

AGENDA ITEM 6

APPENDIX 15

2018/0151/DET

NATIONAL VEGETATION CLASSIFICATION HABITAT SURVEY

National Vegetation Classification Habitat Survey

For Mineral Extraction and Extension to Consented Quarrying

Operations at Dalwhinnie Quarry

Dalwhinnie

Highland

June 2018

Prepared for Johnstone Poole & Bloomer Ltd.

On behalf of Leiths (Scotland) Ltd.

By

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1. Introduction

Acorna Ecology Ltd. was commissioned in March 2018 to carry out a National Vegetation Classification Survey (NVC) for a proposed extension to the extant quarrying operation at Dalwhinnie Quarry (NN 63717 86253). This report contains the findings. At the time of reporting in June 2018 Dalwhinnie Quarry is inactive and flooded. The Quarry lies immediately to the east of the A889 road less than 1km due north of Dalwhinnie.

2. Scope of Assessment and Survey

The work was completed on 16th June 2018 by Dr P. Baker a full member of the Chartered Institute of Ecology and Environmental Management (MCIIEEM), assisted by T. Holliday and J. Kennedy, field assistants for Acorna Ecology Ltd. This report contains the findings of the NVC Survey completed to provide a description of the semi-natural vegetation types within the Application Site and does not include the habitats present on the extant quarry bund or within the extant quarry floor. This NVC survey report should be read in conjunction with the Preliminary Ecological Appraisal report for the Application Site (EnviroCentre Limited, August 2017).

3. Survey Methods

3.1. Phase I habitats 2017

The Phase I Habitat walkover survey by EnviroCentre in August 2017 followed the standard methodology and definitions used to map and describe habitats within the study area as per the Joint Nature Conservancy Committee guidelines (JNCC, 2010). That survey identified the presence of seven Phase I habitat types within the Application Site boundary, of which Dry heath/acid grassland was noted as being 100% of the land coverage within the Application Site outwith the extant quarry site.

Habitats present in Application Site:

- D5 Dry heath/acid grassland mosaic;
- G1 Standing water;
- I2.1 Quarry;
- J1.3 Ephemeral/short perennial;
- J2.4 Fence;
- J3.6 Building; and
- J4 Bare ground

3.2. National Vegetation Classification 2018

The NVC provides a detailed classification and description of the plant communities of Britain, and is the standard method by which the character and value of plant communities are assessed. The results of the NVC survey are presented in a written report detailing the descriptions of the vegetation types recorded and their relative importance, supported with a detailed plant community map to identify areas of key plant interest so that they can be avoided and protected if possible, and/or subject to translocation as part of development planning.

The NVC is comprised of 12 major habitat types subdivided into 286 plant communities, and further subdivided into 578 sub-communities with comprehensive descriptions given in a five volume series of books entitled *British Plant Communities*. Volume 2 (Mires & Heaths, 1991) and Volume 3 (Grassland and Montane Communities, 1992) were relevant to the Application Site.

NVC is less comprehensive than Phase I because it does not cover habitats that lack vascular plant growth such as many aquatic habitats, rock, and other bare habitats. It is also recognised that some grassland community types are not covered and remain to be fully described and incorporated into NVC (Rodwell et al. 2000).

Land within the Application Site but outwith the limits of the extant quarry was surveyed in June 2017 to assess which NVC communities were present. The Application Site was surveyed to identify the range of different semi-natural vegetation communities within the proposed extension area, with the dominant and most frequent associate species being noted in each main vegetation community.

The vegetation in nineteen 4m² quadrats (Figure 2., and Appendix 2, Table 2.1) within and beyond the Application Site were assessed by plant species to determine NVC community present. This size of quadrat is suitable for assessing heath vegetation. Cover abundance was estimated on the DOMIN Scale (Appendix 2, Table 2.2.). In addition, the vegetation communities at a number of random grid reference points were ascribed to NVC community based on the characteristics of the community present.

3.3. Limitations

Weather conditions and time of year were acceptable for the survey but there had been some habitat “damage” by grazing cattle and sheep, with extensive damage to the habitat structure in some areas due to rotational muirburn. This land is rough grazing annually for livestock and muirburn is also a regular management practice, so neither are considered significant limitations to our survey findings.

4. National Vegetation Classification Findings

4.1. Description of Vegetation Communities

The Application Site consisted of an area of upland moor commercially managed for Red Grouse as a sporting interest, with appropriate and well-managed rotational muirburn evident. The dominant land cover was comprised of heather, deer grass and bog cotton. Heather and bog cotton being key target species encouraged by management with muirburn. Heather stands varied from recently burned areas with sparse short heather shoots to stands of degenerate heather in excess of 10 years old, where over-mature plants had started to collapse, however, the majority of heather stands showed characteristics of moderately young – semi-mature heather (dense heather 20 – 40 cm tall). Muirburn does greatly influence the species present and so the following NVC communities identified are not considered natural, some lack key species due to the muirburn, and the overall most abundant habitat present cannot clearly be typified to an exact match in any NVC community as it was dominated by young heather with deer grass as almost equal cover and little else present. Note: Habitat damage by recent Site Investigations revealed that the peat depth in much of the Application Site was no more than 15 – 20cm deep with a loose grainy mineral layer immediately below.

4.2. Assessment of Vegetation Communities

Domin scores for each species within each quadrat (Appendix 2., Table 2.3.) allowed identification of NVC community for most quadrats. The habitat communities present were relatively simple but some could be not be accurately ascribed to any particular NVC communities readily due to the habitat modifying influence of the muirburn: Burning destroys above ground vegetation, fertilises, and increase light penetration (Rawes and Hobbs 1979) and can result in Hare’s-tail Cottongrass becoming dominant for perhaps more than 20 years. Ten-year cycles of muirburn are more botanically beneficial than twenty-year cycles. Note: use of the Modular Analysis of Vegetation Information System (MAVIS) was not completed as the software is basic and requires groups of at least five quadrats for each stand type, which was not possible given numbers of types of

community stand, so data was taken for representative quadrats for each different type of stand present in the survey area, and other examples of such target noted as work progressed across the area. Note: heather was constant in all quadrats, with cross-leaved heath present in almost half, while bell heather was only present in 25% of quadrats.

NVC habitats present included:

- M15 *Trichophorum cespitosus* – *Erica tetralix* wet heath – this is the typical type of wet heath found in north-central Scotland, typified by a mix of the dominants deer grass, cross-leaved heath, abundant heather, and some purple moor-grass (sparse). At the Application Site the muirburn has modified this habitat and allowed heather to be a co-dominant with deer grass over larger areas toward the peak of the hill and running north and eastwards.
- M20 *Eriophorum vaginatum* blanket mire – small areas dominated by dense Hare’s-tail Cottongrass to the exclusion of many other species, possibly as a result of past muirburn and it out-competing other regenerating species.
- M20 *Eriophorum vaginatum* blanket mire *Calluna vulgaris* – *Cladonia* spp/ sub-community – drier patches with a shared dominance of Heather and Hare’s-tail Cottongrass, with varying abundances of *Cladonia* lichens. M20 is typical of long-term management regimes involving muirburn and long- continued grazing. Heather can gradually become an important component of this habitat due to rotational muirburn, which further encourages this species.
- M23a *Juncus effusus/ acutiflorus-Galium palustre* rush-pasture, *Juncus effusus* sub-community
- H9 *Calluna vulgaris-Deschampsia flexuosa* heath
- H21 *Calluna vulgaris-Vaccinium myrtillus* – *Sphagnum capillifolium* heath – a dry heath habitat typical of areas managed with muirburn, although blaeberry was perhaps more scattered and less common so was not a key species, while in some stands the remaining two species were co-dominant or shared dominance.
- U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland – acid grassland typical of marginal upland areas.
- M23a *Juncus effusus/ acutiflorus-Galium palustre* rush-pasture, *Juncus effusus* sub-community rush pasture – a small area just north of the extant quarry by the roadside edge of the Application Site where the ground has been disturbed by stock and has revegetated with a mix of acid-loving species such as Tormentil and heather as well as dominant species such as soft rush and sheep’s fescue. Not a pristine example of the key UK habitat of interest.

Other communities present could not be clearly assigned to an NVC community (this is a known limitation of NVC survey), however, the closest affinity for two related communities was to M19, a typical blanket mire community of high altitude ombrotrophic mire that has been modified by rotational burning as part of grouse moor management although it tends to be found on peat >2m deep, so does not fit with the soil profiles known from the Application Site. Given the impacts of muirburn at the Application Site this is the nearest match.

- M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire. Note: It is common to find some degree of oxidation of the ground surface peats and natural drying out where slope or shallow peat depth allow the surface peats to drain freely such as is the case at the Application Site where the thin peat and open loose

mineral layer allow relatively free drainage, with the community being maintained by water input solely from rainfall.

- M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire Erica tetralix sub community - the Application Site has smaller areas dominated by bog cotton in low-lying depressions, with tussocky ground between having heather and bell heather present despite M19 being a community on sites with peat generally deeper than 0.5m. This may suggest the high rainfall and muirburn here has allowed the development of a similar community to M19.
- H16 *Calluna vulgaris* – *Arctostaphylos uva-ursi* heath – bearberry distribution was patchy probably due to muirburn but this habitat is considered as a probable minor component of the mosaic arising from muirburn

4.3. Groundwater Dependent Terrestrial Ecosystems (GWDTE)

The Scottish Environment Protection Agency (SEPA) has classified a number of NVC communities as candidates for being dependent on groundwater (Groundwater Dependent Terrestrial Ecosystems or GWDTE), although some of these communities will only be classed as GWDTE in specific hydrological conditions (i.e. being fed by groundwater such as flushes, or lying in low ground and being fed by seepage. GWDTE are specifically protected under the Water Framework Directive and are sensitive receptors to the pressures that are potentially caused by development. The guidance 'SNIFFER (2009) WFD95 – A Functional Wetland Typology for Scotland' was used as a resource guide to wetland types, which were looked for both within and adjacent to the Application Site boundary, within 250m of the proposed extension to quarrying as a minimum. Map work was also completed to look for evidence of any groundwater sources that could influence the communities within the Application Site. This NVC report confirms the presence of wet heath identified by SEPA and SNH as wetland habitat type 7 (SNIFFER 2009), with the presence of peat soils, heather, bog cottons, sphagna, and small sedges all indicators of wet heath and present within the Application Site. However, despite this community being present we do not consider it a GWDTE in the setting of the Application Site:

The Application Site is on a moderately high but gently sloping hill with no water input other than from rainfall. There are no springs or other groundwater sources to allow the wet heath to be considered a GWDTE, so it is therefore not a GWDTE in this particular setting. The extremely thin peat underlying the communities and partially oxidised dry surface of areas within the Application Site show an ecosystem highly influenced by daily and seasonal rainfall – very dry and impoverished at the time of our survey after a prolonged dry early summer. Note: the Application Site sits at 402 – 390m asl, with the nearest watercourses at 374m asl. Quarry extension therefore is not considered to have any potential for impacts on any GWDTE.

5. Impacts of Proposed Development

Potential impacts of the proposed extension to quarrying will include:

- i. Soil and vegetation stripping within the Application Site boundary resulting in permanent or long-term loss of the heathland and acid grassland habitats currently present;
- ii. Potential for dust impacts on vegetation adjacent to the quarry;
- iii. Constraints for site restoration (peat resource too minute to store for restoration purposes long-term); and
- iv. Potential for some restoration to acid grassland in lieu of wet heath.

6. Conclusions and Recommendations

Although the proposed extension to quarrying will have significant impacts on the heath communities within the Application Site, we recommend the following measures be put in place to minimise the potential for any negative ecological impacts to those habitats surrounding the Application Site:

- i. No uncontrolled vehicle tracking outwith the development footprint or immediate surrounds;
- ii. The contractor should have a pollution prevention plan in place, appropriate spill kits on site for all vehicles, and should preferably refuel off-site, or refuel in a securely bunded area. Refuelling should only take place in a securely bunded area within the proposed works area, with spill kit on site. No chemicals or fuels should be stored outside of this bund. An emergency plan must also be in place to deal promptly with any potential incident. Refuelling will take place adjacent to the fuel store in a secure area within an impermeable bund to prevent contamination of groundwater. Mobile fuel and lubricant servicing units will be provided with appropriate quality delivery hoses with trigger-type nozzles, and be kept in the secure area. Oil powered pumps, generators etc. will be kept on impermeable drip trays surrounded by earth or sand bunds.
- iii. Any fuel storage required on site will be located in a secure area within an impermeable bund to prevent contamination of groundwater, or re-fuelling will take place off-site. Any fuel storage tanks on site will be located on an impermeable base and be surrounded by an impermeable bund with no surface water outlet. The bund will be capable of retaining at least 110% of the volume of the tanks. Valves and couplings connected to oil storage tanks will be located within the bund and delivery hoses will be fitted with trigger-type handles suspended back within the bund after use. Valves and trigger filler handles will be kept padlocked when not in use. Reasonable security measures will be in place to prevent vandalism.
- iv. Transportation of fuel and oil across the site in drums or other containers will be avoided as much as possible. Extreme caution will be taken to avoid spillages or leaks, with stocks of oil absorbent and containment materials retained on site. All contractors handling such containers will be trained to be familiar with the use of these materials and related emergency spillage containment procedures;
- v. Dust impacts on vegetation adjacent to the Application Site – if works take place in prolonged dry weather then some dust control may be required using water bowsers to dampen the works area down; and
- vi. Suspended solids and other silt run-off into lower ground to the north of the site will be prevented by forward planning of storage of soils and bund placement.

7. References/relevant reading

Cooper, E.A. 1998. Summary descriptions of National Vegetation Classification grassland and montane communities, 92 pages A4 softback, ISBN 1 86107 443 3

Fitter, R., Fitter, A., & Farrer, A. 1987. Collins guide to the grasses, sedges, rushes and ferns of Britain and Northern Europe. Collins. (publ.).

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Rawes, M. & Hobbs, R.J. 1979. Management of semi-natural blanket bog in the northern Pennines. *J. Ecology* 67: 789 - 807

Rose, F. 1981. *The wild flower key*. Warne, London.

SNIFFER 2009. WFD95: A Functional Wetland Typology for Scotland – Field Survey Manual. Version 1. SNIFFER Greenside Place Edinburgh.

Stace, C. 1997. *New flora of the British Isles*. 2nd ed. Cambridge University Press, Cambridge.

Figure 1. Application Site boundary and location of NVC quadrats and target note locations

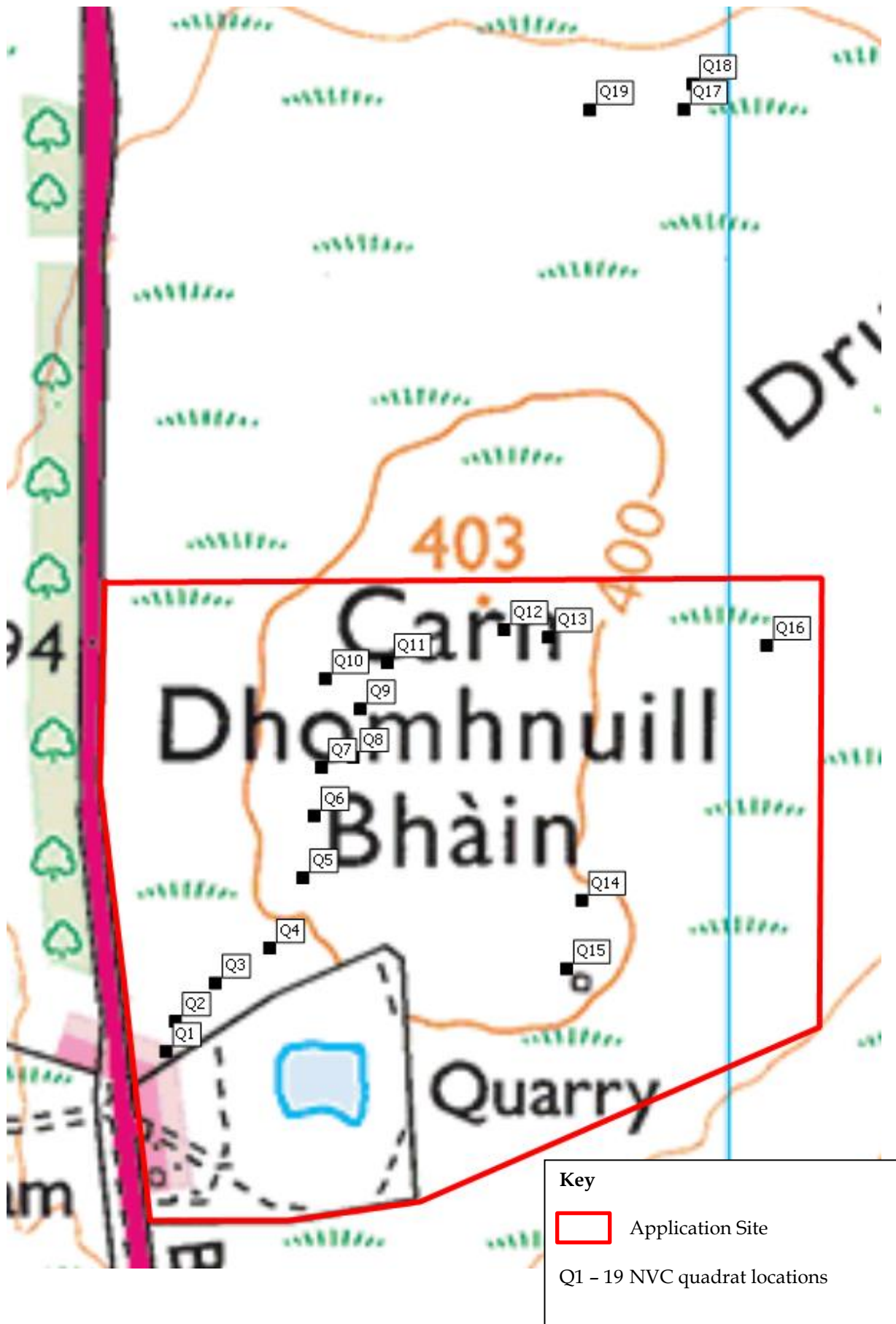
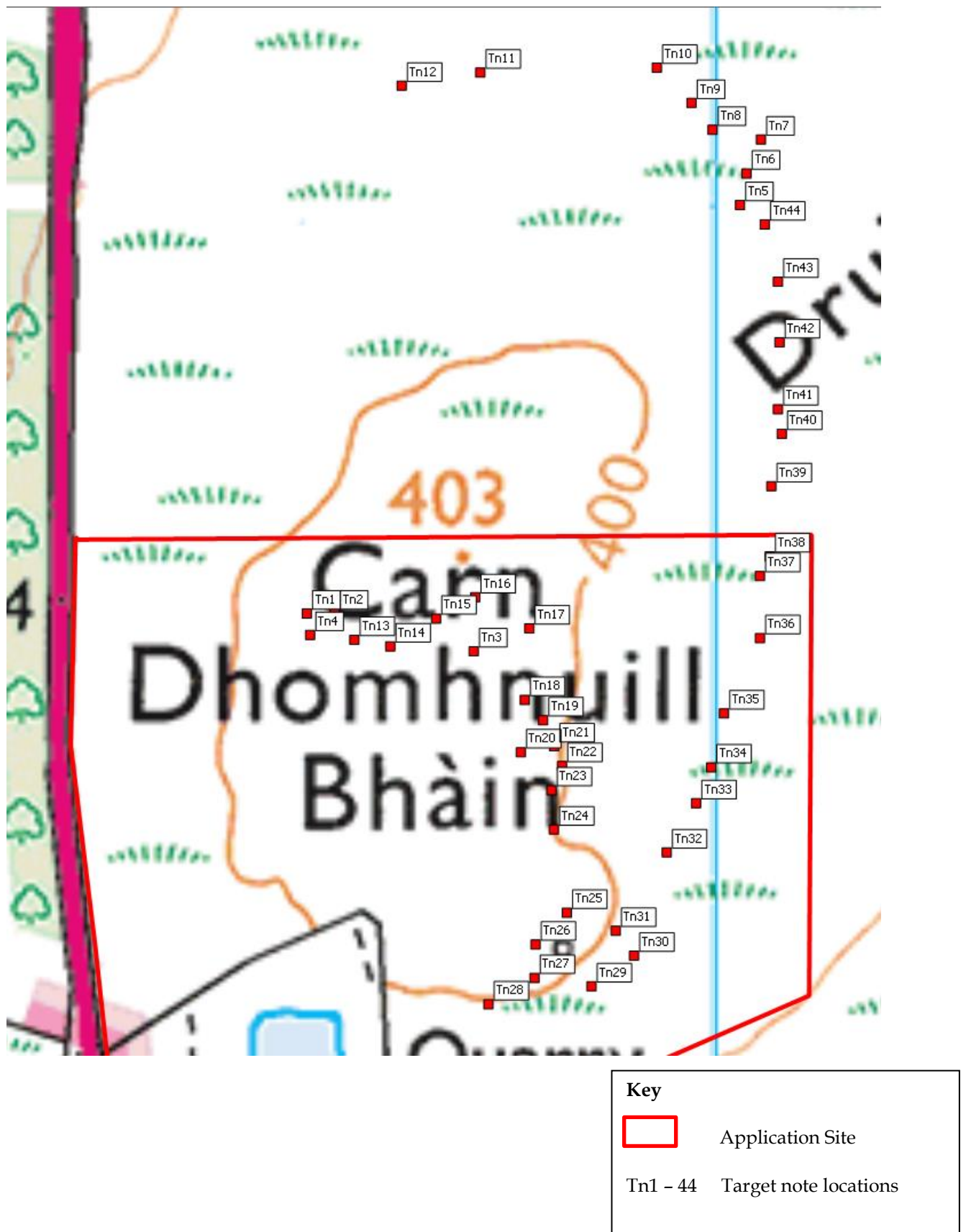


Figure 2. Application Site boundary and target note locations



Appendix 1. 2. Photographs of Quadrats

Quadrat 1. Soft rush and weakly acidic grassland



Quadrat 2. Muirburn area with low levels of regeneration



Quadrat 3. Area dominated by Deer grass and *S. capillifolium*



Quadrat 4. Heather dominant (short)



Quadrat 5. Heather and grasses over Reindeer lichens, with some bearberry



Quadrat 6. Area dominated by bog cotton with some heather



Quadrat 7. Area with mix of heather, bog cotton and sphagna



Quadrat 8. Area with equal heather and bog moss



Quadrat 9. Area dominated by deer grass with some heathers



Quadrat 10. Dry area with sparse heathers, cowberry, and bearberry



Quadrat 11. Bog pool area with no standing water. Dominated by bog cotton and sphagna with some heathers and bearberry



Quadrat 12. Very dry with short heathers



Quadrat 13. Recent muirburn



Quadrat 14. Deep heather dominant



Quadrat 15. Acid grassland mound



Quadrat 16. Very dry ground with moderate regrowth of dense heather



Quadrat 17. Heather & bog myrtle dominated area outwith Application Site (north of)



Quadrat 18. Bog myrtle, deer grass, and bog cotton dominated area outwith Application Site (north of)



Quadrat 19 Bog cotton dominated area outwith Application Site (north of), with some bog asphodel and heather



Appendix 2. NVC survey findings

Table 2.1. Assessment of quadrats: vegetation community by quadrat and target note

Quadrat #	Quadrat grid reference	National Vegetation Community
1	NN 63647 86285	M23a <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush-pasture, <i>Juncus effusus</i> sub-community
2	NN 63653 86304	H9 <i>Calluna vulgaris</i> - <i>Deschampsia flexuosa</i> heath
3	NN 63678 86328	M15 <i>Trichophorum cespitosus</i> – <i>Erica tetralix</i> wet heath
4	NN 63712 86350	M20 <i>Eriophorum vaginatum</i> blanket mire <i>Calluna vulgaris</i> – <i>Cladonia</i> spp/ sub-community
5	NN 63733 86394	M20 <i>Eriophorum vaginatum</i> blanket mire <i>Calluna vulgaris</i> – <i>Cladonia</i> spp/ sub-community
6	NN 63740 86433	M20 <i>Eriophorum vaginatum</i> blanket mire
7	NN 63753 86458	H21 <i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath
8	NN 63760 86471	H21 <i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath
9	NN 63769 86500	M15 <i>Trichophorum cespitosus</i> – <i>Erica tetralix</i> wet heath
10	NN 63747 86519	M20 <i>Eriophorum vaginatum</i> blanket mire <i>Calluna vulgaris</i> – <i>Cladonia</i> spp/ sub-community
11	NN 63786 86529	M20 <i>Eriophorum vaginatum</i> blanket mire <i>Calluna vulgaris</i> – <i>Cladonia</i> spp/ sub-community
12	NN 63864 86545	H9 <i>Calluna vulgaris</i> - <i>Deschampsia flexuosa</i> heath
13	NN 63887 86545	H21 <i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath
14	NN 63908 86380	H21 <i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath
15	NN 63904 86332	U4 <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland
16	NN 64024 86540	M20 <i>Eriophorum vaginatum</i> blanket mire <i>Calluna vulgaris</i> – <i>Cladonia</i> spp/ sub-community
17	NN 63973 86881	H21 <i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath
18	NN 63979 86887	H21 <i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath
19	NN 63913 86876	M20 <i>Eriophorum vaginatum</i> blanket mire
Tn1	NN 63750 86534	Same community as Q9
Tn2	NN 63767 86534	Same community as Q8
Tn3		N & W end of hill mosaic same community as Q8 and Q9
Tn4	NN 63752 86521	402m peak same community as Q9
Tn5	NN 64023 86795	Recovering from burn, short patchy veg
Tn6	NN 64021 86802	Bog pool
Tn7	NN 64024 86815	Bog pool x 2
Tn8	NN 63998 86830	Same community as Q14
Tn9	NN 63989 86841	Same community as Q9
Tn10	NN 63964 86868	Same community as Q7
Tn11	NN 63856 86865	Same community as Q18
Tn12	NN 63808 86857	Old Heather, HTCG, <i>Cladonia</i>
Tn13	NN 63779 86518	Same community as Q11
Tn14	NN 63801 86514	Same community as Q9

Quadrat #	Quadrat grid reference	National Vegetation Community
Tn15	NN 63829 86531	Same community as Q9
Tn16	NN 63853 86544	Same community as Q4
Tn17	NN 63886 86525	Sml amount Crowberry
Tn18	NN 63886 86474	Bog pool same community as Q11
Tn19	NN 63890 86466	Same community as Q11
Tn20	NN 63888 86454	Same community as Q11
Tn21	NN 63894 86446	Same community as Q11
Tn22	NN 63898 86440	Same community as Q11
Tn23	NN 63899 86430	Similar community to Q6
Tn24	NN 63901 86402	Same community as Q11
Tn25	NN 63909 86351	Heather, HTCG mix
Tn26	NN 63890 86325	Same community as Q9
Tn27	NN 63884 86315	Same community as Q13
Tn28	NN 63861 86295	Same community as Q9
Tn29	NN 63924 86306	Q15, acid grassland
Tn30	NN 63941 86323	Same community as Q14
Tn31	NN 63938 86332	Same community as Q9
Tn32	NN 63970 86388	Same community as Q11
Tn33	NN 63988 86418	Semi recovered burnt area, Cowberry and moss 1
Tn34	NN 63990 86425	Sml area acid grassland same community as Q15
Tn35	NN 64005 86473	Deep younger Heather, occ X Leaved Heath <2, Tormentil <4
Tn36	NN 64027 86519	Same community as Q14
Tn37	NN 64027 86557	Old Heather, same community as Q14
Tn38	NN 64033 86569	Same community as Q9
Tn39	NN 64034 86612	Burnt area
Tn40	NN 64036 86649	Same community as Q14
Tn41	NN 64038 86659	Recovering from burn, lots of Blaeberry, little Heather, X leaved heath
Tn42	NN 64039 86700	Same community as Q16
Tn43	NN 64038 86737	Same community as Q14
Tn44	NN 64030 86772	Same community as Q9, ground wet

Table 2.2. Domin Scale

Cover	Domin
91–100%	10
76–90%	9
51–75%	8
34–50%	7
26–33%	6
11–25%	5
4–10%	4
<4% (many individuals)	3
<4% (several individuals)	2
<4% (few individuals)	1

Even within vegetation which is not very conspicuously layered, the total of all the Domin values for the species can exceed 100% cover because of structural overlap of the plants.

Table 2.3. Species found during NVC survey by quadrat sample with DOMIN scores

	Grid reference	Total # Quadrats found in	NN 63647 86285	NN 63653 86304	NN 63678 86328	NN 63712 86350	NN 63733 86394	NN 63740 86433	NN 63753 86458	NN 63760 86471	NN 63769 86500	NN 63747 86519	NN 63786 86529	NN 63864 86545	NN 63887 86545	NN 63908 86380	NN 63904 86332
	Quadrat number		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15
Common name	Scientific name																
Bearberry	<i>Arctostaphylos uva-ursi</i>	3					<4 Domin 1					<4 Domin 3	<4 dom 2				
Bell Heather	<i>Erica cinerea</i>	5					<4 Domin 2	<4 Domin 1		<4 Domin 1		<4 Domin 2					
Blaeberry	<i>Vaccinium myrtillus</i>	4					<4 Domin 2					<4 Domin 3		<4 dom 3	<4 dom 2		
Bog Asphodel	<i>Narthecium ossifragum</i>	2															
Bog Myrtle	<i>Myrica gale</i>	2															
Broad-leaved Dock	<i>Rumex obtusifolius</i>	1	<4 Domin 1														
Broad-leaved Willowherb	<i>Epilobium montanum</i>	1	<4 Domin 1														
Carnation Sedge	<i>Carex panicea</i>	4					<4 Domin 1				<4 Domin 1	<4 Domin 1					<4 dom 2
Common Cottongrass	<i>Eriophorum angustifolium</i>	6							11-25 Domin 5	4-10 Domin 4	<4 Domin 3		11-25 dom 5				
Common Cow-wheat	<i>Melampyrum pratense</i>	4				<4 Domin 3	<4 Domin 1							<4 dom 2	<4 dom 1		
Common Haircap	<i>Polytrichum commune</i>	6		4-10 Domin 4	4-10 Domin 4		<4 Domin 2									<4 dom 2	4-10 dom 4
Common Mouse-ear	<i>Cerastium fontanum</i>	1	<4 Domin 1														
Common Nettle	<i>Urtica dioica</i>	1															<4 dom 1
Common Ragwort	<i>Senecio jacobaea</i>	1	<4 Domin 1														
Common Sedge	<i>Carex nigra</i>	5			<4 Domin 3						<4 Domin 2		<4 dom 3	<4 dom 3	<4 dom 1		
Common Sorrel	<i>Rumex acetosa</i>	1	<4 Domin 2														
Cowberry	<i>Vaccinium vitis-idaea</i>	3					<4 Domin 2					<4 Domin 1	<4 dom 1				
Creeping Buttercup	<i>Ranunculus repens</i>	1	<4 Domin 2														
Creeping Thistle	<i>Cirsium arvense</i>	1	<4 Domin 1														
Cross-leaved Heath	<i>Erica tetralix</i>	11		<4 Domin 2	<4 Domin 3		<4 Domin 2	<4 Domin 3	<4 Domin 3	<4 Domin 2	<4 Domin 2						
Deer Grass	<i>Trichophorum cespitosum</i>	8			4-10 Domin 4	<4 Domin 1	<4 Domin 2	4-10 Domin 4			26-33 Domin 6	<4 Domin 1					
Feathery Bog-moss	<i>Sphagnum cuspidatum</i>	3							<4 Domin 3	11-25 Domin 5			34-50 dom 7				
Field Forget-me-not	<i>Myosotis arvensis</i>	1	<4 Domin 2														
Fir Clubmoss	<i>Huperzia selago</i>	1									<4 Domin 3						
Hares-tail Cottongrass	<i>Eriophorum vaginatum</i>	7						<4 Domin 2	4-10 Domin 4	11-25 Domin 5			40-10 dom 4				

	Grid reference	Total # Quadrats found in	NN 63647 86285	NN 63653 86304	NN 63678 86328	NN 63712 86350	NN 63733 86394	NN 63740 86433	NN 63753 86458	NN 63760 86471	NN 63769 86500	NN 63747 86519	NN 63786 86529	NN 63864 86545	NN 63887 86545	NN 63908 86380	NN 63904 86332
	Quadrat number		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15
Common name	Scientific name																
Heather	<i>Calluna vulgaris</i>	19	<4 Domin 2	4-10 Domin 4	<4 Domin 3	76-90 Domin 9	51-75 Domin 8	34-50 Domin 7	34-50 Domin 7	34-50 Domin 7	26-33 Domin 6	26-33 Domin 6	11-25 dom 5	26-33 dom 6	<4 dom 2	91-100 dom 10	<4 dom 3
Heath Rush	<i>Juncus squarrosus</i>	8	<4 Domin 2	<4 Domin 2	<4 Domin 3		<4 Domin 2	<4 Domin 2				<4 Domin 2		<4 dom 2			<4 dom 3
Heath Bedstraw	<i>Galium saxatile</i>	2											11-25 dom 5				<4 dom 1
Heath Plait-moss	<i>Hypnum jutlandicum</i>	3					11-25 Domin 5				<4 Domin 1						
Heath Speedwell	<i>Veronica officinalis</i>	2												<4 dom 2			<4 dom 3
Heath Wood-rush	<i>Luzula multiflora</i>	1															<4 dom 3
Marsh Pennywort	<i>Hydrocotyle vulgaris</i>	1	<4 Domin 2														
Marsh Thistle	<i>Cirsium palustre</i>	1	<4 Domin 1														
Mat Grass	<i>Nardus stricta</i>	5	<4 Domin 2	<4 Domin 1	<4 Domin 3		11-25 Domin 5				<4 Domin 2						
Purple Moor-grass	<i>Molinia caerulea</i>	8			<4 Domin 3	<4 Domin 1					<4 Domin 3	<4 Domin 2			<4 dom 1	<4 dom 2	
Red Bog-moss	<i>Sphagnum capillifolium</i>	9			4-10 Domin 4		11-25 Domin 5		11-25 Domin 5	34-50 Domin 7	<4 Domin 3		4-10 dom 4				
Red Fescue	<i>Festuca rubra</i>	7		4-10 Domin 4	<4 Domin 3							<4 Domin 3	<4 dom 1			<4 dom 2	
Red-stemmed Feather-moss	<i>Pleurozium schreberi</i>	8				51-75 Domin 8		4-10 Domin 4	11-25 Domin 5		11-25 Domin 5	11-25 dom 5	26-33 dom 6			51-75 dom 8	
Reindeer Lichen	<i>Cladonia Portentosa</i>	6				4-10 Domin 4	34-50 Domin 7				4-10 Domin 4	<4 Domin 3	4-10 dom 4				34-50 dom 7
Round-leaved Sundew	<i>Drosera rotundifolia</i>	1															
Selfheal	<i>Prunella vulgaris</i>	2	<4 Domin 2		4-10 Domin 4												
Sheep's Fescue	<i>Festuca ovina</i>	1	11-25 Domin 5														
Sheep's Sorrel	<i>Rumex acetosella</i>	1		<4 Domin 1													
Shepherd's Cress	<i>Teesdalia nudicaulis</i>	1	<4 Domin 1														
Soft Rush	<i>Juncus effusus</i>	3	51-75 Domin 8	4-10 Domin 4													<4 dom 1
Spear Thistle	<i>Cirsium vulgare</i>	1															<4 dom 1
Star Sedge	<i>Carex echinata</i>	4	<4 Domin 3	<4 Domin 2								<4 Domin 1					
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	3	<4 Domin 3	<4 Domin 2													<4 dom 2
Toad Rush	<i>Juncus bufonius</i>	1	<4 Domin 3														
Tormentil	<i>Potentilla erecta</i>	9	<4 Domin 2		<4 Domin 2	<4 Domin 2	<4 Domin 2					<4 Domin 3		<4 dom 2	<4 dom 1	<4 dom 1	<4 dom 3
Wavy Hair-grass	<i>Deschampsia flexuosa</i>	5		<4 Domin 3							<4 Domin 1	<4 Domin 2		<4 dom 3			<4 dom 3

	Grid reference	Total # Quadrats found in	NN 63647 86285	NN 63653 86304	NN 63678 86328	NN 63712 86350	NN 63733 86394	NN 63740 86433	NN 63753 86458	NN 63760 86471	NN 63769 86500	NN 63747 86519	NN 63786 86529	NN 63864 86545	NN 63887 86545	NN 63908 86380	NN 63904 86332
	Quadrat number		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15
Common name	Scientific name																
Yorkshire-fog	<i>Holcus lanatus</i>	2	<4 Domin 2														<4 dom 2

	Grid reference	Total # Quadrats found in	NN 64024 86540	NN 63973 86881	NN 63979 86887	NN 63913 86876											
	Quadrat number		#16	#17	#18	#19											
Common name	Scientific name																
Bearberry	<i>Arctostaphylos uva-ursi</i>	3															
Bell Heather	<i>Erica cinerea</i>	5				<4 dom 2											
Blaeberry	<i>Vaccinium myrtillus</i>	4															
Bog Asphodel	<i>Narthecium ossifragum</i>	2			<4 dom 2	<4 dom 2											
Bog Myrtle	<i>Myrica gale</i>	2		4-10 dom 4	26-33 dom 6												
Broad-leaved Dock	<i>Rumex obtusifolius</i>	1															
Broad-leaved Willowherb	<i>Epilobium montanum</i>	1															
Carnation Sedge	<i>Carex panicea</i>	4															
Common Cottongrass	<i>Eriophorum angustifolium</i>	6	<4 dom 3			<4 dom 2											
Common Cow-wheat	<i>Melampyrum pratense</i>	4															
Common Haircap	<i>Polytrichum commune</i>	6	<4 dom 3														
Common Mouse-ear	<i>Cerastium fontanum</i>	1															
Common Nettle	<i>Urtica dioica</i>	1															
Common Ragwort	<i>Senecio jacobaea</i>	1															
Common Sedge	<i>Carex nigra</i>	5															
Common Sorrel	<i>Rumex acetosa</i>	1															
Cowberry	<i>Vaccinium vitis-idaea</i>	3															
Creeping Buttercup	<i>Ranunculus repens</i>	1															
Creeping Thistle	<i>Cirsium arvense</i>	1															
Cross-leaved Heath	<i>Erica tetralix</i>	11	<4 dom 1	<4 dom 2	4-10 dom 4	4-10 dom 4											
Deer Grass	<i>Trichophorum cespitosum</i>	8	<4 dom 1		51-75 dom 8												
Feathery Bog-moss	<i>Sphagnum cuspidatum</i>	3															
Field Forget-me-not	<i>Myosotis arvensis</i>	1															
Fir Clubmoss	<i>Huperzia selago</i>	1															
Hares-tail Cottongrass	<i>Eriophorum vaginatum</i>	7		<4 dom 3	11-25 dom 5	76-90 dom 9											
Heather	<i>Calluna vulgaris</i>	19	76-90 dom 9	34-50 dom 7	<4 dom 3	11-25 dom 5											
Heath Rush	<i>Juncus squarrosus</i>	8															
Heath Bedstraw	<i>Galium saxatile</i>	2															
Heath Plait-moss	<i>Hypnum jutlandicum</i>	3	<4 dom														

	Grid reference	Total # Quadrats found in	NN 64024 86540	NN 63973 86881	NN 63979 86887	NN 63913 86876											
	Quadrat number		#16	#17	#18	#19											
Common name	Scientific name																
			3														
Heath Speedwell	<i>Veronica officinalis</i>	2															
Heath Wood-rush	<i>Luzula multiflora</i>	1															
Marsh Pennywort	<i>Hydrocotyle vulgaris</i>	1															
Marsh Thistle	<i>Cirsium palustre</i>	1															
Mat Grass	<i>Nardus stricta</i>	5															
Moss 3		1															
Purple Moor-grass	<i>Molinia caerulea</i>	8		<4 dom 3	4-10 dom 4												
Red Bog-moss	<i>Sphagnum capillifolium</i>	9		<4 dom 3	26-33 dom 6	26-33 dom 6											
Red Fescue	<i>Festuca rubra</i>	7	<4 dom 2	<4 dom 3													
Red-stemmed Feather-moss	<i>Pleurozium schreberi</i>	8		34-50 dom 7													
Reindeer Lichen	<i>Cladonia Portentosa</i>	6															
Round-leaved Sundew	<i>Drosera rotundifolia</i>	1				<4 dom 2											
Selfheal	<i>Prunella vulgaris</i>	2															
Sheep's Fescue	<i>Festuca ovina</i>	1															
Sheep's Sorrel	<i>Rumex acetosella</i>	1															
Shepherd's Cress	<i>Teesdalia nudicaulis</i>	1															
Soft Rush	<i>Juncus effusus</i>	3															
Spear Thistle	<i>Cirsium vulgare</i>	1															
Star Sedge	<i>Carex echinata</i>	4		<4 dom 2													
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	3															
Toad Rush	<i>Juncus bufonius</i>	1															
Tormentil	<i>Potentilla erecta</i>	9															
Wavy Hair-grass	<i>Deschampsia flexuosa</i>	5															
Yorkshire-fog	<i>Holcus lanatus</i>	2															

Table 2.4. Target notes

Quadrat #	Grid reference	Comments
Tn1	NN 63750 86534	Same community as Q9
Tn2	NN 63767 86534	Same community as Q8
Tn3	NN63852 86511	N & W end of hill mosaic same community as Q8 and Q9
Tn4	NN 63752 86521	402m peak same community as Q9
Tn5	NN 64023 86795	Recovering from burn, short patchy veg
Tn6	NN 64021 86802	Bog pool
Tn7	NN 64024 86815	Bog pool x 2
Tn8	NN 63998 86830	Same community as Q14
Tn9	NN 63989 86841	Same community as Q9
Tn10	NN 63964 86868	Same community as Q7
Tn11	NN 63856 86865	Same community as Q18
Tn12	NN 63808 86857	Old Heather, HTCG, Cladonia
Tn13	NN 63779 86518	Same community as Q11
Tn14	NN 63801 86514	Same community as Q9
Tn15	NN 63829 86531	Same community as Q9
Tn16	NN 63853 86544	Same community as Q4
Tn17	NN 63886 86525	Sml amount Crowberry
Tn18	NN 63886 86474	Bog pool same community as Q11
Tn19	NN 63890 86466	Same community as Q11
Tn20	NN 63888 86454	Same community as Q11
Tn21	NN 63894 86446	Same community as Q11
Tn22	NN 63898 86440	Same community as Q11
Tn23	NN 63899 86430	Similar community to Q6
Tn24	NN 63901 86402	Same community as Q11
Tn25	NN 63909 86351	Heather, HTCG mix
Tn26	NN 63890 86325	Same community as Q9
Tn27	NN 63884 86315	Same community as Q13
Tn28	NN 63861 86295	Same community as Q9
Tn29	NN 63924 86306	Q15, acid grassland
Tn30	NN 63941 86323	Same community as Q14
Tn31	NN 63938 86332	Same community as Q9
Tn32	NN 63970 86388	Same community as Q11
Tn33	NN 63988 86418	Semi recovered burnt area, Cowberry and moss 1
Tn34	NN 63990 86425	Sml area acid grassland same community as Q15
Tn35	NN 64005 86473	Deep younger Heather, occ X Leaved Heath <2, Tormentil <4
Tn36	NN 64027 86519	Same community as Q14
Tn37	NN 64027 86557	Old Heather, same community as Q14
Tn38	NN 64033 86569	Same community as Q9
Tn39	NN 64034 86612	Burnt area

Quadrat #	Grid reference	Comments
Tn40	NN 64036 86649	Same community as Q14
Tn41	NN 64038 86659	Recovering from burn, lots of Blaeberry, little Heather, X leaved heath
Tn42	NN 64039 86700	Same community as Q16
Tn43	NN 64038 86737	Same community as Q14
Tn44	NN 64030 86772	Same community as Q9, ground wet