</i> dominated marshy grassland
158	139630.8	932805	KP	T115	11/15/2010	At edge of pool systems

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
159	139373.6	932769.8	KP	T114	11/15/2010	Concentration of M1 pools where old peat cuttings have drained down-slope and water movement has been prevented from moving further by remains of tramway
160	139316.7	932761.9	KP	T113	11/15/2010	Old tramway for past industrial peat cutting works. This ridge through the bog prevents water movement down-slope resulting in an increased frequency of pools immediately adjacent on the upslope side. Peat is shallow over a firm substrate supporting a mixture of blanket bog (M19a), wet heath (M15b) and acid flush vegetation (M6ci)
161	139313.1	932696.6	KP	T112	11/15/2010	Interconnecting pools (M1) through blanket bog
162	139420.3	932679.9	KP	T111	11/15/2010	Some localized bare peat (M3) which is mainly revegetating
163	138023.5	935527.2	KP	T11	9/22/2010	Small peat mound supporting M19a blanket bog
164	138675	929187.6	KP	T109	11/15/2010	This polygon is made up of an intricate pattern of pools of varying sizes with two larger ones
165	138814.9	929154	KP	T108	11/15/2010	Frequent <i>Rhynchospora alba</i> through M1 pools. This target note should be in A515 – move boundary south
166	139347.3	929147.9	KP	T107	11/15/2010	Strip of acid flush vegetation (M6ci) along sides of burn. <i>Juncus effusus</i> dominates over <i>Sphagnum fallax</i> , <i>Sphagnum palustre</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Agrostis stolonifera</i>
167	139076.7	929346.6	KP	T106	11/15/2010	Increased cover of <i>Calluna vulgaris</i> much of which is dying in amongst areas of bare peat (M3). Modified bog vegetation is composed of abundant <i>Calluna vulgaris</i> and <i>Hypnum</i> sp. Also frequent/occasional are <i>Eriophorum angustifolium</i> , <i>Trichophorum cespitosum</i> , <i>Eriophorum vaginatum</i> and <i>Cladonia portentosa</i>
168	138910.4	929479.2	KP	T105	11/15/2010	System of M1 pools with abundant <i>Sphagnum cuspidatum</i> , <i>Sphagnum papillosum</i> , <i>Eriophorum angustifolium</i> and some <i>Rhynchospora alba</i> through shallower pools and margins
169	139244.1	929808	KP	T104	11/15/2010	Small fragments of rush-dominated flush (M6ci) vegetation along minor watercourse.
170	139395.3	929807.3	KP	T103	11/15/2010	Rocky bottomed loch supports <i>Lobelia dortmanna</i> , <i>Subularia aquatica</i> , <i>Carex viridula</i> ssp. <i>oedocarpa</i> and <i>Sphagnum denticulatum</i> in shallow margins
171	140142.3	929642.2	KP	T102	11/15/2010	Small fragments of acid flush (M6ci) vegetation along small watercourse.
172	140396.1	929412.8	KP	T101	11/15/2010	<i>Rhynchosporion</i> hollows (M1). <i>Rhynchospora alba</i> is frequent over this area growing in association with <i>Eriophorum angustifolium</i> , <i>Narthecium ossifragum</i> , <i>Sphagnum denticulatum</i> , <i>Trichophorum cespitosum</i> and <i>Drosera</i> spp.

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
173	140529.9	929505.5	KP	T100	11/15/2010	Inaccessible rock face supporting <i>Polypodium</i> sp.; <i>Lonicera periclymenum</i> ; <i>Erica cinerea</i> , <i>Eriophorum vaginatum</i> , <i>Deschampsia flexuosa</i> and <i>Sorbus aucuparia</i> . There is also some dry heath (H10/H21a) immediately adjacent on steeper slopes. Outcrop provides shelter for herbivores and fragments of acid grassland which are preferentially grazed. There was a high concentration of dung here
174	137810.5	935141.3	KP	T10	9/22/2010	System of bog pools (M1) within good condition intact M17b/M1 hummock/hollow blanket bog. Pools are vegetated by abundant <i>Sphagnum cuspidatum</i> and frequent <i>Eriophorum angustifolium</i> and <i>Sphagnum denticulatum</i> . <i>Drosera intermedia</i> is also found at low cover. Pools of this type are quite widespread through this polygon
175	137024	935022.5	KP	T1	9/21/2010	Area of high <i>Molinia caerulea</i> cover (showing up paler on A/P). locally the vegetation becomes transitional to M19 with <i>Molinia caerulea</i> , <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Erica tetralix</i> and <i>Cladonia</i> spp. all frequent. Other species present include <i>Empetrum nigrum</i> , <i>Potentilla erecta</i> , <i>Succisa pratensis</i> , <i>Calluna vulgaris</i> , <i>Pleurozium schreberi</i> and <i>Racomitrium lanuginosum</i>
176	138254.8	930544.9	TR	0	23/02/2011	Area is mainly wet heath on raised ground amongst old peat cuttings and "standing" stones. Wet heath is M15b/M15c composed of <i>Calluna vulgaris</i> , <i>Trichophorum cespitosum</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Racomitrium lanuginosum</i> , <i>Sphagnum capillifolium</i> and <i>Cladonia portentosa</i> . There is also some patchy <i>Sphagnum papillosum</i> and <i>Sphagnum compactum</i> . Immediately adjacent to roadside there is rank semi-improved grassland. The vegetation is M17b blanket bog where the peat is deeper esp. along ridges within old peat cutting
177	138303.3	930599.4	TR	F2	23/02/2011	Edge of wet heath and peat cuttings. To the north the ground is low-lying and flatter with blanket bog M17a with a very high cover of <i>Molinia caerulea</i> over a patchy carpet of <i>Sphagnum papillosum</i> . Growing amongst the <i>Molinia caerulea</i> are <i>Trichophorum cespitosum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Hylocomium splendens</i> and <i>Aulacomnium palustre</i> . Somewhat transitional to M25a marshy grassland

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
178	138570.7	930637.6	TR	F3	23/02/2011	Peat cuttings to the north of here. Dry ridges of M17b composed of a carpet of <i>Racomitrium lanuginosum</i> with <i>Cladonia portentosa</i> , <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Cladonia uncialis</i> , <i>Trichophorum cespitosum</i> , <i>Eriophorum vaginatum</i> . The bottoms of peat cuttings are re-generating blanket bog with M17b again plus some M17a vegetation consisting of more <i>Sphagnum papillosum</i> , <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> , <i>Sphagnum capillifolium</i> . Occasional a wetter hollow is more like M1 with <i>Sphagnum cuspidatum</i> and <i>Eriophorum angustifolium</i> more prominent.
179	138590.4	930675.9	TR	F4	23/02/2011	M6c acid flush community along drain
180	138631	930659.5	TR	F5	23/02/2011	Rank U4 grassland along road.
181	138678.6	930685.7	TR	F6	23/02/2011	M25a marshy grassland dominated by <i>Molinia caerulea</i> with sparse <i>Calluna vulgaris</i> , <i>Juncus effusus</i> , <i>Cladonia portentosa</i> and <i>Hylocomium splendens</i> .
182	138833.4	930734.3	TR	F7	23/02/2011	Dense <i>Ulex europaeus</i> scrub W23
183	138761.2	930739.3	TR	F8	23/02/2011	<i>Alnus</i> sp. trees and <i>Picea abies</i> planted here
184	138752.3	930758.5	TR	F9	23/02/2011	Rank acid grassland (U5/U4) composed of <i>Nardus stricta</i> , <i>Agrostis capillaris</i> , <i>Molinia caerulea</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> with scattered <i>Ulex europaeus</i> .
185	138752	930758.5	TR	F10	23/02/2011	A small patch of M17a blanket bog with much <i>Sphagnum papillosum</i> and <i>Sphagnum capillifolium</i> , <i>Sphagnum cuspidatum</i> , <i>Calluna vulgaris</i> and <i>Trichophorum cespitosum</i> .
186	138713.5	930757.7	TR	F11	23/02/2011	Wet heath here (M15c) has <i>Calluna vulgaris</i> , <i>Trichophorum cespitosum</i> , <i>Eriophorum angustifolium</i> and in the ground layer <i>Racomitrium lanuginosum</i> , <i>Cladonia portentosa</i> , <i>Cladonia uncialis</i> . <i>Alnus</i> sp. trees planted here are not doing well and look to be dying off.
187	139400.2	931230.9	TR	F12	23/02/2011	Alternative site entrance. There is a band of rank acid with M6ci acid flush in the soakways grassland immediately alongside the road. Beyond this is mainly old peat cuttings with shallow peat wet heath (M15b/c) composed of <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Trichophorum cespitosum</i> , <i>Erica cinerea</i> , <i>Narthecium ossifragum</i> , <i>Juncus squarrosus</i> , <i>Nardus stricta</i> , <i>Racomitrium lanuginosum</i> , <i>Cladonia portentosa</i> , <i>Sphagnum capillifolium</i> and <i>Hypnum jutlandicum</i> .
188	139163.3	931311.3	TR	F13	23/02/2011	M17a blanket bog here has a high cover of <i>Molinia caerulea</i> making it look similar to M25a but there is abundant <i>Sphagnum papillosum</i> with <i>Trichophorum cespitosum</i> , <i>Eriophorum angustifolium</i> and <i>Cladonia uncialis</i> .
189	139066.2	931296.3	TR	F14	23/02/2011	Bank above M17a on flats has wet heath (M15) and patchy blanket bog (M17b) on deeper peat.

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
190	138892.1	931299.6	TR	F15	23/02/2011	A patch of M19a blanket bog within M17b stands out having much reduced <i>Sphagnum</i> , prominent <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> with <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i> , <i>Polytrichum commune</i> and <i>Aulacomnium palustre</i> .
191	138686.8	931350	TR	F17	23/02/2011	Knoll/bank with undifferentiated H10/12 dry heath identified as potential borrow pit location. In the heath there is dominant <i>Calluna vulgaris</i> with sparse <i>Molinia caerulea</i> and the mosses <i>Hypnum jutlandicum</i> , <i>Hylocomium splendens</i> and <i>Racomitrium lanuginosum</i> .
192	138644.9	931313.7	TR	F18	23/02/2011	Borrow pit area here is wet heath (M15c) composed of <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Trichophorum cespitosum</i> , <i>Erica cinerea</i> , <i>Blechnum spicant</i> , <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> and <i>Cladonia portentosa</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i> , <i>Cladonia uncialis</i> , <i>Racomitrium lanuginosum</i> and patchy <i>Sphagnum capillifolium</i> and <i>Sphagnum cuspidatum</i> .
193	138566.1	931301.6	TR	F19	23/02/2011	Wetter blanket bog here is mainly M17a with a high cover of <i>Molinia caerulea</i> and <i>Calluna vulgaris</i> , <i>Trichophorum cespitosum</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Sphagnum papillosum</i> , <i>Cladonia portentosa</i> , <i>Sphagnum capillifolium</i> , <i>Racomitrium lanuginosum</i> .
194	136720	930943.2	TR	F22	23/02/2011	Outside original survey envelope close to turbine location is continuing uniform, intact blanket bog that is mainly M17b (<i>Racomitrium lanuginosum</i> , <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Cladonia portentosa</i>) with just a small amount of M17a here and there. There is also a little <i>Calluna vulgaris</i> -dominated dry heath (H10/12) along the sides of the burn and loch.
195	138182.7	931007.4	TR	0	23/02/2011	Potential laydown area to the east of the fenceline consists of modified/degraded blanket bog with much <i>Juncus effusus</i> , <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> and sparser <i>Calluna vulgaris</i> . <i>Sphagnum</i> is only patchy and occasional and there is much <i>Hylocomium splendens</i> and <i>Aulacomnium palustre</i> .
196	138339.1	930808.7	TR	F24	23/02/2011	This area is old peat cuttings with mixed wet heath (M15) and re-generating blanket bog (M17) on thinner peats.
197	135887.9	930981	TR	0	24/02/2011	Outside original survey envelope close to turbine location. Between here and the loch is uniform intact blanket bog - M17b:80% M17a:20% (M19)

	Longitude	Latitude	Surveyor	Field Note ref.	Date	Note
198	135330.6	930787.1	TR	F29	24/02/2011	Outside original survey envelope close to turbine location. Intact blanket bog - uniform M17b composed of <i>Racomitrium lanuginosum</i> , <i>Calluna vulgaris</i> , <i>Eriophorum angustifolium</i> , <i>Molinia caerulea</i> and <i>Trichophorum cespitosum</i> . M17a occupies approx. 10% here marked out by a high cover of <i>Sphagnum papillosum</i> with <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> and <i>Sphagnum capillifolium</i> . A few M1 wet hollows also occur.
199	135120.4	930633.5	TR	0	24/02/2011	Potential borrow pit area. Modified/drained/planted on lower slope. Higher dry H10/12 (<i>Calluna vulgaris</i> , <i>Hylocomium splendens</i> , <i>Polytrichum commune</i> , <i>Juncus squarrosus</i> , <i>Hypnum jutlandicum</i>) and wet heath M15 (<i>Trichophorum cespitosum</i> , <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Sphagnum capillifolium</i> , <i>Hylocomium splendens</i>).
200	135093.4	930621.3	TR	0	24/02/2011	Shieling
201	134788.1	931083.1	TR	0	24/02/2011	Poss. borrow pit viewed from distance only. Looks like wet/dry dwarf shrub heath.
202	138278.2	935670	TR	F26	24/02/2011	Large area of blanket bog here is very hagged with gullies well over 1m deep throughout most of it. (Potential for re-generation by blocking gullies ?)
203	138716.7	935485.9	TR	F27	24/02/2011	This area of shallow hummock/hollow blanket bog previously included in the high sensitivity category can be downgraded from red to white. The blanket bog is mainly M17b with approx. 5% M17a and a few wet M1 hollows.
204	134365	931365.8	TR		24/02/2011	Outside original survey envelope close to turbine location. The area is largely drained and drained/modified/planted for conifers. In between drained areas there is unmodified M17b blanket bog with more extensive bare peat (M3) than average for the site.

8 APPENDIX 2

NVC Quadrat Data

M1							
Quadrat No.	9	19	5	14	28		
Date	24/09/2010	29/09/2010	23/09/2010	25/09/2010	29/09/2010		
Eastings	137517	134872	139337	137660	135469		
Northings	933334	931175	935277	934110	931924		
Surveyor	KP	KP	TR	TR	TR		
Photograph number	K33	K51/52	T05	T14	T28		
Slope (degrees)	0	0	0	0	0		
Aspect (degrees)	N.A.	N.A.	N.A.	N.A.	N.A.		
Height (heath/herb/moss)	0/5/0	10/20/0	10/25/1	10/30/2	0/15/1		
% cover (heath/herb/moss)	0/3/95	<1/20/90	2/20/70	4/30/80	10/5/90		
Species:							
<i>Sphagnum cuspidatum</i>	10	8	7	8	9	V	(7-10)
<i>Eriophorum angustifolium</i>	3	4	3	3	3	V	(3-4)
<i>Sphagnum denticulatum</i>	3	5		4	3	IV	(3-5)
<i>Eriophorum vaginatum</i>		3	3	4	3	IV	(3-4)
<i>Calluna vulgaris</i>		2	3	4		III	(2-4)
<i>Erica tetralix</i>		2	3	3		III	(2-3)
<i>Sphagnum papillosum</i>		3	5			II	(3-5)
<i>Molinia caerulea</i>		3		4		II	(3-4)
<i>Trichophorum cespitosum</i>			4	3		II	(3-4)
<i>Drosera rotundifolia</i>				1	1	II	(1)
<i>Rhynchospora alba</i>		4				I	(4)
<i>Sphagnum capillifolium</i>			4			I	(4)
<i>Drosera intermedia</i>		3				I	(3)
<i>Menyanthes trifoliata</i>	3					I	(3)
<i>Narthecium ossifragum</i>		2				I	(2)
Water	10		8			II	(8-10)
bare peat			3			I	(3)
M3							
Quadrat No.	16	24	20	25	30		
Date	27/09/2010	29/09/2010	27/09/2010	29/09/2010	15/11/2010		
Eastings	138801	135661	137917	134419	138359		
Northings	932520	932271	931116	931450	929227		
Surveyor	KP	KP	TR	TR	TR		
Photograph number	K45	K64/65	T20	T25	T30		
Slope (degrees)	0	0	0	0	0		
Aspect (degrees)	N.A.	N.A.	N.A.	N.A.	N.A.		
Height (heath/herb/moss)	0/5/0	0/20/3	4/10/1	3/15/2	4/15/2		
% cover (heath/herb/moss)	0/5/0	0/12/8	1/50/2	1/30/1	1/5/2		

Species:							
<i>Eriophorum angustifolium</i>	3	5	3	5		IV	(3-5)
<i>Narthecium ossifragum</i>	3	3	2	2		IV	(2-3)
<i>Carex panicea</i>			4	4		II	(4)
<i>Trichophorum cespitosum</i>	3		6			II	(3-6)
<i>Sphagnum denticulatum</i>		4	2			II	(2-4)
<i>Carex viridula</i> Ssp. <i>oedocarpa</i>	3					I	(3)
<i>Sphagnum cuspidatum</i>			2			I	(2)
<i>Erica tetralix</i>			2			I	(2)
<i>Calluna vulgaris</i>			2			I	(2)
<i>Pleurozia purpurea</i>			2			I	(2)
<i>Campylopus introflexus</i>				2		I	(2)
Bare peat	9	9	7	9		IV	(7-9)
M4							
Quadrat No.	12						
Date	27/09/2010						
Eastings	138826						
Northings	933802						
Surveyor	KP						
Photograph number	K38						
Slope (degrees)	0						
Aspect (degrees)	N.A.						
Height (heath/herb/moss)	0/50/10						
% cover (heath/herb/moss)	0/70/95						
Species:							
<i>Carex rostrata</i>	8					I	(8)
<i>Sphagnum papillosum</i>	8					I	(8)
<i>Sphagnum palustre</i>	6					I	(6)
<i>Agrostis stolonifera</i>	4					I	(4)
<i>Sphagnum cuspidatum</i>	4					I	(4)
<i>Sphagnum fallax</i>	4					I	(4)
<i>Holcus lanatus</i>	3					I	(3)
<i>Menyanthes trifoliata</i>	3					I	(3)
<i>Eriophorum angustifolium</i>	3					I	(3)
<i>Deschampsia flexuosa</i>	3					I	(3)
<i>Polytrichum commune</i>	3					I	(3)
M6							
Sub-community	M6di	M6ci	M6ci	M6ci			
Quadrat No.	8	25	8	15			
Date	24/09/2010	29/09/2010	23/09/2010	25/09/2010			
Eastings	136138	135544	139224	137686			

Northings	932965	932395	934023	934038			
Surveyor	KP	KP	TR	TR			
Photograph number	K29	K66/67	T08	T15			
Slope (degrees)	0	2	0	0			
Aspect (degrees)	N.A.	200	N.A.	N.A.			
Height (heath/herb/moss)	0/80/25	30/70/15	0/80/4	0/80/6			
% cover (heath/herb/moss)	0/80/90	8/65/85	0/30/90	0/70/40			
Species:							
<i>Sphagnum fallax</i>	7	7	9	7		IV	(7-9)
<i>Sphagnum palustre</i>	8	6	4	4		IV	(4-8)
<i>Juncus effusus</i>	3	7	6	8		IV	(3-8)
<i>Molinia caerulea</i>	3	4	3	4		IV	(3-4)
<i>Polytrichum commune</i>		4	4	4		III	(4)
<i>Potentilla erecta</i>	3	3		3		III	(3)
<i>Agrostis stolonifera</i>	4	4				II	(4)
<i>Carex echinata</i>			3	3		II	(3)
<i>Eriophorum angustifolium</i>	3			3		II	(3)
<i>Carex nigra</i>		3		3		II	(3)
<i>Juncus acutiflorus</i>	9					I	(9)
<i>Calluna vulgaris</i>		4				I	(4)
<i>Sphagnum capillaris</i>		3				I	(3)
<i>Festuca vivipara</i>		3				I	(3)
<i>Trifolium repens</i>		3				I	(3)
<i>Viola palustris</i>	3					I	(3)
<i>Agrostis canina</i>			3			I	(3)
<i>Holcus lanatus</i>				3		I	(3)
<i>Epilobium montanum</i>			2			I	(2)
<i>Eriophorum vaginatum</i>			2			I	(2)
M15b							
Quadrat No.	3	6	12	21	16		
Date	23/09/2010	24/09/2010	24/09/2010	25/09/2010	27/09/2010		
Eastings	138431	136319	137293	137883	138238		
Northings	934530	933196	932890	931367	933387		
Surveyor	KP	KP	TR	TR	TR		
Photograph number	K20	K27	T12	T21	T16		
Slope (degrees)	10	5	5	10	0		
Aspect (degrees)	180	180	30	90	N.A.		
Height (heath/herb/moss)	25/20/5	25/30/5	25/30/4	15/30/4	5/30/2		
% cover (heath/herb/moss)	70/30/60	40/50/50	50/10/70	50/20/60	15/30/90		
Photographs							
Species:							
<i>Calluna vulgaris</i>	8	7	7	7	5	V	(5-8)
<i>Sphagnum capillifolium</i>	5	6	6	5	5	V	(5-6)
<i>Trichophorum cespitosum</i>	4	6	3	3	5	V	(3-6)
<i>Cladonia portentosa</i>	3	3	7		7	IV	(3-7)

<i>Pleurozium schreberi</i>	3	4	3	3		IV	(3-4)
<i>Potentilla erecta</i>	3	3	3		3	IV	(3)
<i>Erica tetralix</i>	3	3	3		3	IV	(3)
<i>Eriophorum angustifolium</i>	3		3	3	3	IV	(3)
<i>Hylocomium splendens</i>	5		5	7	2	IV	(2-7)
<i>Juncus squarrosus</i>	3		4	5		III	(3-5)
<i>Racomitrium lanuginosum</i>	3	3			4	III	(3-4)
<i>Molinia caerulea</i>		3	3		3	III	(3)
<i>Eriophorum vaginatum</i>		3	3		3	III	(3)
<i>Rhytidiadelphus loreus</i>	3	3		3		III	(3)
<i>Empetrum nigrum</i>			3	3	3	III	(3)
<i>Cladonia uncialis</i>		3	2			II	(2-3)
<i>Carex panicea</i>	3	2				II	(2-3)
<i>Erica cinerea</i>		2			1	II	(1-2)
<i>Hypnum jutlandicum</i>		4				I	(4)
<i>Narthecium ossifragum</i>					3	I	(3)
<i>Carex</i> sp.	3					I	(3)
<i>Carex echinata</i>		3				I	(3)
<i>Dicranum scoparium</i>		3				I	(3)
<i>Sphagnum tenellum</i>					3	I	(3)
<i>Sphagnum papillosum</i>			2			I	(2)
M15c							
Quadrat No.	2	11	13	21	13		
Date	23/09/2010	25/09/2010	27/09/2010	29/09/2010	25/09/2010		
Eastings	139358	137967	139231	136314	137415		
Northings	934820	935033	933638	931608	934542		
Surveyor	KP	KP	KP	KP	TR		
Photograph number	K16	K36	K39	K57/58	T13		
Slope (degrees)	20	5	10	2	10		
Aspect (degrees)	225	180	000	320	90		
Height (heath/herb/moss)	20/30/5	15/35/5	20/30/5	15/30/5	20/30/5		
% cover (heath/herb/moss)	50/20/65	25/30/90	40/40/80	10/20/85	40/40/50		
Species:							
<i>Calluna vulgaris</i>	7	6	6	4	6	V	(4-7)
<i>Trichophorum cespitosum</i>	4	4	6	6	5	V	(4-6)
<i>Cladonia portentosa</i>	4	6	6	4	5	V	(4-6)
<i>Racomitrium lanuginosum</i>	3	7	7	8	7	V	(3-8)
<i>Molinia caerulea</i>	4	4	4	3	3	V	(3-4)
<i>Potentilla erecta</i>	3	3	3	3	3	V	(3)
<i>Cladonia uncialis</i>	3	3	3	3	3	V	(3)
<i>Narthecium ossifragum</i>	3		3	2	3	IV	(2-3)
<i>Cladonia arbuscula</i>	6	4	3			III	(3-6)
<i>Carex panicea</i>	3	5		3		III	(3-5)
<i>Erica cinerea</i>	4	3	4			III	(3-4)
<i>Hylocomium splendens</i>			3	3	3	III	(3)
<i>Erica tetralix</i>	3			3	3	III	(3)

<i>Hypnum jutlandicum</i>	3	2	2			III	(2-3)
<i>Sphagnum capillifolium</i>			4	4		II	(4)
<i>Eriophorum angustifolium</i>	3		3			II	(3)
<i>Rhytidiadelphus squarrosus</i>	3		3			II	(3)
<i>Pleurozium schreberi</i>	3		3			II	(3)
<i>Succisa pratensis</i>		3	2			II	(2-3)
<i>Nardus stricta</i>	2			2		II	(2)
<i>Polygala serpyllifolia</i>	1	2				II	(1-2)
<i>Sphagnum subnitens</i>	4					I	(4)
<i>Juncus squarrosus</i>			3			I	(3)
<i>Rhytidiadelphus loreus</i>	3					I	(3)
<i>Eriophorum vaginatum</i>			3			I	(3)
<i>Sphagnum denticulatum</i>			3			I	(3)
<i>Pleurozia purpurea</i>			3			I	(3)
<i>Huperzia selago</i>				3		I	(3)
<i>Carex binervis</i>	2					I	(2)
<i>Diplohyllum albicans</i>					2	I	(2)
<i>Sphagnum cuspidatum</i>				1		I	(1)
Bare ground/rock	3	3		4		III	(3-4)
M17a							
Quadrat No.	1	10	7	9	23		
Date	23/09/2010	24/09/2010	23/09/2010	24/09/2010	28/09/2010		
Eastings	139378	137533	139075	136792	138357		
Northings	934591	933453	935213	933377	931669		
Surveyor	KP	KP	TR	TR	TR		
Photograph number	K14/15	K34/35	T07	T09	T23		
Slope (degrees)	0	0	0	0	0		
Aspect (degrees)	N.A.	N.A.	N.A.	N.A.	N.A.		
Height (heath/herb/moss)	15/30/5	20/40/3	15/30/3	10/25/4	20/30/4		
% cover(heath/herb/moss)	5/70/70	30/15/95	20/40/90	8/20/90	20/40/80		
Photographs							
Species:							
<i>Sphagnum papillosum</i>	4	8	7	7	8	V	(4-8)
<i>Calluna vulgaris</i>	4	6	5	4	5	V	(4-6)
<i>Sphagnum capillifolium</i>	3	5	6	5	5	V	(3-6)
<i>Eriophorum vaginatum</i>	3	4	5	3	4	V	(3-5)
<i>Trichophorum cespitosum</i>	3	4	5	5	5	V	(3-5)
<i>Molinia caerulea</i>	5	4	3	3	3	V	(3-5)
<i>Erica tetralix</i>	3	3	4	3	3	V	(3-4)
<i>Narthecium ossifragum</i>	5	3	2	3	3	V	(2-5)
<i>Eriophorum angustifolium</i>	5	3		3	3	IV	(3-5)
<i>Cladonia portentosa</i>		5	3	5	4	IV	(3-5)
<i>Sphagnum tenellum</i>		3	3	3	3	IV	(3)
<i>Potentilla erecta</i>	3	2	3		3	IV	(2-3)
<i>Cladonia uncialis</i>		3		3	3	III	(3)
<i>Drosera rotundifolia</i>	2	3		2		III	(2-3)

<i>Pleurozia purpurea</i>		3		4		II	(3-4)
<i>Sphagnum cuspidatum</i>	4	3				II	(3-4)
<i>Sphagnum palustre</i>	7					I	(7)
<i>Racomitrium lanuginosum</i>				4		I	(4)
<i>Pleurozium schreberi</i>		3				I	(3)
<i>Hypnum jutlandicum</i>		3				I	(3)
<i>Campylopus atrovirens</i>				3		I	(3)
<i>Empetrum nigrum</i>			2			I	(2)
<i>Polygala serpyllifolia</i>	2					I	(2)
M17b							
Quadrat No.	4	22	1	6	22		
Date	24/09/2010	29/09/2010	21/09/2010	22/09/2010	28/09/2010		
Eastings	136281	136520	136405	139204	136982		
Northings	933570	932148	935091	935781	931869		
Surveyor	KP	KP	TR	TR	TR		
Photograph number	K22/23	K59/60	T01	T06	T22		
Slope (degrees)	0	0	0	0	0		
Aspect (degrees)	N.A.	N.A.	N.A.	N.A.	N.A.		
Height (heath/herb/moss)	15/30/5	20/35/10	8/30/3	10/40/5	10/40/6		
% cover(heath/herb/moss)	50/25/75	30/15/90	10/40/70	30/20/95	40/20/80		
Species:							
<i>Calluna vulgaris</i>	7	6	8	6	6	V	(6-8)
<i>Cladonia portentosa</i>	4	7	5	7	9	V	(4-9)
<i>Racomitrium lanuginosum</i>	7	7	8	7	3	V	(3-8)
<i>Trichophorum cespitosum</i>	5	3	5	4	4	V	(3-5)
<i>Erica tetralix</i>	4	3	3	3	3	V	(3-4)
<i>Eriophorum angustifolium</i>	3	3	3	3	3	V	(3)
<i>Molinia caerulea</i>	4	4	4	4	2	V	(2-4)
<i>Eriophorum vaginatum</i>	3	4	4		3	IV	(3-4)
<i>Cladonia uncialis</i>	3	3	3	4		IV	(3-4)
<i>Erica cinerea</i>	3		3	3	2	IV	(2-3)
<i>Potentilla erecta</i>	2	3			3	III	(2-3)
<i>Carex panicea</i>	2	1				II	(1-2)
<i>Sphagnum capillifolium</i>				4		I	(4)
<i>Pleurozium schreberi</i>					4	I	(4)
<i>Sphagnum tenellum</i>	3					I	(3)
<i>Cladonia arbuscula</i>	3					I	(3)
<i>Pleurozia purpurea</i>	3					I	(3)
<i>Juncus squarrosus</i>					3	I	(3)
<i>Diplophyllum albicans</i>					3	I	(3)
M17mod							
Quadrat No.	17	23	11	19	29		
Date	27/09/2010	29/09/2010	24/09/2010	27/09/2010	29/09/2010		
Eastings	138832	136228	137132	138055	134763		
Northings	932906	932071	932876	932606	931608		

Surveyor	KP	KP	TR	TR	TR		
Photograph number	K47	K61/62/63	T11	T19	T29		
Slope (degrees)	5	2	0	0	0		
Aspect (degrees)	030	020	N.A.	N.A.	N.A.		
Height (heath/herb/moss)	50/50/10	35/45/10	30/40/8	40/50/4	30/40/4		
% cover(heath/herb/moss)	35/45/80	75/30/65	40/30/75	40/40/20	40/40/40		
Species:							
<i>Calluna vulgaris</i>	7	8	6	7	7	V	(6-8)
<i>Molinia caerulea</i>	7	6	6	6	6	V	(6-7)
<i>Erica tetralix</i>	3	3	3	3	3	V	(3)
<i>Potentilla erecta</i>	3	3	3	3	3	V	(3)
<i>Cladonia portentosa</i>	6	6		6	5	IV	(5-6)
<i>Hylocomium splendens</i>	5		8			II	(5-8)
<i>Pleurozium schreberi</i>	4		5			II	(4-5)
<i>Racomitrium lanuginosum</i>	3	4				II	(3-4)
<i>Racomitrium</i> sp.		3			4	II	(3-4)
<i>Empetrum nigrum</i>	3		3			II	(3)
<i>Cladonia uncialis</i>	3	3				II	(3)
<i>Eriophorum angustifolium</i>				2	4	II	(2-4)
<i>Eriophorum vaginatum</i>			2	2		II	(2)
<i>Sphagnum capillifolium</i>	6					I	(6)
<i>Hypnum jutlandicum</i>		3				I	(3)
<i>Sphagnum palustre</i>	3					I	(3)
<i>Trichophorum cespitosum</i>				2		I	(2)
<i>Erica cinerea</i>				2		I	(2)
Litter	5	7	5	6		IV	(5-7)
M19a							
Quadrat No.	7	15	18	2	3		
Date	24/09/2010	27/09/2010	28/09/2010	21/09/2010	22/09/2010		
Eastings	136169	139276	139019	136810	139926		
Northings	933006	932938	932046	935049	935215		
Surveyor	KP	KP	KP	TR	TR		
Photograph number	K28	K42/43	K49/50	T02	T03		
Slope (degrees)	0	0	10	5	10		
Aspect (degrees)	N.A.	N.A.	340	30	180		
Height (heath/herb/moss)	50/60/15	35/45/5	30/40/10	40/50/8	25/40/8		
% cover(heath/herb/moss)	70/40/90	85/30/65	60/30/85	30/30/60	25/50/60		
Species:							
<i>Calluna vulgaris</i>	8	9	8	6	6	V	(6-9)
<i>Hylocomium splendens</i>	7	7	5	8	7	V	(5-8)
<i>Eriophorum vaginatum</i>	7	6	5	6	7	V	(5-7)
<i>Sphagnum capillifolium</i>	4	4	7		5	IV	(4-7)
<i>Pleurozium schreberi</i>	7	5	4	4		IV	(4-7)
<i>Rhytidadelphus loreus</i>		3	3		5	III	(3-5)

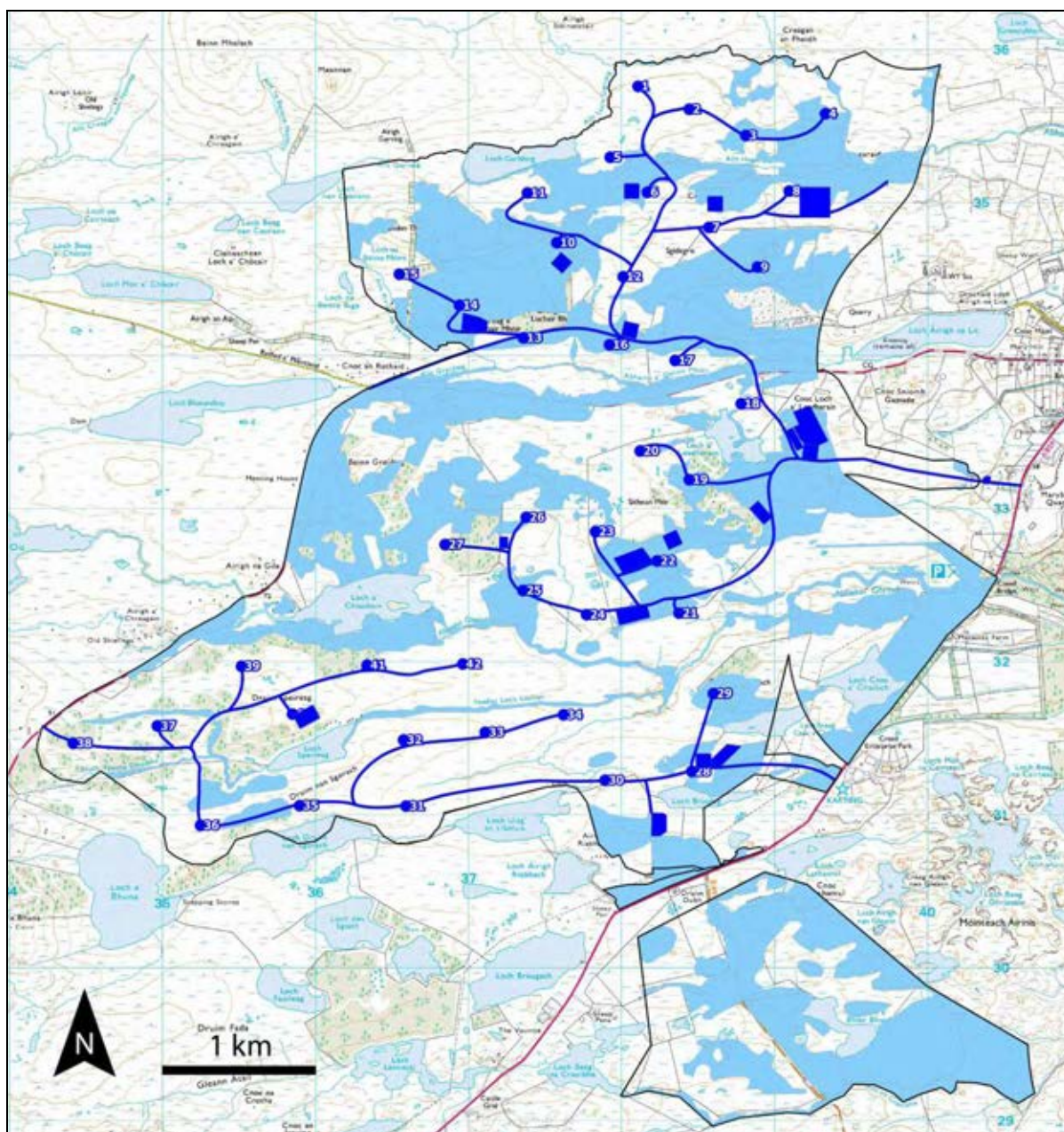
<i>Molinia caerulea</i>	4		3		3	III	(3-4)
<i>Cladonia portentosa</i>	2		3		3	III	(2-3)
<i>Trichophorum cespitosum</i>			3		4	II	(3-4)
<i>Eriophorum angustifolium</i>	3	3				II	(3)
<i>Erica tetralix</i>	3		3			II	(3)
<i>Potentilla erecta</i>	3				3	II	(3)
<i>Hypnum jutlandicum</i>			3			I	(3)
<i>Dicranum scoparium</i>		3				I	(3)
<i>Aulacomnium palustre</i>		3				I	(3)
<i>Plagiothecium undulatum</i>		3				I	(3)
<i>Carex echinata</i>					3	I	(3)
<i>Sphagnum papillosum</i>					3	I	(3)
M25a							
Quadrat No.	20	10	18	26	27		
Date	29/09/2010	24/09/2010	27/09/2010	29/09/2010	29/09/2010		
Eastings	135324	136671	137636	135792	135749		
Northings	931201	933002	933150	931433	932102		
Surveyor	KP	TR	TR	TR	TR		
Photograph number	K55/56	T10	T18	T26	T27		
Slope (degrees)	0	0	0	0	0		
Aspect (degrees)	N.A.	N.A.	N.A.	N.A.	N.A.		
Height (heath/herb/moss)	15/50/10	40/50/6	0/40/4	30/50/3	50/50/5		
% cover(heath/herb/moss)	5/90/30	5/98/40	0/98/40	2/95/1	2/100/20		
Species:							
<i>Molinia caerulea</i>	9	10	10	10	10	V	(9-10)
<i>Potentilla erecta</i>	4	3	3	3	3	V	(3-4)
<i>Calluna vulgaris</i>	3	4		3	2	IV	(2-4)
<i>Hylocomium splendens</i>		7	8		5	III	(5-8)
<i>Eriophorum vaginatum</i>	3				3	II	(3)
<i>Pleurozium schreberi</i>	3	3				II	(3)
<i>Erica tetralix</i>	3		3			II	(3)
<i>Sphagnum capillifolium</i>	5					I	(5)
<i>Empetrum nigrum</i>	4					I	(4)
<i>Rhytidiadelphus loreus</i>	3					I	(3)
litter	8	6	6	9		IV	(6-9)
H10/H12							
Quadrat No.	4	17	5	14	31		
Date	22/09/2010	27/09/2010	24/09/2010	27/09/2010	15/11/2010		
Eastings	139485	138243	136182	139065	139311		
Northings	935532	933382	933240	933572	930115		
Surveyor	TR	TR	KP	KP	TR		
Photograph number	T04	T17	K25	K40	T31		
Slope (degrees)	10	20	10	10	30		

Aspect (degrees)	270	180	250	180	180		
Height (heath/herb/moss)	30/60/3	40/50/3	30/30/5	30/25/5	15/4/2		
% cover (heath/herb/moss)	95/1/80	80/1/70	90/1/75	85/5/75	90/1/20		
Species:							
<i>Calluna vulgaris</i>	9	9	9	9	8	V	(9)
<i>Hylocomium splendens</i>	8	9	7	8		IV	(7-9)
<i>Pleurozium schreberi</i>	3	4	4	3		IV	(3-4)
<i>Rhytidiadelphus loreus</i>	3		3	3		III	(3)
<i>Potentilla erecta</i>	3		3	3	3	IV	(3)
<i>Carex binervis</i>	1		2	3		III	(1-3)
<i>Hypnum jutlandicum</i>			7	5		II	(5-7)
<i>Vaccinium myrtillus</i>		3				I	(3)
<i>Nardus stricta</i>				3		I	(3)
<i>Frullania dilatata</i>	3					I	(3)
<i>Deschampsia flexuosa</i>		3				I	(3)
<i>Eriophorum angustifolium</i>				3		I	(3)
<i>Rhytidiadelphus squarrosus</i>			3			I	(3)
<i>Agrostis stolonifera</i>				3		I	(3)
<i>Erica cinerea</i>			3		4	II	(3)
<i>Racomitrium lanuginosum</i>				3	3	II	(3)
<i>Scapania gracilis</i>	2					I	(2)
<i>Rhytidiadelphus triquetrus</i>		2				I	(2)
<i>Dicranum scoparium</i>			2			I	(2)
<i>Carex panicea</i>				2		I	(2)
<i>Polytrichum</i> sp.			2			I	(2)
<i>Molinia caerulea</i>				2		I	(2)
<i>Danthonia decumbens</i>				2		I	(2)
<i>Agrostis capillaris</i>			1			I	(1)
<i>Luzula</i> sp.				1		I	(1)
<i>Cladonia portentosa</i>					3		
rock/peat					5		

9 APPENDIX 3

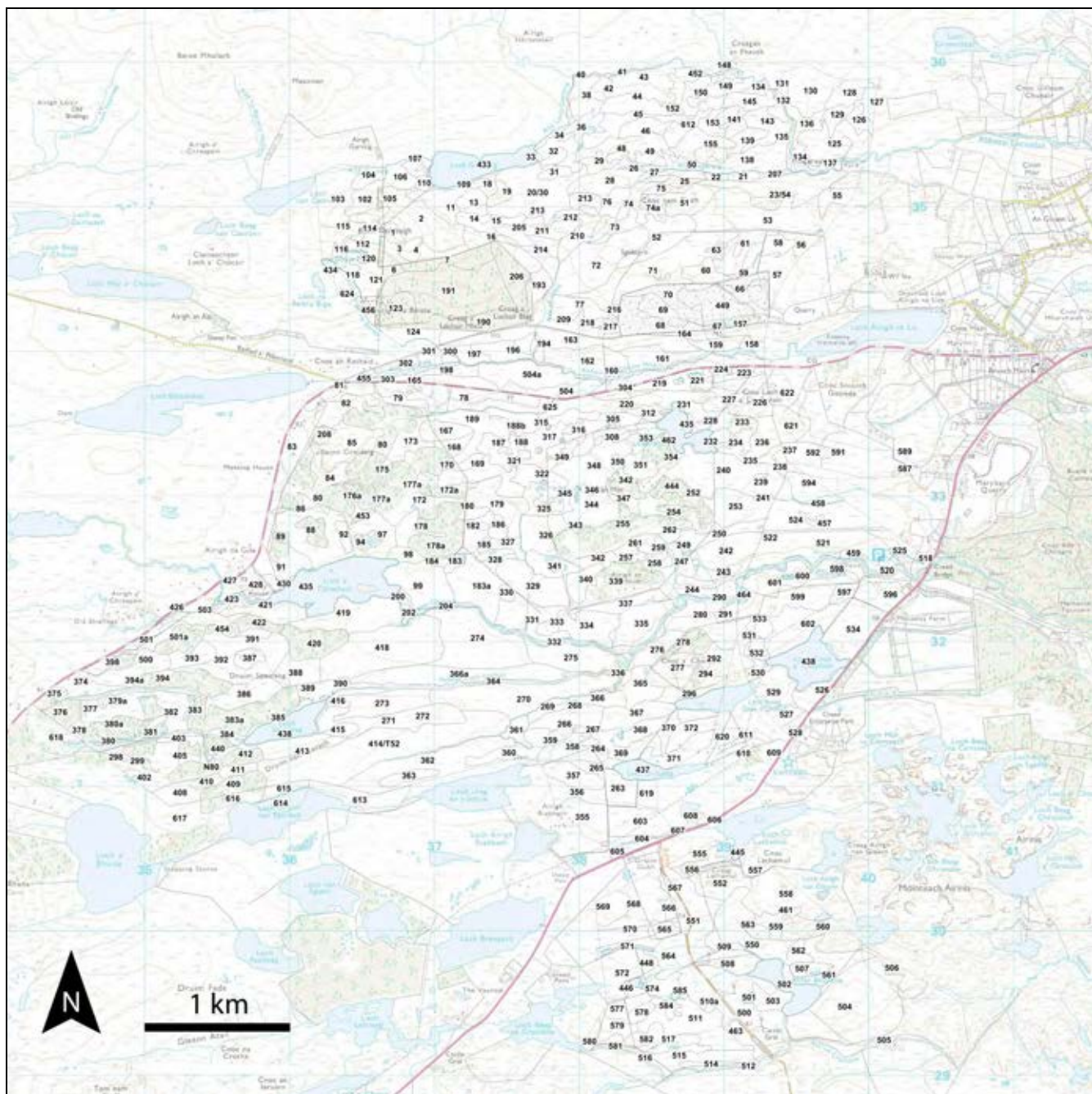
Other distribution maps:

- Figure 1: Groundwater Dependent Terrestrial Ecosystems (GWDTE) - showing surveyed polygons in which GWDTE NVC communities with wind farm infrastructure overlaid.
- Figure 2: GIS polygons of habitats, numbered for ground truthing in the field.



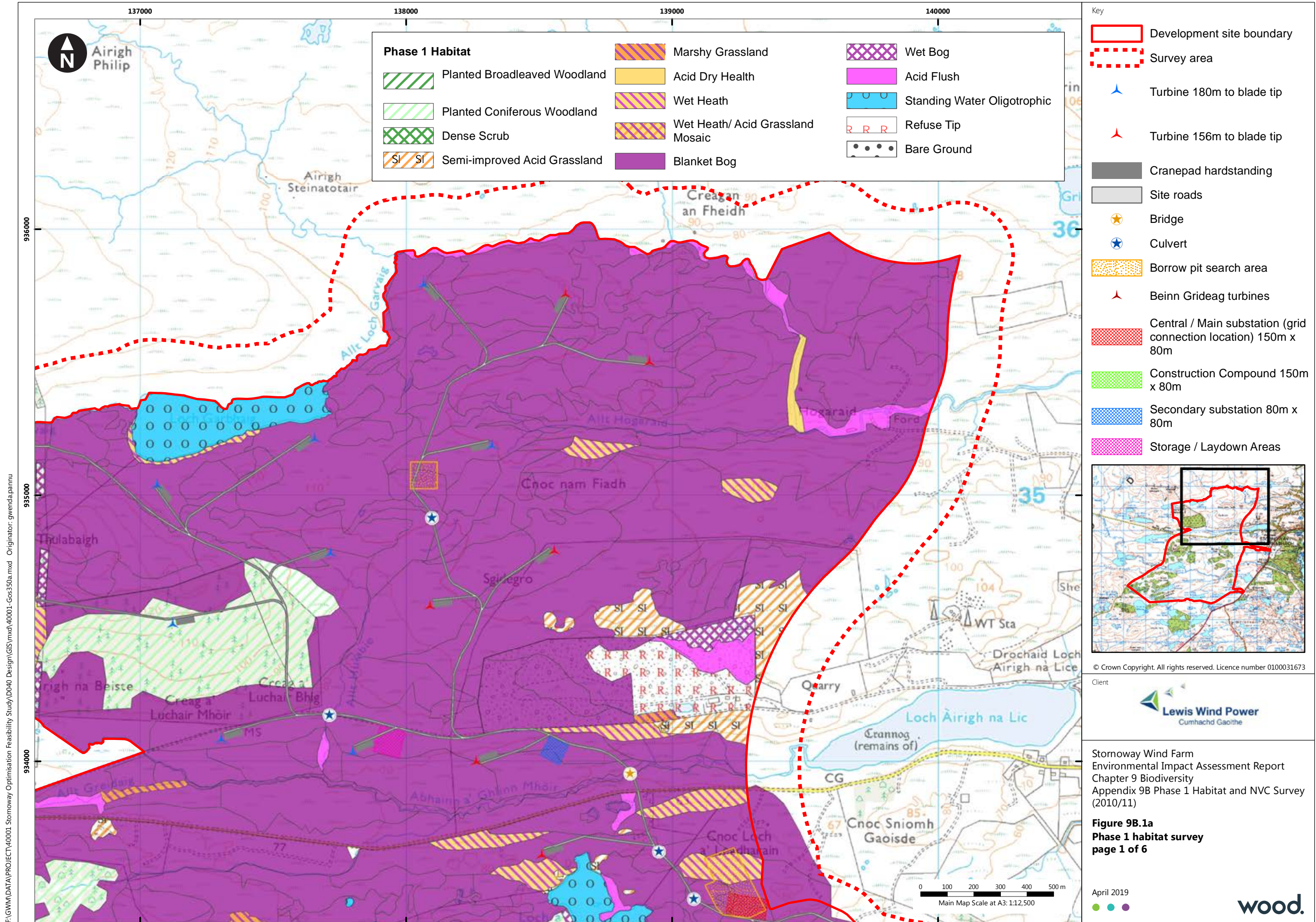
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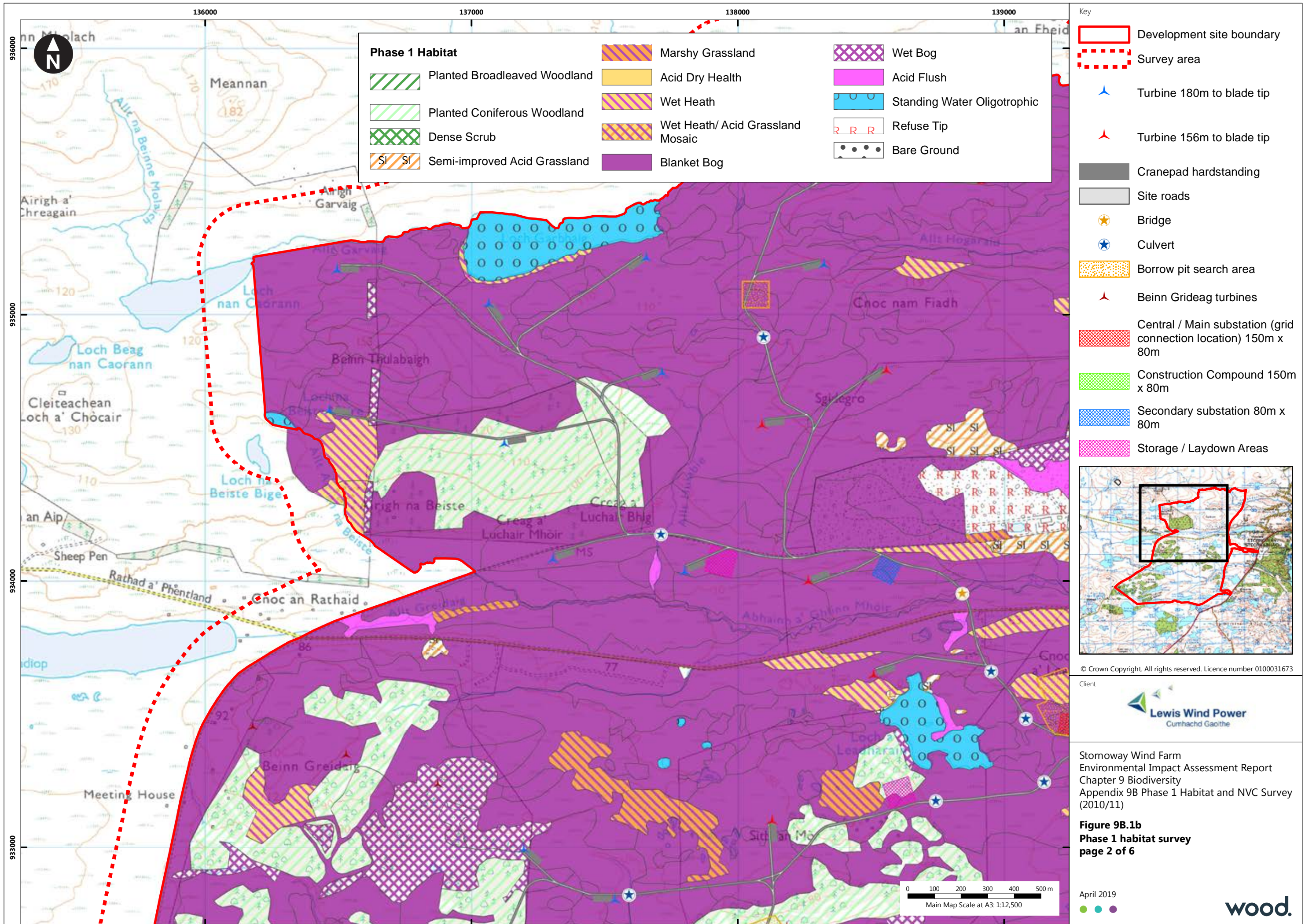
Figure 1: Groundwater Dependent Terrestrial Ecosystems (GWDTE) – the surveyed NVC polygons shown contain GWDTE NVC communities. Wind farm infrastructure overlaid

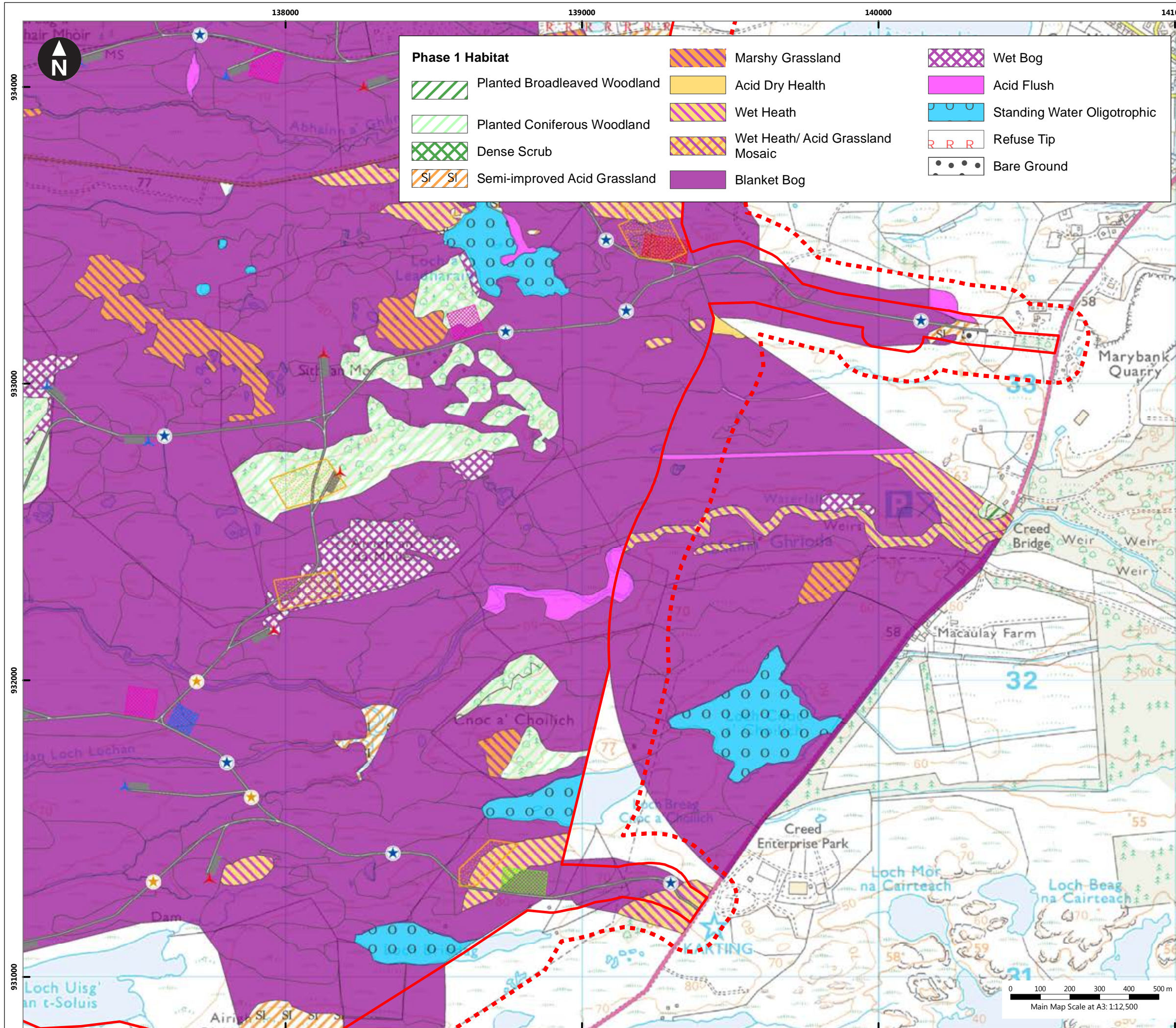


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Figure 2: GIS habitat data polygon number maps







Phase 1 Habitat

- Planted Broadleaved Woodland
- Planted Coniferous Woodland
- Dense Scrub
- Semi-improved Acid Grassland

- Marshy Grassland
- Acid Dry Heath
- Wet Heath
- Wet Heath/ Acid Grassland Mosaic
- Blanket Bog

- Wet Bog
- Acid Flush
- Standing Water Oligotrophic
- Refuse Tip
- Bare Ground

Key

- Development site boundary
- Survey area
- Turbine 180m to blade tip
- Turbine 156m to blade tip
- Cranepad hardstanding
- Site roads
- Bridge
- Culvert
- Borrow pit search area
- Beinn Grideag turbines
- Central / Main substation (grid connection location) 150m x 80m
- Construction Compound 150m x 80m
- Secondary substation 80m x 80m
- Storage / Laydown Areas

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Client

Stormoway Wind Farm
Environmental Impact Assessment Report
Chapter 9 Biodiversity
Appendix 9B Phase 1 Habitat and NVC Survey (2010/11)

Figure 9B.1c
Phase 1 habitat survey
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April 2019

