
**Lochluichart Wind Farm Extension II (LXX)
on behalf of Infinergy Limited**
Appendix 11.A - Habitats & Vegetation



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1 INTRODUCTION

1.1 Background

- 1.1.1 This report details the results of habitat surveys undertaken for the Lochluichart Wind Farm Extension II in 2015 and 2017. The land encompassing the entire development, as shown on **Figure 11.1**, is herein referred to as the 'Proposed Development'.
- 1.1.2 The Proposed Development is located between Lochluichart Wind Farm Extension I and Corriemoillie Wind Farm.
- 1.1.3 An Extended Phase 1 habitat survey and National Vegetation Classification (NVC) survey was undertaken within the Proposed Development in 2010 to inform the Lochluichart Wind Farm Extension I development.

2 AIM AND OBJECTIVES

- 2.1.1 The aim of this report is to describe and assess the distribution and nature of the habitats and NVC communities within the Proposed Development, to achieve the objectives of mapping and description of the NVC communities and sub-communities.

3 FIELD SURVEY METHODOLOGY

3.1 Survey Methodology

- 3.1.1 An updated habitat walkover survey was completed on 1st July 2015 by Avian Ecology Ltd. to identify any material changes in baseline habitats recorded within the Proposed Development since 2010.
- 3.1.2 A further Extended Phase 1 habitat survey and NVC survey was also undertaken in July and August 2017 to accommodate changes in the Proposed Development layout. The survey included all land within the Proposed Development. The survey areas are present on **Figure 11.3 and 11.4**.
- 3.1.3 This report details the results of the 2015 and 2017 surveys.
- 3.1.4 All surveys were undertaken in accordance with industry guidance applicable at the time:
- Averis, A., Averis, B., Birks, J., Horsfield, D., Thompson, D., Yeo, M. (2004). *An Illustrated Guide to British Upland Vegetation*. JNCC, Peterborough.
 - CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2016)
 - JNCC (2010). Handbook for Phase 1 Habitat Survey - a technique for environmental audit. Revised Reprint 2010. JNCC, Peterborough.
 - JNCC (2011) Spreadsheet of "Conservation Designations for UK Taxa" from <http://www.jncc.gov.uk/default.aspx?page=3409>, accessed 25th July 2017.
 - National Vegetation Community Users' Handbook (Rodwell, 2006)
 - Scotland and Northern Ireland Forum for Environmental Research (SNIFFER, 2009)WFD95:A Functional Wetland Typology for Scotland – Field Survey Manual. Version 1.

- Rodwell, J. S. (2006). *National Vegetation Community Users' Handbook*. JNCC, Peterborough.
- Rodwell, J. S. (ed.) (1993). *British Plant Communities. Volume 2. Mires and Heaths*. Cambridge University Press, Cambridge.
- Rodwell, J. S. (ed.) (1992). *British Plant Communities. Volume 3. Grasslands and montane communities*. Cambridge University Press, Cambridge.
- Stace, C. (1997). *Field flora of the British Isles*. Cambridge University Press, Cambridge.

3.1.5 The NVC survey followed procedures detailed within (Rodwell 1992, 1993 and 2006) and JNCC NVC (Rodwell, 2006) guidance. Homogenous and mosaics of habitats were marked as polygons onto field plans at 1:6,000 scale. Target Notes were made of pertinent features including a grid reference and photograph.

3.1.6 NVC surveys were only undertaken where communities were deemed likely to form Annex 1 habitats. NVC square quadrats of size 2m² were distributed throughout stands identified for survey in order to provide a representative sample of the vegetation communities present. In each quadrat sample area, data was collected on the presence and abundance of vascular plant species using the 'Domin' scale (see tables in **Annex 1**). These data were then analysed and classified to an NVC vegetation community, where possible, using the keys in Rodwell (2006) *British Plant Communities Volumes 2, mires and heaths*.

3.1.7 Habitat survey methods were extended through the additional recording of specific features indicating the presence, or likely presence, of protected or notable species. The results are not presented within this report but within Appendix 11.B.

3.2 Personnel

3.2.1 Surveys were conducted by Mr Colin Davies MSC MCIEEM, Ms S Turner BSc(Hons) MSc GradCIEEM and M Wood BSc; competent botanists with considerable experience of undertaking Habitat surveys.

4 HABITATS

4.1 Overview

4.1.1 The Proposed Development is upland in character and dominated by habitats typical of the biogeographical zone. The majority of habitats comprise large areas of blanket bog and wet heath communities, developing on peat of variable depth. Blanket bog is the most prominent habitat type on the northern slopes where the ground is much wetter and north facing. Centrally and towards the south the bog becomes more heath-like, with wet dwarf shrub heath dominating.

4.1.2 Land management within the Proposed Development appears to be associated primarily with deer, with overgrazing of heathland habitat likely restricting the floristic diversity across the Proposed Development and increasing the presence of grasses to shrubs and heather.

4.1.3 The habitat types correspond to European wet heath and Active raised bog and blanket bog listed on Annex I of the Habitats Directive and also represent priority habitat types for the Ross and Cromarty (East) LBAP.

4.2 Wet Heath

- 4.2.1 Heathland habitat communities present are dominated by varying combinations of deergrass, heather and hare's-tail cottongrass, with peat-forming *Sphagnum capillifolium* and *S.papillosum* present. Occasional small flushes and mires dominated by grasses, rushes and sedges are also present and the Proposed Development is drained by a number of small fast flowing upland streams with stony beds.
- 4.2.2 The best community match for wet heath is M15 *Trichophorum cespitosum-Erica tetralix* wet heath. This is a ubiquitous community over much of the north and west of Scotland. The community type is dominated by *Calluna vulgaris*, *Erica tetralix*, *Trichophorum cespitosum* and *Molinia caerulea* and has much *Narthecium ossifragum* and *Eriophorum angustifolium* present. The sub-community present on site is M15b typical sub-community.
- 4.2.3 Whilst some grazing is thought to be essential in maintaining the structural and floristic diversity of heathland communities (Averis *et. al.* 2004), the overabundance of *Trichophorum cespitosum* within the wet heath communities present would appear to indicate current overgrazing, presumably by deer.

4.3 Plantation

- 4.3.1 The northern extent of the Proposed Development also supports areas of birch and Scots pine *Pinus sylvestris* plantation atop areas of blanket bog and wet heath. The ground is very wet and it appears that small drains have been created to aid surface water run off to promote tree growth. Overall the plantation growth is stunted; some areas appear to have been unsuccessful with the presence of dead saplings.
- 4.3.2 Trees across the site are around 2-4m tall. Vegetation below canopy is mostly Ericoids composed of *Calluna vulgaris*, *Erica tetralix* and *Empetrum nigrum*. There is however a scattering of *Betula nana*.



4.4 Blanket Bog


- 4.4.1 The best community match for bog habitats is M17 *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire. This community is typically dominated by *Trichophorum cespitosum*, *Eriophorum vaginatum* and *Eriophorum angustifolium* with *Calluna vulgaris* and *Erica tetralix*. *Sphagnum papillosum* and *S. capillifolium* are the commonest sphagnums whilst *Narthecium ossifragum* and the *Drosera* species are also present in good numbers. The sub-community present is likely to be the *Cladonia* sub-community M17b.
- 4.4.2 The M17 *Trichophorum cespitosum-Eriophorum vaginatum* community is common and widespread throughout the North West Highlands of Scotland, but is recognised as globally rare (Averis *et.al.*, 2004).


4.5 Notable Plant Species and Target Notes


- 4.5.1 Notable plants species recorded included Alpine bearberry *Arctostaphylos alpina* and dwarf birch *Betula nana*. They are included in the IUCN Red List as 'Species of Least Concern' i.e. species that are rare but not thought to be threatened with extinction. In addition, alpine bearberry and dwarf birch are listed as Nationally Scarce.

4.5.2 Table 3.1 below details Target Notes from the survey.

Target Note	Grid ref	Description	Photo
TN1	NH 33205 69565	<p>Wet heath community on shallow peat, modified by tree planting (Scots pine) and deer poaching. Dominant heather, deer grass, abundant cross leaved heath, scattered sphagnum pools relating to tree planting trenches. Some bare peat.</p> <p>Young Scots pine plantation 2-4m high.</p>	
TN2	NH 33191 70073	<p>Borrow pit used for original wind farm construction. Reinstated with soil covering, mix of peat and stones, well drained and dry. Dominant bulbous rush and velvet bent, with sheep's fescue, <i>Polytrichum juniperinum</i> and small ephemeral mosses on bare earth. Occasional soft rush and small heather shoots, and very young Sphagnum.</p>	

Target Note	Grid ref	Description	Photo
TN3	NH 33208 68889	Wet heath on shallow stony peat. Mix of dominant deer grass, heather and cross leaved heath, abundant <i>Sphagnum papillosum</i> , <i>Racomitrium lanuginosum</i> , and bog asphodel, occasional common cotton grass, round leaved sundew, dwarf birch, tormentil, great sundew, fir clubmoss, cowberry and purple moor grass.	

Target Note	Grid ref	Description	Photo
TN4	NH 32556 68534	Exposed, relatively level hill top area, with very shallow stony soil. Drier than hillsides, with some bare soil. Deergrass and <i>Cladonia</i> lichens dominant, abundant <i>Racomitrium lanuginosum</i> , occasional heather, bell heather, carnation sedge and heath rush.	

Target Note	Grid ref	Description	Photo
TN5	NH 32319 68698	Small area of mire type vegetation within blanket bog, adjacent to watercourses. No ericoids, dominant hare's-tail cottongrass, deergrass, Sphagnums, frequent black sedge, tormentil, occasional mat grass, sweet vernal grass, soft rush and <i>Polytrichum commune</i> .	
TN6	NH 33704 68928	Small nutrient poor pond. Little emergent vegetation. Common Hawker dragonfly <i>Aeshna juncea</i> , observed here.	n/a
TN7	NH 34482 70236	This area of wet heath was largely uninteresting also being dominated chiefly by <i>Calluna</i> and <i>Molinia caerulea</i> with some scattered birch	n/a

Target Note	Grid ref	Description	Photo
		but was the only locality for Heath fragrant orchid <i>Gymnadenia borealis</i> .	

ANNEX 1 – QUADRAT DATA

Quadrat	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Depth	>50	>50	>50	>50	>50	>50	>50	>50	<50	<50	<50	<50	<50	>50	>50	>50	>50	>50	>50	>50	>50	>50	
Habitat	Bog	Bog	Bog	Bog	Bog	Bog	Bog	Bog	WH	WH	WH	WH	WH	Bog	Bog	Bog	Bog	Bog	Bog	Bog	Bog	Bog	
Species																							
<i>Trichophorum cespitosum</i>	8	8	8	8	7	7	8	8	7	9	6	7	7	7	7	7	8	7	7	8	6	6	
<i>Calluna vulgaris</i>	5	7	7	7	8	7	8	8	6	5	7	7	7	9	8	8	5	5	7	9	5	7	
<i>Sphagnum capillifolium</i>	4	7	7	8	7	7	7	6	4	0	7	7	7	7	8	7	6	6	5	7	8	7	
<i>Cladonia sp.</i>	8	7	7	7	5	9	7	6	8	7	6	6	6	0	6	6	6	4	5	4	6	4	
<i>Sphagnum papillosum</i>	0	0	0	4	0	4	0	0	0	0	0	0	0	4	6	5	6	7	7	7	0	7	
<i>Eriophorum angustifolium</i>	5	5	4	4	7	5	5	4	5	0	4	0	4	5	5	5	5	5	4	5	5	5	
<i>Eriophorum vaginatum</i>	5	5	0	5	5	5	4	4	4	0	0	0	0	4	4	5	5	5	0	4	5	4	
<i>Racomitrium lanuginosum</i>	6	5	5	0	4	4	4	4	5	5	4	5	4	0	4	5	5	4	4	4	0	4	
<i>Erica tetralix</i>	4	4	4	4	4	4	5	4	5	5	4	5	4	4	4	4	4	4	4	4	4	4	
<i>Narthecium ossifragum</i>	4	0	4	4	4	4	4	0	5	4	4	4	4	4	4	4	4	4	4	4	4	4	
<i>Hypnum jutlandicum</i>	0	5	4	4	4	4	0	4	4	4	5	4	5	4	0	0	4	0	0	5	5	4	
<i>Hylocomium splendens</i>	0	0	5	4	5	0	4	4	0	4	4	5	4	4	0	0	0	4	0	0	0	0	
<i>Molinia caerulea</i>	0	4	0	4	5	0	4	4	4	5	5	4	0	0	4	4	0	4	0	4	0	0	
<i>Potentilla erecta</i>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	4	0	0	4	0	4	
<i>Juncus squarrosus</i>	0	0	4	4	0	4	0	0	4	4	4	4	6	4	4	0	0	0	0	0	0	5	0
<i>Drosera rotundifolia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	0	0	4	
<i>Pleurozium schreberi</i>	0	0	0	4	0	0	4	0	0	0	0	0	4	0	0	0	0	0	0	4	0	0	
<i>Carex echinata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	
<i>Rhytidadelphus loreus</i>	0	0	0	4	0	0	0	0	4	4	4	0	0	0	4	0	0	0	0	0	0	0	
<i>Betula nana</i>	0	0	0	0	0	4	0	4	0	0	0	0	4	0	4	0	0	0	0	0	0	0	
<i>Empetrum nigrum</i>	0	0	4	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	5	0
<i>Vaccinium myrtillus</i>	0	0	4	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Sphagnum fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Rubus chamaemorus (cloudberry)</i>	0	0	0	4	4	0	0	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	
<i>Vaccinium vitis-idaea (cowberry)</i>	0	0	4	4	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Quadrat	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Depth	>50	>50	>50	>50	>50	>50	>50	>50	<50	<50	<50	<50	<50	>50	>50	>50	>50	>50	>50	>50	>50	>50
Habitat	Bog	Bog	Bog	Bog	Bog	Bog	Bog	Bog	WH	WH	WH	WH	WH	Bog	Bog	Bog	Bog	Bog	Bog	Bog	Bog	Bog
<i>Dosera anglica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Sphagnum denticulatum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Sphagnum subnitens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Blechnum spicant</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
<i>Erica cinerea</i>	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
<i>Lycopodium annotinum</i>	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Menyanthes trifoliata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Quadrat	23	24	25	26	27	28	29	30	31	32	33	34	35
Depth	>50	>50	>50	>50	>50	>50	>50	>50	>50	>50	>50	>50	>50
Habitat	Bo g	Bo g	Bo g	Bo g	Bo g	Bo g	Bo g	Bo g	Bo g	Bo g	Bo g	Bo g	Bo g
Species													
<i>Trichophorum cespitosum</i>	7	4	7	5	4	7	7	7	7	7	7	6	8
<i>Calluna vulgaris</i>	5	0	5	7	4	5	8	6	8	8	7	5	6
<i>Sphagnum capillifolium</i>	8	7	8	9	7	6	7	7	7	5	6	4	4
<i>Cladonia sp.</i>	4	0	4	5	4	7	7	5	6	7	6	4	5
<i>Sphagnum papillosum</i>	6	8	6	4	8	7	5	7	4	0	4	5	0
<i>Eriophorum angustifolium</i>	5	6	4	4	4	4	4	5	5	4	5	7	5
<i>Eriophorum vaginatum</i>	5	4	6	4	5	5	5	5	5	6	5	5	6
<i>Racomitrium lanuginosum</i>	4	0	0	0	0	0	6	4	7	5	8	0	4
<i>Erica tetralix</i>	4	4	4	4	4	4	4	4	5	4	5	5	4
<i>Narthecium ossifragum</i>	4	4	4	4	0	4	4	4	4	4	4	5	0
<i>Hypnum jutlandicum</i>	4	0	0	4	0	4	0	4	4	4	4	0	4
<i>Hylocomium splendens</i>	4	0	0	5	0	4	4	0	4	0	4	0	4
<i>Molinia caerulea</i>	4	0	4	0	4	0	4	0	4	0	0	0	4
<i>Potentilla erecta</i>	4	0	4	4	0	0	4	0	4	4	4	0	4
<i>Juncus squarrosus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Drosera rotundifolia</i>	4	4	4	0	0	4	4	4	0	0	4	4	0
<i>Pleurozium schreberi</i>	0	0	4	4	0	0	0	0	0	0	0	0	4
<i>Carex echinata</i>	4	4	0	0	0	4	0	4	0	0	4	4	0
<i>Rhytidiadelphus loreus</i>	0	0	0	0	0	0	4	0	0	0	0	0	0
<i>Betula nana</i>	0	0	0	0	0	0	0	0	1	0	0	0	0
<i>Empetrum nigrum</i>	0	0	0	0	0	0	0	0	1	0	0	0	0
<i>Vaccinium myrtillus</i>	1	0	0	4	0	0	0	0	0	0	0	0	0
<i>Sphagnum fallax</i>	0	0	0	0	0	4	4	0	0	0	0	4	0
<i>Rubus chamaemorus (cloudberry)</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vaccinium vitis-idaea (cowberry)</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Dosera anglica</i>	0	4	0	0	4	0	0	4	0	0	0	4	0
<i>Sphagnum denticulatum</i>	4	0	0	0	4	0	0	0	0	0	0	0	0
<i>Sphagnum subnitens</i>	0	4	0	0	0	0	0	0	0	0	0	0	0
<i>Blechnum spicant</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Erica cinerea</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Lycopodium annotinum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Menyanthes trifoliata</i>	0	0	0	0	0	0	0	0	0	0	0	4	0

ANNEX 2 - QUADRAT DETAILS

Quadrat	Easting	Northing	Depth	NVC habitat
1	232180	869429	>50	Blanket Bog
2	232160	869397	>50	Blanket Bog
3	232099	869386	>50	Blanket Bog
4	232033	869439	>50	Blanket Bog
5	232067	869569	>50	Blanket Bog
6	232023	869223	>50	Blanket Bog
7	232168	869252	>50	Blanket Bog
8	232273	869261	>50	Blanket Bog
9	232470	869695	<50	Wet Heath
10	232554	869693	<50	Wet Heath
11	232633	869609	<50	Wet Heath
12	232681	869717	<50	Wet Heath
13	232735	869582	<50	Wet Heath
14	232538	869347	>50	Blanket Bog
15	232692	869363	>50	Blanket Bog
16	233249	869629	>50	Blanket Bog
17	233037	869758	>50	Blanket Bog
18	233527	869841	>50	Blanket Bog
19	233761	869859	>50	Blanket Bog
20	233575	869649	>50	Blanket Bog
21	233700	869690	>50	Blanket Bog
22	233836	869582	>50	Blanket Bog
23	233593	869467	>50	Blanket Bog
24	233666	869357	>50	Blanket Bog
25	233949	869396	>50	Blanket Bog
26	233820	869253	>50	Blanket Bog
27	233688	869159	>50	Blanket Bog
28	234004	869240	>50	Blanket Bog
29	233863	868988	>50	Blanket Bog
30	234021	868892	>50	Blanket Bog
31	234095	869012	>50	Blanket Bog
32	233881	868864	>50	Blanket Bog
33	233794	868978	>50	Blanket Bog
34	233661	868932	>50	Blanket Bog
35	233218	869257	>50	Blanket Bog