APPENDIX 3.

Vegetation Characterisation and Monitoring

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Contents

FIGURES

PLATES

1. BACKGROUND

As part of a Defra-funded project to measure carbon and greenhouse gas fluxes across a range of lowland peatland habitats in England and Wales, work was undertaken during Summer 2013 to characterise the different vegetation types at the English sites within which gas flux measurements were made. Measurements of plant species' abundance within the gas flux 'collars', and estimates of the vigour of selected species (as a proxy measurement of biomass) were also made. This work was repeated during Summer 2015 in order to provide a measure of whether (and how much) the vegetation had changed during the course of the project. The two Welsh sites (both on the Anglesey Fens) were surveyed once as part of the project, in Autumn 2014. The sites have since been resurveyed by Natural Resources Wales staff, but as this work was not part of the project it is not reported here.

Seven sites were examined as part of the project:

1) Somerset Levels extensive grassland (SL-EG).
2) Somerset Levels intensive grassland (SL-IG).
3) Wicken Sedge Fen low nutrient semi-natural (EF-LN).
4) Bakers Fen extensive grassland (EF-EG).
5) Chat Moss re-wetted semi-natural bog (MM-RW).
6) Anglesey Fens low-nutrient semi-natural (AF-LN)
7) Anglesey Fens high-nutrient semi-natural (AF-HN)

All gas flux collars were 60 x 60 cm in size. At most sites (SL-EG, SL-IG, EF-LN, EF-EG, AF-LN and AF-HN) there were 6 gas flux collars, which had been split into two sets of three, located in visually different vegetation types. At Chat Moss (MM-RW) there were 9 collars in total, with 3 collars placed in each of three vegetation types.

2. METHODS

2.1 VEGETATION CHARACTERISATION

Initially the vegetation within which each group of gas flux collars was situated, was examined by walking through the area and assessing whether the collar groups had been sited within a relatively uniform stand, and where necessary marking on a site map the rough boundaries of different vegetation types (if present). A representative sample was then recorded within each vegetation stand, using as the basis of sampling a quadrat of a suitable size (i.e. 2 x 2 m for grassland, 4 x 4 m for coarse or species-poor vegetation such as bog vegetation and rush pasture, or 10 x 10 m for species-poor stands of bulky species such as *Phragmites* or *Cladium* reed- or sedge-beds). A record was made of all species of higher plant and bryophyte occurring within each quadrat, and an estimate was made of their percentage cover using the Domin scale[1]. In addition, a record was made of any species present in the stand of vegetation but not within the quadrat (these are known as 'outsiders' and help to give a more accurate representation of the vegetation type as a whole). The locations of the sampling quadrats were not marked permanently, but were recorded using a hand held global positioning device (GPS, nominally accurate to 5 m). In addition, their distance and bearing from the nearest gas flux collar was measured and marked on an annotated site map.

The quadrat data for each site were compiled onto Microsoft Excel spread-sheets, and used to assign the vegetation to a National Vegetation Classification (NVC) plant community or sub-community using a combination of the keys and community descriptions in the published NVC accounts

[1] Domin cover values: **1:** <4% cover, with few individuals. **2:** <4% cover, with several individuals. **3:** <4% cover, with many individuals. **4:** 4-10% cover. **5:** 11-25% cover. **6:** 26-33% cover. **7:** 34-50% cover. **8:** 51-75% cover. **9:** 76-90% cover. **10:** 91-100% cover.

(Rodwell, 1991, *et seq.*; Rodwell *et al.*, 2000), and by inputting the data into MATCH, a vegetation analysis software tool (Malloch, 1992).

Species names follow Stace (2010) for higher plants, and Smith (2004) for bryophytes.

2.2 MONITORING SPECIES COMPOSITION, ABUNDANCE AND VIGOUR

The flux collar locations were permanently marked, and their locations were recorded using a handheld GPS.

The gas flux collars were used as permanent quadrats for the purpose of monitoring the vegetation encompassed by them. Each was divided into 100 sub-units by placing on them a frame subdivided into 6 x 6 cm squares, and the following information was recorded:

1) Within each sub-unit the presence of all higher plants and bryophytes was noted.
2) The percentage cover of each species for the whole collar was estimated by looking vertically down through the collar, or obliquely from the sides of the collars for tall vegetation such as *Phragmites* or *Cladium* reed- or sedge-beds.
3) In each collar, for the three most abundant species the length and maximum width of the largest leaf (or stem for leafless rushes such as *Juncus effusus*) was recorded for up to 10 plants of each species, with material selected to encompass the entire size range observed. Where very few individuals of a species were present, multiple leaves from a single plant were measured. Where there was a choice between assessing the vigour of an abundant but very diminutive species, versus a large robust species with few individuals, the robust species was measured in preference to the small species.

Where tall or robust vegetation was present, the frame sub-divisions had to be 'threaded' through from the sides in order to prevent the vegetation from being pushed aside. In such cases the assessment of species presence within each sub-unit was somewhat subjective due to the height of the vegetation above the frame.

The field data were input onto Microsoft Excel spread-sheets that accompany this report.

3. DATA PRESENTATION

All data have been compiled into separate spread-sheets for each site, as follows:

1) Somerset Levels extensive grassland: 'DPP SL-EG Veg 28-09-2015'.
2) Somerset Levels intensive grassland: 'DPP SL-IG Veg 28-09-2015'.
3) Wicken Sedge Fen low nutrient semi-natural: 'DPP EF-LN Veg 02-10-2015'.
4) Bakers Fen extensive grassland: 'DPP EF-EG Veg 02-10-2015'.
5) Chat Moss re-wetted semi-natural bog 'DPP MM-RW Veg 05-10-2015.
6) Anglesey Fens Low Nutrient: 'DPP AF-LN Veg 09-12-2014'.
7) Anglesey Fens High Nutrient: 'DPP AF-HN Veg 09-12-2014'.

Each spread-sheet includes separate work-sheets for species presence and cover data; plant vigour (biomass) data; quadrat data (including MATCH coefficients); and vegetation descriptions, which also includes an embedded sketch map of the site, indicating locations of flux collars, quadrats, and vegetation zones. The vegetation descriptions are summarised below.

4. SUMMARY OF VEGETATION DESCRIPTIONS

4.1 SOMERSET LEVELS EXTENSIVE GRASSLAND (SL-EG)

MG8 *Cynosurus cristatus* - *Caltha palustris* grassland; with affinities to
MG4 *Alopecurus pratensis* - *Sanguisorba officinalis* grassland; and
M22b *Juncus subnodulosus* - *Cirsium dissectum* fen meadow, *Briza media* - *Trifolium* spp. sub-community.

Broadly speaking the field within which the gas flux measurements were made supports quite diverse grass-, sedge-, rush- and forb-rich wet grassland vegetation, with the taller grasses and forbs forming a layer between 50 and 70 cm high over a lower layer of smaller plants 15-40 cm tall. Although at first glance the vegetation appears quite patchy and visually heterogeneous, it supports similar species composition throughout, but with some local variation. The vegetation is probably best described as a form of MG8 grassland, which is characteristic of periodically inundated land that has been treated in a traditional fashion (particularly as managed water meadows), and is widespread, though localised, in the British lowlands (Rodwell, 1992). However, there are also strong affinities to both MG4 grassland (another type of traditional meadow vegetation on seasonally flooded land), and M22b fen meadow (typically rush-dominated vegetation that is often irrigated by base-rich groundwater and managed by mowing and grazing).

The vegetation seen here lacks certain character species of MG4 (e.g. *Sanguisorba officinalis, Lathyrus pratensis, Lotus corniculatus, Luzula campestris, Primula veris, Ranunculus acris, Silaum silaus, Leucanthemum vulgare* and *Succisa pratensis*) and M22b (e.g. *Angelica sylvestris, Briza media, Carex hostiana, Cirsium palustre, Dactylorhiza fuchsii, Equisetum palustre, Galium uliginosum, Hydrocotyle vulgaris, Hypericum tetrapterum, Juncus subnodulosus, Mentha aquatica, Potentilla erecta* and *Valeriana dioica*). However, many of these species can also be found at low frequency in MG8 grassland, highlighting the complex floristic links between these communities. Further complicating the classification of this vegetation, some typical species of MG8 were also less constant than might be expected, e.g. *Caltha palustris, Cerastium fontanum, Festuca rubra, Poa trivialis,* and *Trifolium repens*.

In general terms, in 2015 the vegetation appeared to have responded to conditions that were drier than in 2013 by a decrease in abundance of species that are generally characteristic of wetter situations, and an increase in abundance of plants that tend to prefer drier conditions. In terms of the analysis of floristic composition undertaken using the MATCH software, these changes appear to have resulted in a higher coefficient for MG8 in quadrat 1 compared with the 2013 data. For the adjacent quadrat 2, the vegetation has closer affinities to all of MG4, MG8 and M22b (i.e. less distinction between them) than in 2013. Data from quadrat 3, in the north of the field (close to the weather station), were similar to those from 2013 in that the strongest affinity was to MG4, closely followed by MG8. However, MG5 grassland sub-communities were also given high coefficients, replacing the M22b fen meadow of 2013; MG5 is a mesotrophic grassland type that is typical of drier meadows that have been treated in a traditional manner by mowing and aftermath (post-mowing) grazing.

These results suggest firstly that short term variations in local environmental conditions, such as drier weather, can have a marked influence on plant species abundance, and secondly that the vegetation types described in the National Vegetation Classification system as MG4, MG8 and M22b have close floristic links that can make it difficult to differentiate between them in some circumstances.

Figure 1 shows a sketch map of the monitoring site, and Plates 1 and 2 show example photos of two collars to illustrate the nature of the vegetation at this site.

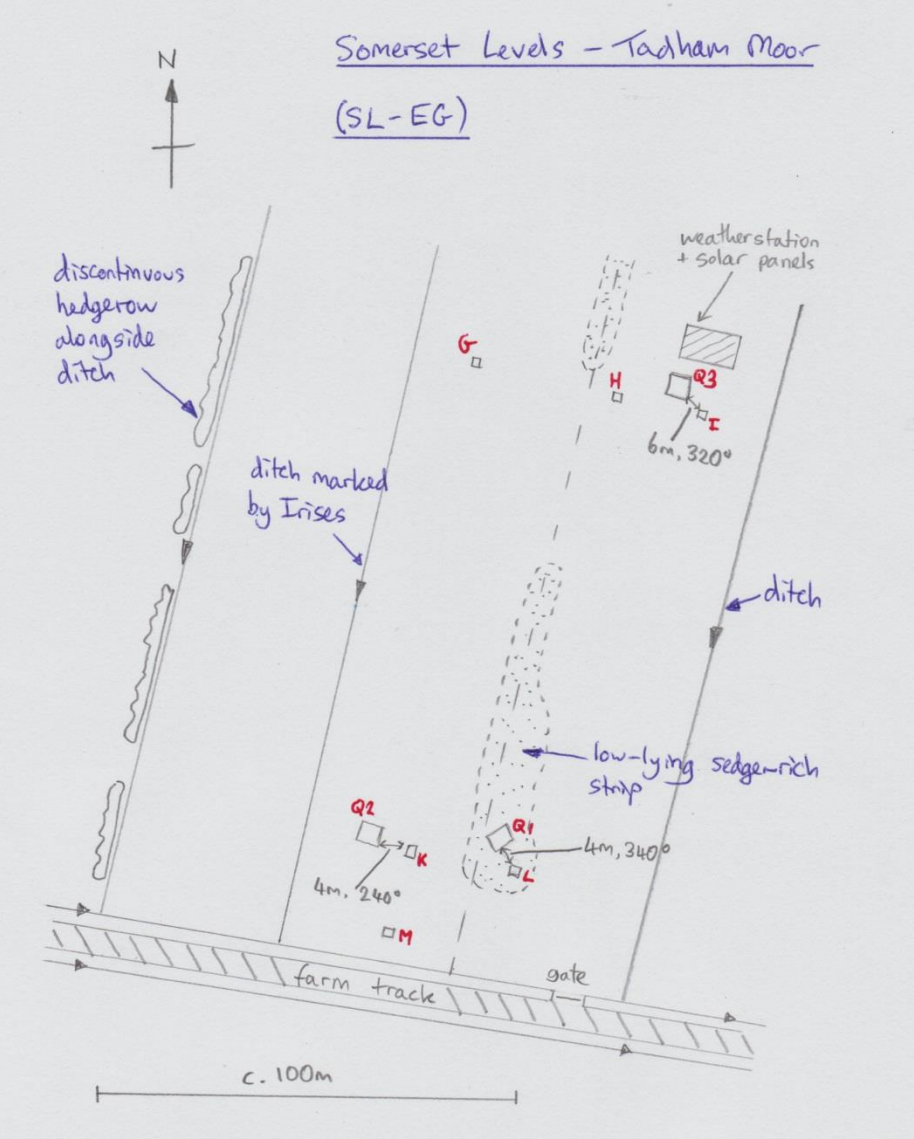

Figure 1. Sketch map of the SL – EG monitoring site

Plate 1. Collar K

Plate 2. Collar I

4.2 SOMERSET LEVELS INTENSIVE GRASSLAND (SL-IG)

MG7a *Lolium perenne-Trifolium repens* leys

This field is a re-seeded meadow, managed for silage production as an arable-ley rotation. In 2013 the whole field had been sown with a rye-grass – clover mix, and was dominated by vigorous *Lolium perenne* approximately 10-20 cm tall, but with small patches of bare soil present between grass clumps that allowed pioneer species to seed in. In 2015, the western half of the field had been turned over to maize production, and the flux collars E, I and J had to be abandoned. New collars (B, C and D) were set in place approximately 100 m to the north of the remaining collars F, G and H.

Within the remaining intensive grassland area, other plant species included frequent *Cerastium fontanum, Poa annua, Ranunculus repens, Taraxacum* agg., and *Trifolium repens*. Also present occasionally were *Capsella bursa-pastoris, Cardamine flexuosa, Chenopodium* sp., *Elytrigia repens, Holcus lanatus, Juncus bufonius, Matricaria chamomilla, Persicaria maculosa, Poa trivialis, Rumex obtusifolius, Sonchus asper*, and *Urtica dioica*.

The vegetation as recorded in 2015 was essentially the same in character as that seen in 2013, and it can clearly be assigned to the MG7a grassland community (a type of reseeded and intensively managed lowland grassland).

Figure 2 shows a sketch map of the monitoring site, and Plates 3 and 4 show example photos of two collars to illustrate the nature of the vegetation at this site.

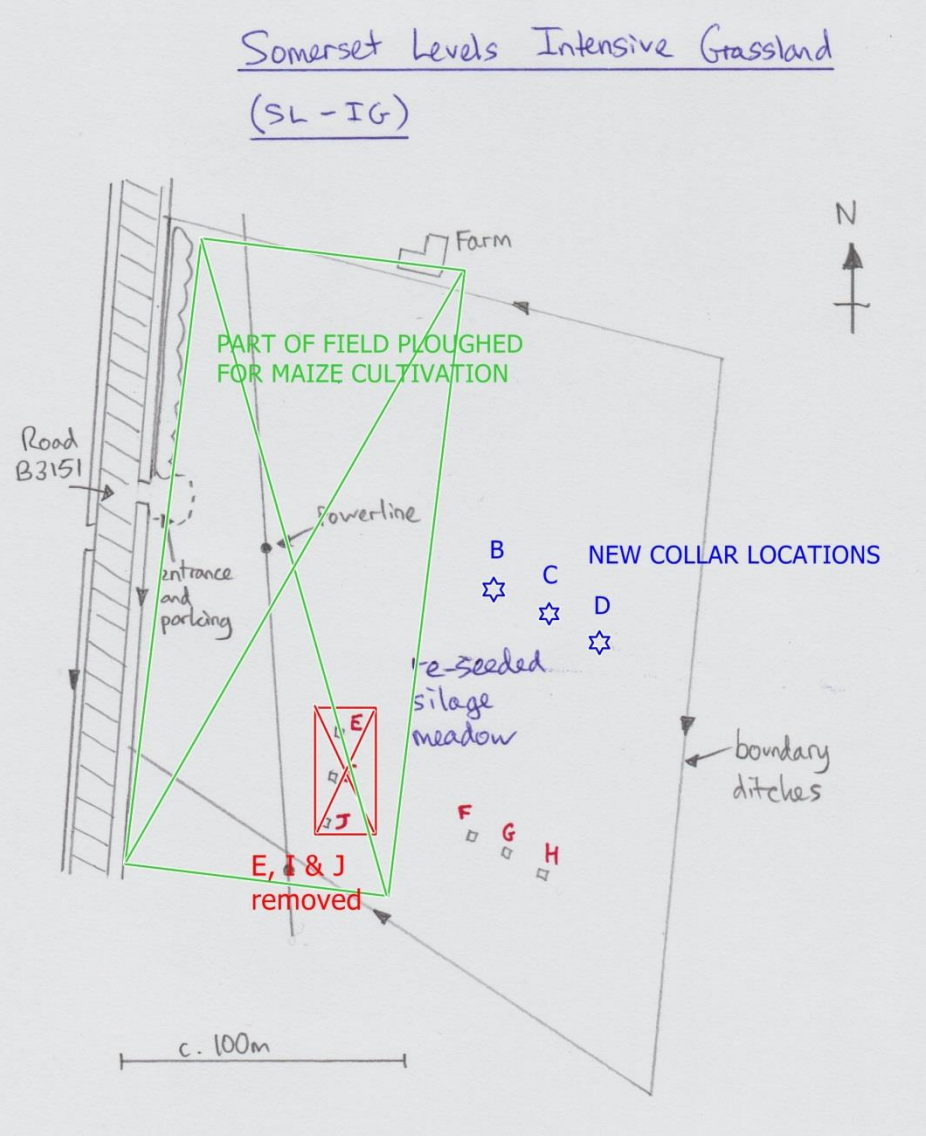

Figure 2. Sketch map of the SL – IG monitoring site

Plate 3. Collar F

Plate 4. Collar B

4.3 WICKEN SEDGE FEN LOW NUTRIENT SEMI-NATURAL (EF-LN)

S24c *Phragmites australis* - *Peucedanum palustre* tall-herb fen, *Symphytum officinale* sub-community

Since the initial survey in 2013 the original bank of solar panels that was situated between the two clusters of flux collars had been demolished, and a larger bank of panels had been constructed approximately 7 m north of Collar 1, about 8 m east of the flux tower, and within the area originally sampled by quadrat 2.

Collars 1-3 represent vegetation to the north and west of the new solar panels, while collars 4-6 represent vegetation to the south of the solar panels. Superficially the two areas appeared slightly different, with the southern area dominated by *Phragmites australis*, and the northern section dominated by a mixture of *Cladium mariscus* and *Phragmites australis*. As a whole the vegetation surrounding the experimental areas was a patchwork of these two 'types'. However, upon examination, floristically the vegetation of these two areas was very similar, and they can both be assigned to the S24c tall-herb fen community. In general the vegetation reached a maximum height of approximately 2.5 m, with subordinate layers of smaller herbs, seedlings and ferns, and a dense layer of persistent litter with scattered bryophytes.

The northern and western area was dominated by a mixture of *Cladium mariscus* and *Phragmites australis*, with abundant *Phalaris arundinacea*, and occasional *Calamagrostis canescens, Calystegia sepium, Carex riparia, Galium palustre, Iris pseudacorus, Lysimachia vulgaris, Stachys palustris, Symphytum officinale* and *Thalictrum flavum*. Other species scattered very sparsely through the stand included *Calamagrostis epigejos, Carex acutiformis, Filipendula ulmaria, Frangula alnus* saplings, *Juncus subnodulosus, Lythrum salicaria, Peucedanum palustre, Salix cinerea* saplings, *Scutellaria galericulata* and *Viburnum opulus*. At the time of survey the upper layer of *Cladium mariscus* and *Phragmites australis* was roughly 2 - 2.5 m tall, over smaller grasses, sedges and tall forbs 1 - 1.5 m tall, seedlings 0.5 - 1 m tall, and a dense litter layer with scattered *Calliergonella cuspidata*.

The southern area was overwhelmingly dominated by *Phragmites australis,* with locally frequent *Phalaris arundinacea, Solanum dulcamara, Symphytum officinale* and *Thelypteris palustris.* Scattered throughout the stand were *Calamagrostis canescens, Calamagrostis epigejos, Carex riparia, Cladium mariscus, Galium palustre, Juncus subnodulosus, Lysimachia vulgaris,* and *Stachys palustris,* with rarely *Carex panicea* and *Ranunculus flammula.* At the time of survey the upper layer of *Phragmites australis* was approximately 2 - 2.5 m tall, over a subordinate layer of smaller grasses, tall herbs and scrambling plants 0.5 - 1.8 m tall, a lower layer of seedlings and ferns 0.1 - 0.5 m tall, over a dense layer of persistent litter with scattered *Calliergonella cuspidata*.

Some quite marked differences were noted when comparing the vegetation found in the collars in 2013 with 2015. Broadly speaking, for most collars there had been a net increase in species-richness and a change in species composition, involving the subordinate species of grasses, sedges and forbs present in the surrounding vegetation (e.g. *Agrostis stolonifera, Calamagrostis canescens, Calamagrostis epigejos, Galium palustre, Lythrum salicaria, Phalaris arundinacea* and *Stachys palustris*). In some collars this also involved an expansion in cover of subordinate species such as *Juncus subnodulosus* and *Iris pseudacorus*, and for collars 4 to 6 there was a noticeable increase in cover of the dominant *Phragmites australis*. At the same time, it was noticed that the overall height of the plants within the collars was much lower than that of the surrounding vegetation (approximately 150-200 cm compared with 200-250 cm, respectively). It is likely that with such tall vegetation, the process of repeatedly placing the flux chambers over each collar caused some flattening of the vegetation. Simultaneously, the trampled vegetation surrounding the collars allowed increased light penetration to the collar vegetation, which may have increased the ability of the subordinate species to germinate seed and to grow more robustly than the adjacent unaffected stands of vegetation. Despite these changes, it is considered that the collar vegetation in 2015 was adequately represented by the sampled adjacent stands of S24c tall-herb fen vegetation.

Figure 3 shows a sketch map of the monitoring site, and Plate 5 shows an example photo of collar 1 to illustrate the nature of the vegetation at this site.

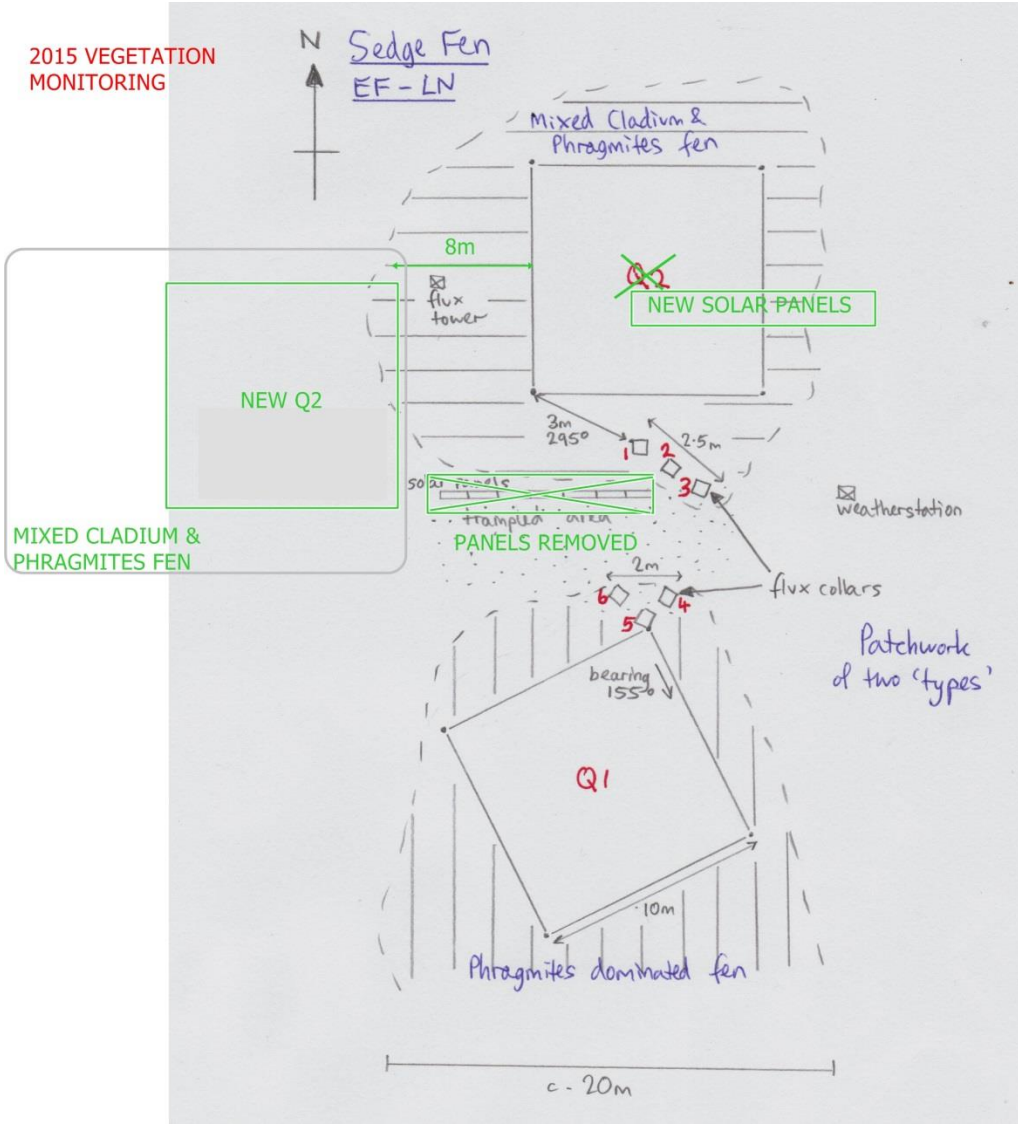

Figure 3. Sketch map of the EF – LN monitoring site

Plate 5. Collar 3

4.4 BAKERS FEN EXTENSIVE GRASSLAND (EF-EG)

Affinities to:
MG1a *Arrhenatherum elatius* grassland, *Festuca rubra* sub-community;
MG7D *Lolium perenne - Alopecurus pratensis* grassland;
OV25 *Urtica dioica - Cirsium arvense* community;
MG10b *Holcus lanatus - Juncus effusus* rush pasture, *Juncus inflexus* sub-community.

The two fields within which the gas flux collars were sited essentially support species-poor, disturbed, damp flood-plain pasture. Their management history is not known in detail, but it appears that they have been agriculturally improved through drainage and addition of fertiliser, and managed intensively for arable production. Recently they have been allowed to flood regularly and are now grazed extensively by cattle and horses. As a consequence of their previous intensive management and disturbance they support species-poor grassland that, particularly for the eastern field (Collars 1 to 3), is difficult to assign clearly to particular NVC plant communities.

Flux collars 1 to 3 were located in species-poor damp grassland, quite close to the weather station and flux tower enclosure, and very close to a ditch running from south-west to north-east that is marked by a strip of *Phragmites australis*. The wet grassland close to the ditch was dominated by *Agrostis stolonifera*, but this graded to the east (away from the ditch) into patches of slightly drier grassland of similar floristic composition but with greater cover of *Arrhenatherum elatius, Cirsium arvense, Dactylis glomerata* and *Holcus lanatus*. The vegetation consisted of two layers: taller grasses and large forbs (60 to 120 cm tall), over various smaller forbs (20 to 40 cm tall); in 2015 the vegetation was very similar in composition to 2013, but appeared slightly taller and more robust.

This vegetation appeared to have its strongest affinities to MG1a, a mesotrophic grassland community that is typically species-poor and widespread on rich soils that are only sporadically mown or grazed; but it also had some similarities to OV25, a community of open vegetation that is characteristic of disturbed nutrient-rich soils in poorly managed meadows and pastures; and to MG7D, a form of rye-grass silage meadow typical of moist alluvial soils.

It should be noted that, because cattle have repeatedly trampled Collars 1-3, their locations had changed since 2013 (although Collar 1 appeared to be very close to its original position), and the collars themselves were absent during the 2015 visit. While their locations were made roughly visible by marks in the ground, it is considered likely that there will have been a slight location error in the order of approximately 5 cm in any direction. Both of these factors could influence the comparability of the cover and biomass data between 2013 and 2015. The location of Quadrat 1 was approximately relocated by its 2013 grid reference and in reference to the location of Collar 1.

Collars 4 to 6 were situated 90 m to the south-west, across the ditch in the adjacent field. Much of this field supported similar damp grassland as described above, but it graded to the west and north-west into an area of rush pasture that surrounds a large muddy hollow that had been artificially deepened in places. The collars were situated in the rush pasture, which is characterised by clumps of *Juncus inflexus* within a matrix of *Agrostis stolonifera*, with frequent *Poa trivialis, Carex otrubae,* and *Juncus subnodulosus*. Other species scattered at low cover through the sward included *Arrhenatherum elatius, Eleocharis palustris, Glechoma hederacea, Holcus lanatus, Phragmites australis, Plantago major, Ranunculus repens, Rumex crispus* and *Urtica dioica.* The vegetation was slightly more robust than in 2015, consisting of a discontinuous layer of rushes 60 to 110 cm tall, over lower-growing herbage 10 to 25 cm tall.

The vegetation in this area had changed little since 2013; it is best assigned to the MG10b rush pasture community, to which it shows the greatest resemblance.

Figure 4 shows a sketch map of the monitoring site, and Plates 6 and 7 show example photos of two collars to illustrate the nature of the vegetation at this site.

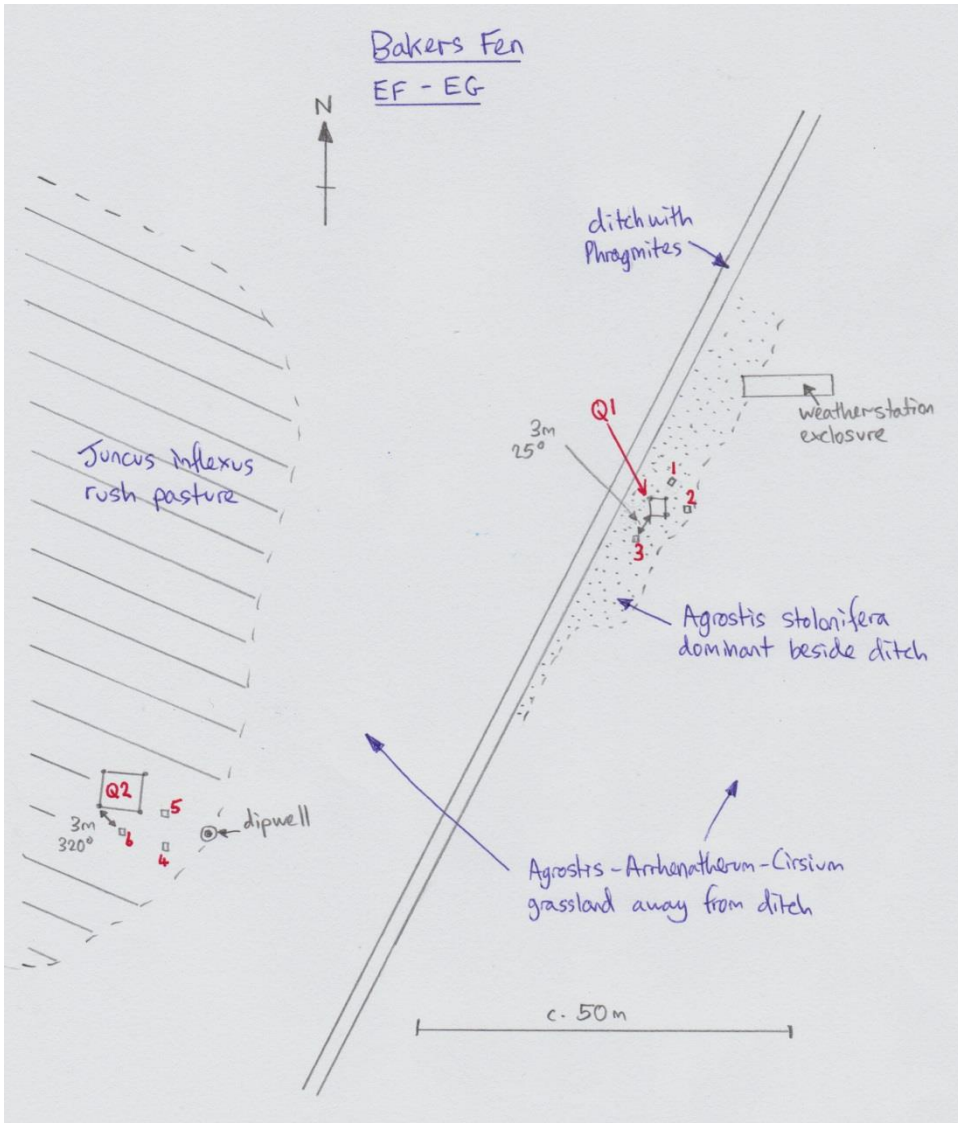

Figure 4. Sketch map of the EF – EG monitoring site

Plate 6. Collar 3

Plate 7. Collar 6

4.5 CHAT MOSS RE-WETTED SEMI-NATURAL BOG (MM-RW)

Zone A - Bund

H9e *Calluna vulgaris* – *Deschampsia flexuosa* heath, *Molinia caerulea* sub-community.
A bund runs north-south beside the weather-station, and along the eastern edge of the bund were located collars C1 to C3 (see Zone B, below). The bund is roughly 2 m wide, and at the time of survey its top was raised approximately 50 to 100 cm above the level of the vegetation within the bund. The bund is constructed of peat, with plastic piling inserted along it at various intervals, and the peat was damp at the time of survey (following several weeks of dry weather). It supported species-poor vegetation (see quadrat 1) that was dominated by tussocks of *Molinia caerulea* (forming a layer c. 60 to 80 cm tall), scattered *Betula pubescens* saplings (approximately 100 to 150 cm) and *Calluna vulgaris* shrubs (20 to 45 cm tall), with occasional bryophytes such as *Campylopus introflexus*. This vegetation is best considered as a very species-poor form of the H9e damp heath community.

Zone B – Lower margin of the bund

Affinities to:
M18a *Erica tetralix* – *Sphagnum papillosum* raised and blanket mire, *Sphagnum magellanicum* – *Andromeda polifolia* sub-community;
M19a *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire, *Erica tetralix* sub-community

Collars C1 to C3 were situated on the lower margin of the bund where it grades into the adjacent rewetted area. Whilst dominated by *Molinia* vegetation with *Calluna, Myrica gale* and occasional *Betula pubescens* saplings (see quadrat 2), this zone also included *Eriophorum angustifolium* and *Eriophorum vaginatum*, with scattered *Sphagnum capillifolium, Sphagnum fimbriatum, Sphagnum papillosum,* and *Sphagnum subnitens,* and notably some *Andromeda polifolia*. The shrubs had grown since 2013, reaching 80 to 120 cm tall in 2015. Where not trampled, the *Molinia* was 50 to 100 cm tall, forming a layer over the cotton-grasses (30 to 60 cm tall) and the bryophytes (approximately 1 to 10 cm tall). Although still quite disturbed, this area appeared to have become more diverse since 2013, and its character had clear affinities to the raised and blanket mire communities M18a and M19a. The collar vegetation showed very little change from 2013 apart from a slight increase in cover of *Eriophorum angustifolium* and *Eriophorum vaginatum.*

Zone C – Sphagnum lawn

M2 *Sphagnum cuspidatum / recurvum* bog pool community.

Inside the bund the re-wetted ground, which lies roughly 100 cm below the bund top, was very wet, and supported a mosaic of vegetation types. Adjacent to the bund was a narrow strip of low-growing *Sphagnum cuspidatum*, mingled with scattered *Eriophorum angustifolium, Eriophorum vaginatum* and *Molinia caerulea* (see quadrat 4). The graminoids had grown since 2013, and in 2015 they formed a discontinuous layer approximately 20 to 40 cm tall, over the bryophyte layer (which was roughly 1 to 5 cm tall). This vegetation can be considered to be a species-poor form of the M2 bog pool community.

Flux collars C1S, C2S and C3S were situated within this zone, and they showed some changes from 2013, although these were not consistent between collars. For example, *Eriophorum angustifolium* increased its cover in C1S and C3S, but declined in C2S. *Eriophorum vaginatum* increased its cover in C2S, but declined in C3S. Likewise, *Sphagnum cuspidatum* increased its cover in C1S, but declined in C3S.

Zone D – Molinia and cottongrass bog

Affinities to:
M19a *Calluna vulgaris – Eriophorum vaginatum* blanket mire, *Erica tetralix* sub-community;
M20 *Eriophorum vaginatum* blanket mire.

Much of the rest of the rewetted area within the bund supported tussocky species-poor vegetation characterised by *Molinia caerulea, Eriophorum angustifolium* and *Eriophorum vaginatum*, with abundant *Sphagnum fimbriatum* and frequent *Sphagnum subnitens*. The tussocks formed a layer roughly 60 to 80 cm above the elevation of the runnels between them, which were generally litter-filled and lacking live vegetation, although with a little *Sphagnum*. Parts of this zone were more open, with the same species-composition, but with more bare peat and less abundant *Sphagnum*. As noted above, previous drainage and recent restoration and rewetting operations have led to the development of species-poor vegetation that is difficult to assign to a single NVC community, but which has weak affinities to the blanket mire communities M19a & M20.

Collars B1, B2 and B3 were situated in this zone, adjacent to the boardwalk, and they displayed some changes in cover between 2013 and 2015. *Eriophorum angustifolium* increased in collar B3 but decreased in B1; *Eriophorum vaginatum* increased in collar B2 and B3; *Molinia caerulea* increased its cover in B2; and *Sphagnum fimbriatum* increased its cover in collar B3.

Figure shows a sketch map of the monitoring site, and Plates 8, 9 and 10 show example photos of three collars to illustrate the nature of the vegetation at this site.

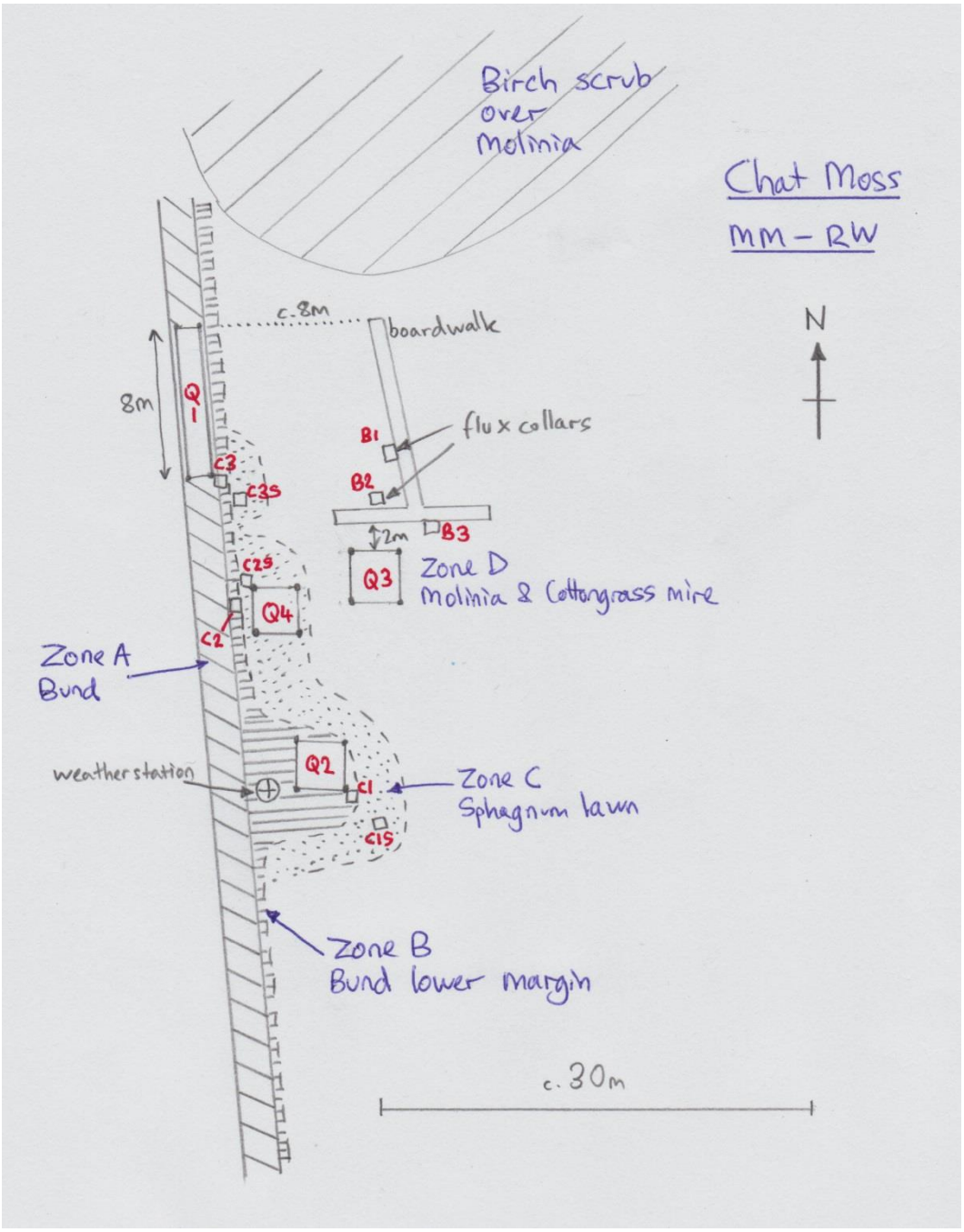

Figure 5. Sketch map of the MM – RW monitoring site

Plate 8. Collar C1

Plate 9. Collar C1S

Plate 10. Collar B3

4.6 ANGLESEY FENS LOW NUTRIENT SEMI-NATURAL (AF-LN)

The vegetation of Cors Erddreiniog National Nature Reserve has previously been surveyed and characterised in detail in 2008 by Countryside Council for Wales staff (now Natural Resources Wales). However, considering the small scale of the plots examined as part of this project, it was considered worthwhile examining the vegetation within which the flux collars are situated, and comparing this with the previously mapped vegetation boundaries. This work was undertaken at both of the study sites located within the reserve.

The vegetation of Cors Erddreiniong was mapped by Countryside Council for Wales in 2008. The compartment within which Collars B1-3 and J4-6 are situated was considered to include a range of mire types. In general the most species-rich and base-rich communities were found in the north and east, grading to the south and west into less diverse acidic vegetation types. M13b was mapped along parts of the eastern edge, grading into broad stands of M22a and M22b, with small patches of M13b near the centre of the compartment embedded within M22b vegetation and, to a lesser extent, within large stands of M25a and species-poor M25 toward the south-west. In the far north-east two narrow strips of M10b were mapped, embedded within a mixture of M22a, M22b and M24b.

The gas flux collars are situated in the northern part of the compartment, approximately 25 metres from an empty wooden fenced enclosure.

Collars B1-3: Sedge-rich soakway vegetation

M13b *Schoenus nigricans - Juncus subnodulosus* mire, *Briza media - Pinguicula vulgaris* sub-community; with affinities to M10 *Carex dioica – Pinguicula vulgaris* mire.

Collars B1-3 are situated within relatively low-growing (*c*. 10-40 cm tall) sedge-, rush- and forb-rich vegetation that is embedded within taller, more robust fen vegetation dominated by *Juncus subnodulosus* (probably M22 fen meadow, but not sampled here). The low-growing vegetation is situated in an area mapped by CCW as M22, but has the appearance of a damp soakway or flushed zone, and may be a south-western extension of the nearby areas mapped as M10b. The vegetation is characterised by an abundance of sedges (*Carex flacca, C. lasiocarpa, C. lepidocarpa, C. panicea*) and the bryophyte *Campylium stellatum*, with abundant but stunted *Juncus subnodulosus*, and frequent (but low-growing) *Molinia caerulea* and *Myrica gale*. A range of other species are present at lower cover, including the bryophytes *Aneura pinguis*, *Bryum pseudotriquetrum*, *Ctenidium molluscum* and *Fissidens adianthoides*; graminoids such as *Agrostis stolonifera*, *Eriophorum angustifolium, Juncus articulatus, J. bulbosus*, and *Phragmites australis*; and a range of forbs suchs as *Anagallis tenella, Angelica sylvestris, Centaurea nigra, Epipactis palustris, Eupatorium cannabinum, Lythrum salicaria, Pedicularis palustris, Pinguicula vulgaris, Potentilla erecta, Triglochin palustre* and *Valeriana officinalis*. Whilst this stand has affinities to M10, its composition appears more closely allied with M13b, despite the lack of *Schoenus nigricans*.

Collars J4-6: Fen meadow with *Juncus subnodulosus* and *Myrica gale*

Affinities to both M13b *Schoenus nigricans - Juncus subnodulosus* mire, *Briza media - Pinguicula vulgaris* sub-community, and M24 *Molinia caerulea - Cirsium dissectum* fen meadow.

Collars J4-6 are located in more robust (*c.* 30-60 cm tall) and less diverse fen vegetation to the south-west of Collars B1-3, on ground that is slightly drier than the soakway area, in a location that appears to correspond to a transition between stands mapped by CCW as M13b, M22b, and M25a. The vegetation is dominated by *Juncus subnodulosus*, with abundant *Carex lasiocarpa, C. panicea, Molinia caerulea* and *Myrica gale*. Small quantities of bryophytes are present (e.g. *Calliergonella cuspidata, Calypogeia fissa, Campylium stellatum, Kindbergia praelonga, Rhizomnium pseudopunctatum, Sphagnum fimbriatum, S. palustre* and *S. subnitens*), and a range of other forbs, graminoids and sub-shrubs are present at low cover, including *Angelica sylvestris, Cirsium palustre, Cladium mariscus, Drosera rotundifolia, Dryopteris carthusiana, Erica tetralix, Eupatorium cannabinum, Hydrocotyle vulgaris, Lythrum salicaria, Pedicularis palustris, Rubus fruticosus* and *Valeriana officinalis*. The sampled vegetation appears to have strongest affinities with both M13 and M24 communities; the affinity with M24 is perhaps understandable, since this area is some distance from the base-rich seepages supporting extensive M13 stands along the eastern margins of the

compartment than Collars B1-3, and the compartment may have suffered some drainage in the past; M24 vegetation is often a component of base-rich fen that has experienced reduced irrigation from base-rich springs and seepages (Wheeler *et al*., 2009), with consequent loss of species-richness and an increased occurrence of more 'acidic' species such as *Sphagnum* mosses and ericaceous shrubs.

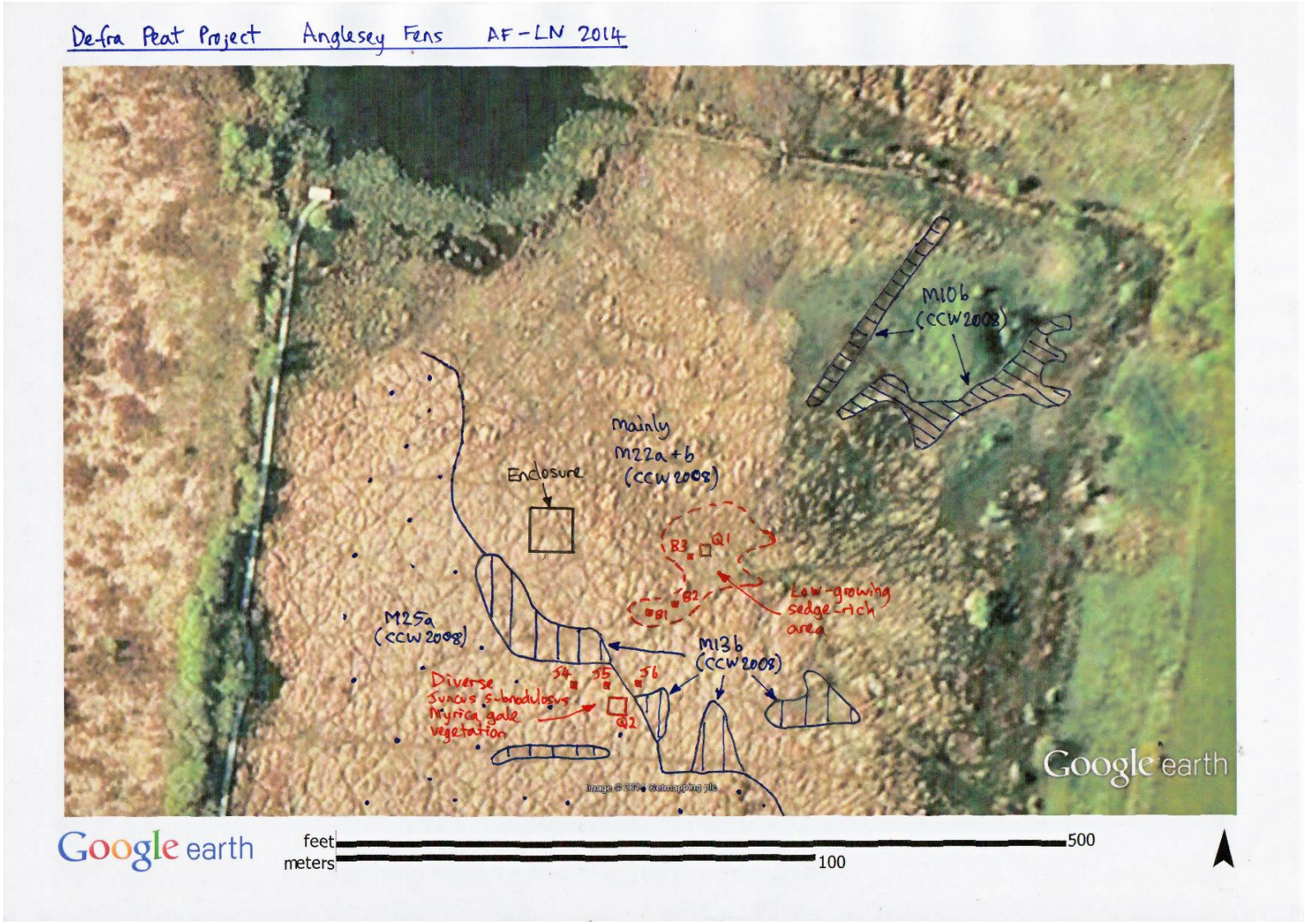

Figure 6. Sketch map of the AF – LN monitoring site, overlaid on aerial photograph

4.7 ANGLESEY FENS (CORS ERDDREINIOG) – HIGH NUTRIENT (AF-HN)

The compartment within which Collars C4 - C6 and PM4 - PM6 are situated is crossed east-west by a boardwalk. To the south of the boardwalk the wetland vegetation is characterised by an abundance of *Molinia caerulea*, *Myrica gale*, *Phragmites australis*, and dense patches of *Cladium mariscus*. Countryside Council for Wales mapped this area in 2008 as comprising mainly species-poor M25 mire vegetation, with patches of M25a mire, 'Cladio-Molinietum a', S2a swamp and M25c mire vegetation.

Approximately 200 m east of the pylon tower on the north-western edge of the compartment, a small boardwalk runs south from the main boardwalk for about 30 m to an enclosure with a gas flux tower and solar panel bank. Collars C4-6 are situated roughly 15 m north-west of the enclosure close to a small mapped stand of 'Cladio-Molinietum a', that is embedded within species-poor M25. From the enclosure the small boardwalk continues south-westwards for approximately 25 m to Collars PM4-6, which appear to be situated very close to the approximate boundaries between small mapped stands of 'Cladio-Molinietum a' and M25a vegetation, embedded within species-poor M25, although these stands were not clearly evident in the field at the time of this survey.

'Cladio-Molinietum a' and 'Cladio-Molinietum b' vegetation have been described in an internal report by CCW (2009). These are considered to represent variants of the Cladio-Molinietum as described by Wheeler (1980).

Cladium mariscus-dominated fen

‘Cladio-Molinietum a’

The vegetation containing Collars C4-6 is very species-poor, being dominated by *Cladium mariscus*, forming an upper layer (*c.* 200 cm tall) with abundant *Phragmites australis*, over a lower layer (*c.* 40-60 cm tall) of abundant *Molinia caerulea* and *Myrica gale* and occasional plants of *Carex acutiformis*, *Dryopteris carthusiana*, *Eupatorium cannabinum*, *Lythrum salicaria*, and *Potentilla erecta*, with scattered patches of the bryophytes *Kindbergia praelonga* and *Mnium hornum* on tussock sides. Adjacent to the boardwalk there is a little *Juncus subnodulosus*, but this is not considered to be a typical component of the sampled stand. This vegetation does not fit into the NVC scheme, and is thought to represent an example of the 'Cladio-Molinietum a' vegetation type.

Phragmites-Molinia-Myrica fen

‘Cladio-Molinietum a’ / species-poor M25

Collars PM4-6 are located in very species-poor vegetation that is characterised by tall (*c.* 200 cm) *Phragmites australis* over a subordinate layer (*c.* 40-60 cm tall) of abundant *Molinia caerulea* and *Myrica gale*. Mingled with these dominants are a scattering of *Carex lasiocarpa, Cladium mariscus, Dryopteris carthusiana, D. dilatata, Erica tetralix, Lythrum salicaria, Narthecium ossifragum, Potentilla erecta, Rubus fruticosus*, with the bryophytes *Hypnum jutlandicum* and *Kindbergia praelonga* occasional on tussock sides. The species-composition of this stand very similar to that of the *Cladium* stand, with the main differences being the relative abundance of *Phragmites* (high cover here) and *Cladium* (very low cover here), plus the presence at very low cover here of *Erica tetralix* and *Narthecium ossifragum*. The latter two species give this some affinity to 'Cladio-Molinietum b', although they are probably not at high enough cover. It is likely that this stand is a form of 'Cladio-Molinietum a', although alternatively it might be considered to be a form of species-poor M25 mire.

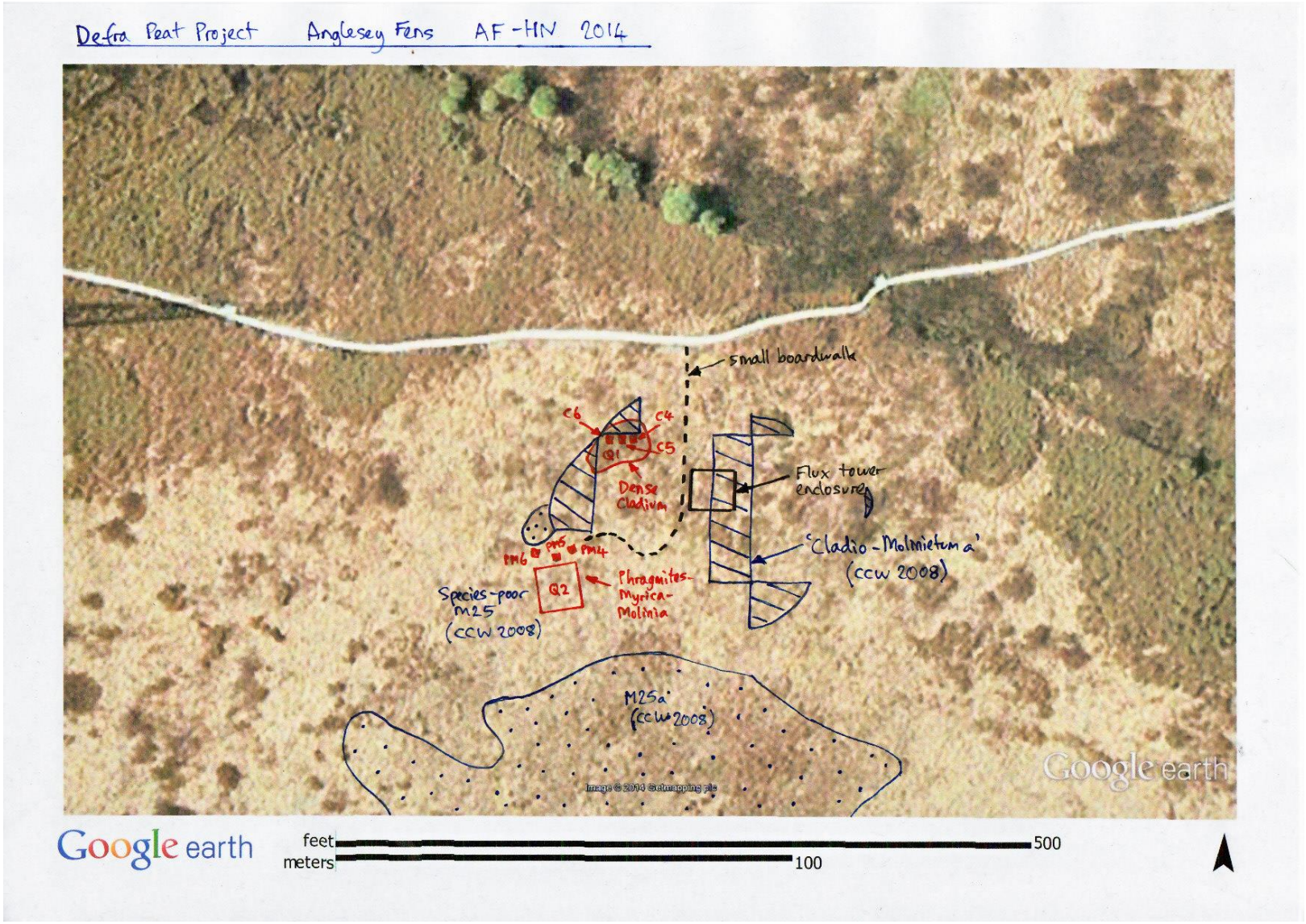

Figure 7. Sketch map of the AF – HN monitoring site, overlaid on aerial photograph

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