Dean Moor
Solar Farm

Environmental Statement: Appendix 8.2 – National Vegetation Classification (NVC) Survey

on behalf of **FVS Dean Moor Limited**

March 2025
Prepared by: Stantec UK Ltd
PINS Ref: EN010155
Document Ref: 6.3
Revision: 1

Firma Energy

ib vogt

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Appendix 8.2: National Vegetation Classification (NVC) Survey Report

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National Vegetation Classification (NVC) Survey Report

Appendix 8.2

March 2024

DEAN MOOR SOLAR FARM

NVC REPORT

APPENDIX 8.2

PREPARED ON BEHALF OF FVS DEAN MOOR LIMITED

Project Ref:	**34641/A5/Appendix 8.2**
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1 Introduction

1.1 Overview

1.1.1 This report presents the result of a National Vegetation Classification ('NVC') survey for the Dean Moor Solar Farm (the Proposed Development), commissioned by FVS Dean Moor Limited. This NVC Survey Report forms Appendix 8.2 of Chapter 8 – Biodiversity of the PEIR for the Proposed Development.

1.1.2 The Proposed Development is located on land between the villages of Gilgarran and Branthwaite in West Cumbria (the Site) which is situated within the administrative area of Cumberland Council (the Council).

1.1.3 The purpose of the NVC survey is to identify botanical composition within three areas of the Site, identified during the Preliminary Ecological Appraisal (Appendix 8.1) as potentially having elevated botanical interest. The results will be used to inform the ecological impact assessment process as well as the evolving design of the Proposed Development.

1.2 Site Location and Description

1.2.1 The Site is 279.50 hectares ('ha') in area and is located between the villages of Gilgarran and Branthwaite in West Cumbria (PEIR Figure 1.1). The Site is bisected by a minor road that runs between Gilgarran and Branthwaite Edge hereafter referred to as the "Gilgarran Road".

1.2.2 The Site is predominantly pasture that is grazed by sheep. It is generally drained by a series of unnamed minor watercourses which run broadly south to north and west to east in Area C. The watercourses coalesce near Branthwaite Rigg and flow north to ultimately join the River Derwent.

1.2.3 The land within the Site has a varied topography with steep-sided hills associated with Thief Gill in Area C; and flat land to the north, east and west around Areas A and B. Small areas of plantation woodland are present in and adjacent to Areas A and B.

1.2.4 Land surrounding the Site is dominated by grazing pasture and arable farmland, with large areas of plantation woodland also located north, east, and west of the Site.

1.3 Proposed Development

1.3.1 The Proposed Development comprises the proposed construction, operation and maintenance, and decommissioning of a renewable energy generating project on 279.50ha of land between the villages of Gilgarran and Branthwaite in West Cumbria.

1.3.2 The Proposed Development will have the capacity to export up to 150MW of electricity at any time. The generating station would also involve the construction and operation of up to 100MW of BESS.

1.3.3 A conceptual layout of the Proposed Development is presented in the PEIR (Figure 3.1). Site areas are shown on PEIR Figure 3.3.

1.4 Report Objectives

1.4.1 The objectives of this report are to:

- Outline survey methodologies and relevant survey guidance; and
- Detail the results of the survey.

1.5 Description of surveyed areas

1.5.1 Area 1 is an area of rush *Juncus* dominated marshy grassland on the southern plateau of Area C.

1.5.2 Area 2 is an area of marshy grassland and flushes on the valley sides of the upper reaches of an incised stream passing through Thief Gill in Area C.

1.5.3 Area 3 is damp improved grassland with a predominance of rushes to the north of Area C and just south of the Gilgarran Road.

2 Methods

2.1 Field survey

2.1.1 An NVC survey of vegetation in three areas of the Site (Survey Areas 1, 2, and 3 as shown on Figure 1) was undertaken on 9th August 2023. The survey was completed with reference to standard methodology[1] and by suitably experienced and qualified surveyors. The general approach was to:

- Identify a homogenous stand of vegetation in each survey area of similar appearance to the eye in terms of floristic composition and physiognomy.
- Describe the upper soils where apparent and record the average depth of peat (where present), by inserting a metal rod into the soil until resistance was felt.
- Select a representative area of vegetation within this stand to sample, using 2 x 2 m square quadrats (approximate locations of quadrats shown on Figure 1).
- Record plant abundance within quadrats using the Domin scale (Rodwell, 2006).
- Take representative photographs of each survey area.

2.1.2 Two of the quadrats (1 and 6) relating to Survey Area 2 are shown on Figure 1 as being outside the survey area. These two quadrats had similar vegetation to the main Site boundary but are shown as outliers to Survey Area 2 on Figure 1 because of their differing soil profile (i.e., little, or no underlying peat). Quadrats 1 and 2 have very similar constant species and are unlikely to significantly affect the outcome of the NVC analysis, and so have been included in the analysis.

2.2 Analysis

2.2.1 The field data were run through the program Modular Analysis of Vegetation Information System (MAVIS)[2]. MAVIS is a program that assigns vegetation data to a number of different classification systems including NVC, based on the 'goodness of fit' with published community

[1] National Vegetation Classification Users' Handbook (2006). Rodwell J.S. Joint Nature Conservation Committee (JNCC)

[2] Modular Analysis of Vegetation Information System (version 1.03). Centre for Ecology and Hydrology CEH (2016) https://www.ceh.ac.uk/services/modular-analysis-vegetation-information-system-mavis [accessed 01/07/19].

types[3]. For groups of plots or quadrats entered into MAVIS as constancy tables, matching coefficients are computed between the published synoptic tables in the NVC and the field data in question. The top 10 coefficients are displayed.

2.2.2 Quadrat data were also tabulated using Microsoft Excel and sorted into floristic tables based on those provided in literature[4],[5] with species ordered by frequency class (i.e. frequency of occurrence, scored 1 to 5).

2.2.3 To determine the affinity of the survey areas to NVC communities the following data analysis was used:

- The outputs of the MAVIS programme were reviewed against the field notes and photographs; and
- The MAVIS outputs were also reviewed (by inspection) against floristic tables produced for the survey areas, which were in turn reviewed against the published floristic tables for the relevant communities); as well as against the published NVC community descriptions and keys, and guidance[6] Elkington *et al* (2001).

2.3 Limitations

2.3.1 No limitations to the field survey were encountered. The weather was dry and warm (20 °C) and provided no constraint to the survey. Access was unimpeded and all parts of the survey areas were accessible.

[3] British Plant Communities; 5 volumes (1991) Rodwell, J. S. e.seq. (ed.) Cambridge University Press, Cambridge.
[4] British Plant Communities (1991) Volume 2: Mires and Heaths, Cambridge University Press, Cambridge.
[5] British Plant Communities (1992) Volume 3: Grassland and Montane Communities, Cambridge University Press, Cambridge
[6] National Vegetation Classification: Field Gide to Mires and Heaths (2001) Elkington *et al*. JNCC

3 Results and Interpretation

3.1 Survey Area 1

3.1.1 This is a *Juncus*-dominated marshy grassland with patches of short mossy ground and frequent *Carex spp.. Molinia caerulea* is locally abundant / frequent. There is occasional pooling water in wheel ruts and peaty subsoils, estimated to extend to a depth of around 0.6 m (Photograph 1).

3.1.2 Output from Mavis analysis:

- NVC: M23a 59.30;
- NVC: M23 57.67;
- NVC: M23b 56.47;
- NVC: MG8c 45.08;
- NVC: MG8v 244.17;
- NVC: MG10a 43.26;
- NVC: MG8b 42.08;
- NVC: MG8 41.51;
- NVC: MG8d 41.25; and
- NVC: MG4c 39.68.

3.1.3 The highest scoring community in the MAVIS analysis is M23a, with slightly lower scores for the M23 community as a whole and the M23b sub-community. The scores for M23 are markedly higher than for any other community.

3.1.4 Following the main community identification key to mires and heaths the community appears to fall best into the M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture community.

3.1.5 Many of the constants of the M23a *Juncus acutiflorus* sub-community are present, and this species is present throughout, and at a high level of abundance. The community does lack a prevalence of tall herbs, which might otherwise be more characteristic of this sub-community.

3.1.6 The sample has some of the constants of the M23b *Juncus effusus* sub-community, and contains frequent *Juncus conglomeratus* as well as

frequent *Galium palustre*, *Cirsium palustre*, and *Ranunculus flammula,* which are described in the field key as good distinguishing features of the M23b sub-community. However, many other associated species are lacking and *Juncus acutiflorus* is more constant (frequency 5) in this survey area than is indicated in the published floristic table for M23b (frequency 1).

3.1.7 The presence of *Cynosurus cristatus* as a constant species is probably a result of the setting of the survey location in improved grassland.

3.1.8 The vegetation here is clearly characteristic of the M23 community, with characteristics of both of the sub-communities. While it is difficult to clearly assign it to one or the other, the presence of constant *Juncus acutiflorus* at a high level of abundance suggests that it should probably be assigned to the M23a *Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus acutiflorus* sub-community.

3.2 Survey Area 2

3.2.1 A flush habitat characterised by *Juncus spp.* and *Cirsium palustre* and tall vegetation. It is on silty clays by the stream banks located within Thief Gill and is peaty in flush areas to approx. 80 cm depth. Quadrat 1 (Q1) and Q6 are on non-peat soils; Q2 to Q5 (more flushed) are on peat. The lower reaches of this Survey Area in Thief Gill is shown in Photograph 2.

3.2.2 Output from Mavis analysis:

- NVC: M23b 53.22;
- NVC: M23a 52.63;
- NVC: M23 52.25;
- NVC: M27c 48.21;
- NVC: M27 47.25;
- NVC: MG10a 46.82;
- NVC: MG10 44.80;
- NVC: M25c 44.09; and
- NVC: M28a 44.02.

3.2.3 The output of the MAVIS analysis gives relatively poor (and similar) coefficient scores for both sub-communities of the M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture community, with a similar score for the M23 main community. However, the scores for M23 are higher than for any other community.

3.2.4 Following the main community identification key to mires and heaths the community appears to fall best into the M23 community. Survey Area 2 is more species-rich than Survey Area 1, although many of the extra species are present at low frequency.

3.2.5 *Juncus effusus* is the dominant rush species in terms of both frequency and abundance across all the quadrats, including Q1 and Q6; and *Rumex acetosa, Galium palustre, Cirsium palustre,* and *Holcus lanatus* are all present at high frequencies in survey area 2, which is in line with the published floristic tables for M23b (*Juncus effusus* sub-community). *Juncus acutiflorus* is present at higher frequency (4) compared to frequency (1) in the published floristic tables for M23b. The higher presence of *Juncus acutiflorus* is more characteristic of the M23a sub-community.

3.2.6 Although the community has characteristics of both sub-communities of the *Juncus effusus/acutiflorus– Galium palustre* rush-pasture community, it probably fits more comfortably into the M23b *Juncus effusus* sub-community.

3.2.7 The M23 communities in Survey Areas 1 and 2 fall within the definition of purple moor grass and rush pasture (PMRP)[7]. PMRP is a very variable priority habitat (NERC Act Section 41) encompassing a wide range of plant communities, with the broader definition of PMRP including NVC communities M22–M26, and sometimes also M27.

[7] UK Biodiversity Action Plan Priority Habitat Descriptions (2011) JNCC http://jncc.defra.gov.uk/PDF/UKBAP_PriorityHabitatDesc-Rev2011.pdf [accessed 01/07/19]

3.3 Survey Area 3

3.3.1 This survey area comprises modified grassland / improved wet pasture that is cut / grazed very short and experiences heavy poaching by cattle (Photograph 3). Herb cover is very low; there are occasional clumps of *Juncus effusus* and *J. conglomeratus* throughout. The underlying soils appear to be silty clay.

3.3.2 Output from Mavis analysis:

- NVC: MG10a 57.21;
- NVC: MG6a 51.88;
- NVC: MG10 49.86;
- NVC: MG6 48.36;
- NVC: MG11a 45.85;
- NVC: MG6b 44.86;
- NVC: MG13 44.32;
- NVC: MG10b 42.76;
- NVC: MG4c 42.62; and
- NVC: MG7B 41.93.

3.3.3 The Key to Mesotrophic Grasslands[8] leads to both MG10a and MG6a which are the highest ranked communities from the MAVIS analysis.

3.3.4 The presence of constant Lolium perenne, Cynosurus cristatus, Holcus lanatus and Trifolium repens is a good fit for MG6, although the constant presence of Juncus effusus, Holcus lanatus and Agrostis stolonifera; as well as occasional Ranunculus repens, is quite characteristic of MG10 grassland (although Lolium perenne and Cynosurus cristatus are typically at much lower frequencies in the published floristic tables for MG10, than was found at Dean Moor).

3.3.5 The community clearly has characteristics of both MG6 and MG10 but it seems reasonable to speculate that the *Lolium perenne* and *Cynosurus cristatus* are likely to have been present, followed by colonisation of damp ground by the rush and other damp-tolerant species, as the community

[8] British Plant Communities (1992) Volume 3: Grassland and Montane Communities, Cambridge University Press, Cambridge

transitions from MG6 to MG10. The constancy of *Juncus effusus* and *Juncus conglomeratus* in the survey area (as well as constant *Agrostis stolonifera* – which typically has a low frequency in MG6 communities) seem then to place it in the MG10, which is reflected in the damp nature of the habitat.

3.3.6 This conclusion is consistent with the MAVIS analysis which assigns the highest coefficient to MG10a, the typical sub-community.

3.3.7 Given the presence of constant *Juncus effusus, Holcus lanatus*, and *Agrostis stolonifera* the community is provisionally assigned to MG10a. The high presence of *Lolium perenne, Cynosurus cristatus*, *Holcus lanatus* and *Trifolium repens* nonetheless make the community transitional with MG6a.

4 Figures

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NVC Survey Area 1

NVC Survey Area 2

NVC Survey Area 3

0 0.5 1 1.5 2 km

Legend

- Draft Order Limits
- NVC Survey Area
- Quadrat

Habitat

- Scrub
- Tree
- J2.1.2 - Intact hedge - species-poor
- J2.3.2 - Hedge with trees - species-poor
- J2.4 - Fence
- J2.5 - Wall
- G2 - Running water
- A1.1.2 - Broadleaved woodland - plantation
- A1.2.2 - Coniferous woodland - plantation
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- B1.2 - Acid grassland - semi-improved
- B2.2 - Neutral grassland - semi-improved
- B4 - Improved grassland
- B5 - Marsh/marshy grassland
- B6 - Poor semi-improved grassland
- G1 - Standing open water
- J3 - Built up areas (e.g. hardstanding)
- J3.6 - Buildings

Project Title

Dean Moor Solar Farm

Client

FVS Dean Moor Limited

Title

DEAN MOOR SOLAR FARM
DEVELOPMENT CONSENT ORDER
NVC Survey Results

Scale: 1:6,500 @ A3	Date: 08/03/2024
Drawn: TL	Checked: IA
Figure: 1	Rev: A

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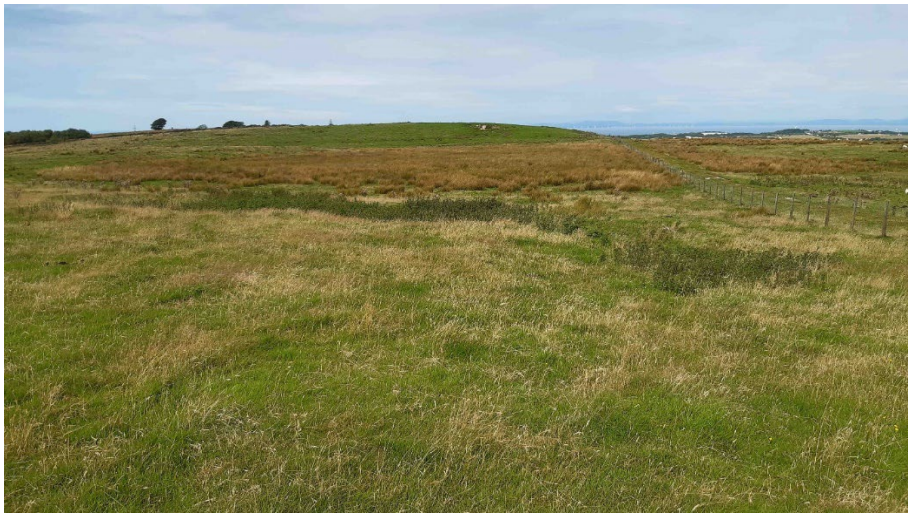
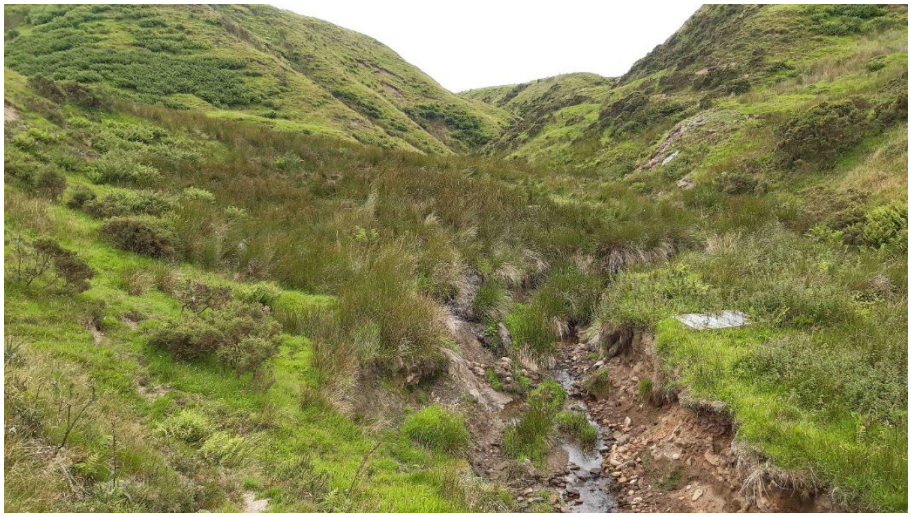
Path: C:\Users\tletendrie\Documents\ArcGIS\Projects\332511471\332511471.aprx

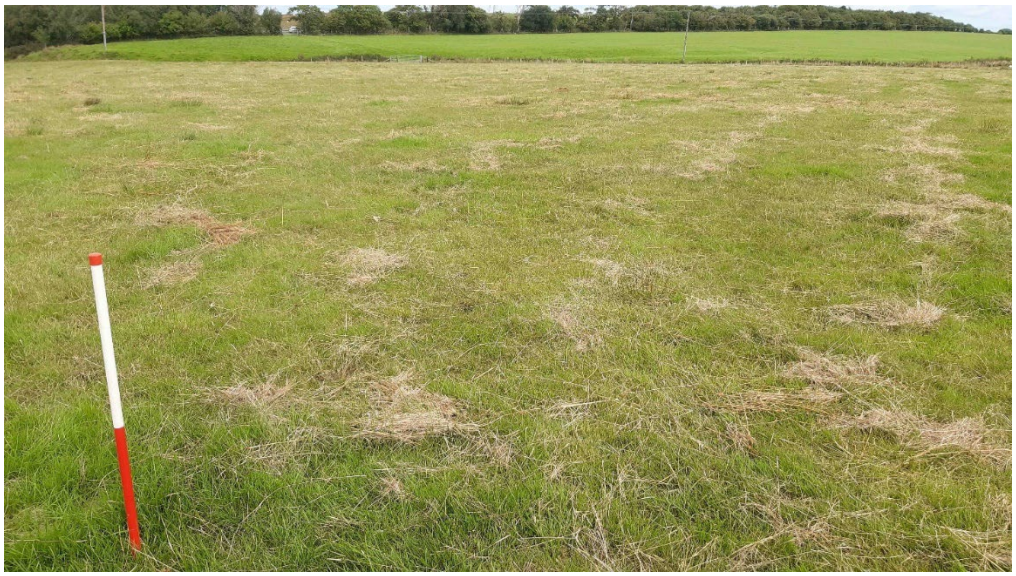
5 Photographs



Photograph 1: Survey Area 1 looking north.



Photograph 2: Survey Area 2 looking upstream of Thief Gill. Tall rush-dominated vegetation mainly on left of watercourse



Photograph 3: Survey Area 3 looking north.

Appendix 1: Frequency Tables

The percentage cover shown in the frequency tables is the midpoint of the corresponding Domin scale range:

Cover	Domin	Value used in frequency tables / entered into MAVIS
91–100%	10	95
76–90%	9	83
51–75%	8	63
34–50%	7	42
26–33%	6	30
11–25%	5	18
4–10%	4	7
<4% (many individuals)	3	3
<4% (several individuals)	2	2
<4% (few individuals)	1	1

Survey Area 1: Frequency Table

	Percentage cover in each Quadrat						
	<Q1>	<Q2>	<Q3>	<Q4>	<Q5>	Frequency	Abundance
Juncus acutiflorus	63	83	63	83	42	5	(7-9)
Holcus lanatus	7	42	30	42	30	5	(4-7)
Cynosurus cristatus	7	18	18	18	18	5	(4-5)
Anthoxanthum odoratum	7	18	30	2	3	5	(2-5)
Galium palustre	3	2	3	18	3	5	(2-5)
Juncus effusus	7	2	2	2	2	5	(2-4)
Epilobium palustre	2	2	1	2	2	5	(1-2)
Cardamine pratensis	2	3	2	2	2	5	(2-3)
Trifolium repens	7	7	2		63	4	(2-8)
Ranunculus acris	2	3	7		7	4	(2-4)
Festuca rubra agg.		4	7	30		3	(4-6)
Juncus conglomeratus	2		3	2		3	(2-3)
Ranunculus flammula			2	3	2	3	(2-3)
Cirsium palustre		2		2	1	3	(1-2)
Molinia caerulea	18				30	2	(5-6)
Juncus squarrosus	2				3	2	(2-3)
Luzula campestris	2				1	2	(1-2)
Poa trivialis			2		2	2	2
Molinia caerulea					30	1	6
Carex panicea	18					1	5
Trichophorum cespitosum	7					1	4
Carex echinata					7	1	4
Juncus articulatus	2					1	2
Agrostis capillaris	2					1	2
Juncus articulatus					2	1	2
Carex ovalis	1					1	1

Survey Area 2: Frequency Table

	Percentage cover in each Quadrat							
	<Q1>	<Q2>	<Q3>	<Q4>	<Q5>	<Q6>	Frequency	Abundance
Juncus effusus	63	42	83	83	63	30	5	(6-9)
Rumex acetosa	30	18	7	7	30	42	5	(4-7)
Galium palustre	7	3	3	7	18	7	5	(3-5)
Cirsium palustre	2	2	18	7	7	18	5	(2-5)
Chrysosplenium oppositifolium	18	7		42	30	18	5	(4-7)
Holcus lanatus	3	30	7		18	18	5	(3-5)
Juncus acutiflorus	7	18		18	83		4	(4-9)
Agrostis stolonifera	7	7		7	2		4	(2-4)
Cardamine pratensis	2	3	3		2		4	(2-3)
Festuca rubra agg.	7	7					2	7
Carex nigra			18		2		2	(2-5)
Potentilla erecta	2				2		2	2
Geranium robertianum	7					7	2	2
Lathyrus pratensis	2	2					2	2
Epilobium [spp]				2		2	2	2
Lotus pedunculatus			2		2		2	2
Dryopteris carthusiana				2		2	2	2
Myosotis scorpioides		2			1		2	(1-2)
Arrhenatherum elatius						7	1	7
Juncus conglomeratus						7	1	7
Holcus mollis	3						1	3
Urtica dioica						3	1	3
Phalaris arundinacea	2						1	2
Phleum pratense sens.lat.	2						1	2
Luzula multiflora	2						1	2
Cynosurus cristatus		2					1	2
Galium aparine	2						1	2
Cardamine flexuosa	2						1	2
Epilobium [spp]	2						1	2
Rumex crispus	2						1	2
Epilobium palustre		2					1	2
Ranunculus repens			2				1	2
Epilobium palustre			2				1	2
Festuca ovina agg.			2				1	2
Equisetum arvense				2			1	2
Caltha palustris				2			1	2
Angelica sylvestris						2	1	2
Deschampsia cespitosa						2	1	2
Heracleum sphondylium						2	1	2
Potentilla reptans						2	1	2
Poa trivialis						2	1	2
Rumex obtusifolius		1					1	1
Ranunculus flammula			1				1	1

Survey Area 3: Frequency Table

	Percentage cover in each Quadrat						
	<Q1>	<Q2>	<Q3>	<Q4>	<Q5>	Frequency	Abundance
Lolium perenne	83	63	83	83	42	5	(7-9)
Cynosurus cristatus	30	42	30	30	63	5	(6-8)
Trifolium repens	42	7	30	7	7	5	(4-7)
Holcus lanatus	18	30	30	18	18	5	(5-6)
Agrostis stolonifera	18	2	7	18	7	5	(2-5)
Juncus effusus	9	1	4	4	1	5	(1-4)
Juncus conglomeratus	9	1	4	4	1	5	(1-4)
Anthoxanthum odoratum		18		7		2	(4-5)
Ranunculus repens		2		2		2	2
Festuca rubra agg.				3		1	3
Alopecurus pratensis				2		1	2
Poa pratensis sens.lat.					2	1	2
Dactylis glomerata		2				1	2
Carex ovalis	2					1	2