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Greater Cambridge Partnership

CAMBOURNE TO CAMBRIDGE

Environmental Statement
Technical Report 5: Ecology, Appendix 5.4:
Botanical Survey Report (Draft)

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Greater Cambridge Partnership

Cambourne to Cambridge

Botanical Survey Report (Draft)

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1   Introduction

1.1   Project Background

1.1.1.   The Cambourne to Cambridge project (C2C) is a proposed new 13.6km public transport route linking Cambourne and Cambridge, hereafter referred to as the 'Scheme'. It will include a dedicated busway serving communities in Cambourne and the proposed Bourn Airfield development, as well as in Hardwick, Coton and the West Cambridge campus. A service road, to be used as a path for active travel, particularly by cyclists and pedestrians, will run alongside the busway. A new travel hub will be provided at Scotland Farm.

1.1.2.   Scheme details are provided in the main report to the Environmental Statement (ES).

1.2   Ecological Background

1.2.1.   The recommendation for specialist botanical surveys to inform the Scheme was made as part of a Phase 1 habitat survey undertaken in 2017 (Cambridge Ecology, 2017). A mosaic of terrestrial and aquatic habitats is present which provide the necessary conditions to support notable plant communities was identified.

1.2.2.   Cambridge Ecology subsequently undertook a National Vegetation Classification (NVC) survey of semi-natural woodland, unimproved and species rich semi-improved grassland, as well as an arable field margin survey during 2021 (Cambridge Ecology, 2021). The NVC is a system of classifying natural habitat types in Great Britain according to the vegetation they contain. These habitats were identified for further survey due to their importance as either Cambridgeshire and/or UK BAP habitats and Habitats of Principal Importance under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006). A number of the habitats recorded through the 2021 NVC surveys are no longer within the Scheme boundary and are therefore no longer relevant to the Scheme. A summary of the NVC survey findings relevant to the current Scheme boundary is presented below.

1.2.3.   Open Mosaic Habitats on Previously Developed Land was recorded within the 2021 NVC surveys, particularly in areas associated with the dualling of the A428. This habitat was recorded within areas of recently disturbed ground near to the balancing pond south of the A428 and north of St Neots Road.

1.2.4.   Three grassland communities were referenced in the 2021 NVC survey report which were considered likely to be Lowland Meadow; this being a Habitat of Principal Importance under the NERC Act. These grasslands were assessed to closely resemble the following grassland communities:

- MG1d *Arrhenatherum elatius* grassland, *Pastinaca sativa* sub-community;
- MG1e *Arrhenatherum elatius* grassland, *Centaurea nigra* sub-community; and
- MG5b *Centaurea nigra – Cynosurus cristatus* grassland, *Galium verum* sub-community.

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1.2.5. The grassland types were associated with recently disturbed land along the embankments of the A428 and near to the Hardwick roundabouts. It was considered likely that the assemblage of plant species may have arisen from the use of seed mixes.

1.2.6. Two woodland communities were recorded during the 2021 NVC surveys, these included the following:

- W8a *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland, Pri*mula vulgaris – Glechoma hederacea* sub-community; and
- W8d *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland, *Hedera h*elix sub-community.

1.2.7. As part of these detailed surveys, an assessment for important arable field margins was also undertaken. No important arable field margins were recorded within the areas surveyed.

1.2.8. An assessment of grasslands against the County Wildlife Site (CWS) Criteria was also undertaken as part of the NVC report. A summary of this assessment relevant to the current Scheme boundary is provided below.

1.2.9. Most surveyed grassland sites contained multiple indicator species set out within the Selection Guidelines for County Wildlife Sites in Cambridgeshire and Peterborough. Key sites with a diverse assemblage of grassland indicator species above the threshold for CWS selection include:

- Childerley Gate (Site A) – An area of disturbed ground adjacent to woodland, north of Wellington Way and South of St Neots Road; and
- A428 Western Balancing Ponds (Sites B & D) – described in Section 1.2.3, and A428 road verges and banks (Site C) – Described in Section 1.2.5.

1.2.10. Cambridge Ecology experienced access constraints preventing the survey of all relevant habitats within the Scheme. Additionally, the Scheme boundaries have changed since their surveys in 2021, resulting in new habitats requiring survey.

1.3 Brief and Objectives

1.3.1. WSP UK Ltd was commissioned by Greater Cambridge Partnership (GCP) to undertake botanical surveys and a report, with the following objectives:

- Undertake NVC surveys and compile species lists describing the main vegetation communities within the development and mitigation areas;
- Identify important arable field margins; and
- Provide an evaluation of the value of the plant communities surveyed.

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2 Relevant Legislation

2.1.1. This report has been compiled with reference to the following relevant nature conservation legislation, from which the protection of sites, habitats and species is derived in England.

- The Natural Environment and Rural Communities (NERC) Act 2006; and
- The Wildlife and Countryside Act 1981 (as amended).

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3 Methodology

3.1 Survey Area

3.1.1. The Survey Area was selected by identifying areas within the Scheme that:

- Consisted of habitat types identified in the 2017 Phase habitat survey as having conservation value;
- Would likely be directly impacted by the Scheme; and
- Had not been surveyed by Cambridge Ecology.

3.1.2. The Survey Area is illustrated in **Annex 5.4.1** and consisted a 0.7ha area for the NVC survey and a total of 0.65km arable field margins.

3.2 National Vegetation Classification Survey

3.2.1. There was no priority woodland within the Survey Area which required NVC. Therefore, only grassland NVC methodologies were required. The methodology employed for the NVC surveys followed the methods outlined in British Plant Communities (Rodwell et al., 1992).

3.2.2. Homogeneous stands of vegetation were first identified using visual inspection and surveyor experience. Sample quadrats were then located in these homogeneous areas. This inevitably involved some surveyor bias but avoided problems of the arrangement of random samples and incorporating obvious vegetation boundaries (ecotones) or unrepresentative floristic features.

3.2.3. To survey the grassland, five 2m by 2m quadrats were used.

Measuring Abundance

3.2.4. Within each quadrat a quantitative measure of the abundance of each species of vascular plant, bryophyte and macro-lichen was recorded using the Domin scale. Cover was assessed by eye as a vertical projection on to the ground of all live, above-ground parts of the plants within the quadrat. The Domin scale categories are presented below:

- Cover of 91-100% is recorded as Domin 10;
- Cover of 76-90% is recorded as Domin 9;
- Cover of 51-75% is recorded as Domin 8;
- Cover of 34-50% is recorded as Domin 7;
- Cover of 26-33% is recorded as Domin 6;
- Cover of 11-25% is recorded as Domin 5;
- Cover of 4-10% is recorded as Domin 4;
- Cover of <4% with many individuals is recorded as Domin 3;
- Cover of <4% with several individuals is recorded as Domin 2; and
- Cover of <4% with few individuals is recorded as Domin 1.

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3.2.5. Frequency was used in conjunction with abundance when determining the community type, either using dichotomous keys within British Plant Communities or the MAVIS computer program. Roman numerals I-V are used to measure frequency with:

- I signifying a species present in 1-20% of samples (scarce);
- II signifying a species present in 21-40% of samples (occasional);
- III signifying a species present in 41-60% of samples (frequent);
- IV signifying a species present in 61-80% of samples (constant); and
- V signifying a species present in 81-100% of samples (constant)

3.2.6. Floristic tables were compiled from the quadrat data, showing the range of Domin scores of each species, and its frequency class within the community. Species occurring at frequencies of IV and V are described as constants within the community, while species occurring at other frequencies are described as companions.

Determining Vegetation Community Type

3.2.7. Shortlists of possible communities were identified using the computer program MAVIS. This program compares the survey data with floristic tables of NVC communities. The shortlists were subsequently refined using NVC keys and the appropriate community descriptions as given in British Plant Communities volume 3 (Rodwell et al. 1992).

3.2.8. The coefficient of similarity generated by MAVIS (calculated as a percentage) was used to improve the confidence with which data collected could be assigned to a particular NVC community. In line with the published guidance, however, the MAVIS assessments were not used in isolation: a combination of the keys and descriptions within the published NVC handbooks, MAVIS assessment, and surveyor experience was used to determine community types.

3.2.9. As a rough guide, MAVIS coefficients below 40% were considered to represent particularly poor fits, while those over 50% were considered particularly good fits. Coefficients between 40% and 49% inclusive were not considered to provide a definitive result with confidence, and in these cases, the published keys and descriptions, plus surveyor experience was used as a favoured method. In some cases, even particularly good fits for MAVIS assessments were disregarded where the result was not considered to be a true reflection of the existing conditions by the surveyor. This judgement may have been made because of the absence of one or more species at the survey site, which are normally constant species within the community with the highest percentage similarity coefficient, using the MAVIS program.

3.3 Arable Field Margins

3.3.1. With each arable field of the Survey Area, a representative stretch of the arable margin at least 200 metres in length was walked and all plant species within 1m of the crop margin were recorded. Quadrats were not sampled as, in most cases, the associated species were present at low density, with much bare ground.

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3.3.2. The flora of the arable margins was assessed using Plantlife's 'Important Arable Plant Area (IAPA)' criteria (Plantlife, 2022). The IAPA method is used to highlight arable farmland in the UK of three levels of importance:

- Sites of European Importance: sites that are identified as being of European importance on account of their vascular arable plant interests alone, and which should be considered for inclusion within the UK's IPA contribution to the European network of IPAs;
- Sites of National Importance: additional sites of national importance for their arable plant interests; and
- Sites of County Importance: a shadow listing of sites that are of high regional importance which may with further detailed recording prove to be of National or European Importance.

3.3.3. IAPAs are based on:

- Threatened species (Plantlife, 2022b);
- Exceptional plant assemblages (using the IAPA scoring methods) (Plantlife, 2022c); and
- Priority habitats.

3.4 Dates of Survey and Personnel

3.4.1. The surveys were undertaken on the 4 and the 7 July 2022, which is within the optimal season for botanical surveys of grasslands and arable land. The surveys were led by an experienced and qualified botanical and habitat surveyor who holds a Level 4 Field Identification Skills Certificate.

3.5 Notes and Limitations

3.5.1. There were no limitations to the surveys. The quadrat sampling was undertaken during the optimal time of year for grassland NVC surveys (May-July) and arable land (June-August) when most species present within the Survey Area would have been evident. Full access was also available for all land required within the Survey Area.

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4 Results

4.1 National Vegetation Classification Survey

Community Description

4.1.1. There was one grassland habitat which received an NVC survey. Quadrat data is shown in **Table 4-1**. This area of grassland is located to the south of Madingley Wood, within private property. The location of this grassland is presented in **Annex 5.4.1**.

4.1.2. The sward was grass dominated, and the most frequent species recorded were Red Fescue *Festuca rubra* and Perennial Rye-Grass *Lolium perenne*, both with a constant frequency and coverage of between Domin 8 and 9. Other constant species included Common Ragwort, Bristly Oxtongue *Helminthotheca echioides*, Dandelion *Taraxacum agg.*, Common Daisy *Bellis perennis*, Common Mouse-Ear *Cerastium fontanum*, Lesser Trefoil *Trifolium dubium*, Cut Leaved Cranesbill *Geranium dissectum*, and Smaller Cat's-Tail *Phluem bertolonii*, however these species were all recorded at a lower coverage (Domin 1-6).

4.1.3. Frequent species within the sward were Spear Thistle *Cirsium vulgare*, Creeping Bent *Agrostis stolonifera*, Yorkshire Fog *Holcus lanatus* and Common Bent *Agrostis capillaris*. These were only recorded within three of the five quadrats however with a low coverage (Domin 1-4). Other species that were recorded within the sward during the UKHab survey, but not recorded in any NVC quadrats were Lady's Bedstraw *Galium verum* and Cocksfoot *Dactylis glomerata*. This is likely due to the UKHab survey including a larger survey area.

Table 4-1 - Species recorded within each 2x2m quadrats for NVC survey of MG6c grassland with Domin score provided where present (0 is not part of the Domin scale but has been used when a species is absent from a quadrat).

Species	Scientific Names	Q 1	Q 2	Q3	Q 4	Q 5	Frequency (I-V)
Common Ragwort	*Jacobaea vulgaris*	4	3	2	4	5	V
Bristley Oxtongue	*Helminthotheca echioides*	3	2	4	3	0	IV
Smooth Sow-Thistle	*Sonchus oleraceus*	4	0	0	0	1	II
Dandelion	*Taraxacum* sp.	5	5	5	5	5	V
Spear Thistle	*Cirsium vulgare*	1	0	1	0	4	III
Common Daisy	*Bellis perennis*	4	3	4	0	3	IV
Common Mouse-Ear	*Cerastium vulgatum*	5	4	4	0	4	IV

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Species	Scientific Names	Q1	Q 2	Q3	Q4	Q5	Frequency (I-V)
Lesser Trefoil	*Trifolium dubium*	6	6	5	5	5	V
Smooth Hawk's-Beard	*Crepis capillaris*	1	1	0	0	0	II
Cut-Leaved Crane's-Bill	*Geranium dissectum*	1	3	2	0	1	IV
Thyme-Leaved Speedwell	*Veronica serpyllifolia*	1	0	0	0	0	I
Red Fescue	*Festuca rubra*	9	9	8	8	9	V
Perennial Rye-Grass	*Lolium perenne*	8	8	9	8	9	V
Smaller Cat's-Tail	*Phleum bertolonii*	3	3	2	1	4	V
Meadow Barley	*Hordeum brachyantherum*	2	0	0	0	0	I
Yorkshire-Fog	*Holcus lanatus*	1	0	1	0	4	III
Common Bent	*Agrostis capillaris*	2	1	5	0	0	III
Creeping Bent	*A. stolonifera*	4	0	5	7	0	III
Beaked Hawks-Beard	*C. vesicaria*	0	0	1	2	0	II
Prickly Sow-Thistle	*S. asper*	0	0	0	2	0	I
Ribwort Plantain	*Plantago lanceolata*	0	0	0	0	1	I
Perennial Sow-Thistle	*S. arvensis*	0	0	0	0	1	I
Greater Plantain	*P. major*	0	0	0	0	2	I
Yellow Oat-Grass	*Trisetum flavescens*	0	0	0	0	5	I

Determining NVC Community

4.1.4. Mavis analysis of the sampling quadrats (**Table 4-2**) gives the highest similarity co-efficient of 44.90% for the OV23c *Lolium perenne - Dactylis glomerata* community - *Plantago major-Trifolium repens* sub-community.

4.1.5. This community, however, is normally associated with a higher grass cover and poorer species sward than that in the sample, often associated with amenity and urban grassland such as grass curbs along pavements. The only constant or frequent forb species within

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OV23c are Creeping Buttercup *Ranunculus repens*, White Clover *Trifolium repens*, Greater Plantain *Plantago major*, Ribwort Plantain *P. lanceolata* and Dandelion. These are all species associated with poorer condition grassland with higher nutrient enrichment and disturbance. Out of these only Dandelion was present as a frequent or constant species within the sample. It is likely that the highest percentage match with this community was due to the high coverage of Perennial Rye-Grass and Dandelion.

4.1.6. Perennial Rye-Grass is also a constant within MG6c, the community which scored the second highest percentage match of 44.88%, as well as Smaller Cat's-Tail, Common Mouse Ear and Red Fescue, which were also constants within the sample. MG6c has a similar species composition to OV23c, but slightly more species rich like the sample, MG6c also better reflects the very high cover of Red Fescue within the sample. It is likely that the surveyed habitat was somewhere between OV23c and MG6c. Historic aerial imagery indicates that it is a young sward, converted from arable land within the last 20 years. It is likely the vegetation started as OV23c but is now transitioning into MG6c, which explains the high Dandelion cover and the lack of Crested Dog's-Tail *Cynosurus cristatus*.

Table 4-2 – Top ten NVC communities identified by MAVIS with the highest similarity co-efficient to the surveyed sample

NVC Community	NVC Community code	Goodness-of-fit Co-efficient (%)
Lolium perenne - Dactylis glomerata community, *Plantago major-Trifolium repens* sub-community	OV23c	44.90
Lolium perenne-Cynosurus cristatus grassland, *Trisetum flavescens* sub-community	MG6c	44.88
Lolium perenne - Dactylis glomerata community	OV23	44.73
Lolium perenne-Cynosurus cristatus grassland, typical sub-community	MG6a	44.10
Lolium perenne leys and related grasslands, *Lolium perenne-Plantago lanceolata* grassland	MG7e	42.59
Lolium perenne-Cynosurus cristatus grassland	MG6	41.75
Festuca rubra-Agrostis stolonifera-Potentilla anserina grassland, *Lolium perenne sub-community*	MG11a	41.53
Lolium perenne-Dactylis glomerata community, typical sub-community	OV23a	40.22

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NVC Community	NVC Community code	Goodness-of-fit Co-efficient (%)
Lolium perenne leys and related grasslands, *Lolium perenne-Poa pratensis* grassland	MG7f	40.09
Lolium perenne-Dactylis glomerata community, *Crepis vesicaria-Rumex obtusifolius* sub-community	OV23b	38.70

4.2 Arable Field Margins

4.2.1. All three surveyed arable field margins were cereal crop fields, with a clayey soil. In total there were 44 species recorded within the three arable field margins as seen in **Table 4-3**, however only five species were recorded within all three margins including Barren Brome *Bromus sterilis*, Soft Brome *B. hordeaceus*, Bristly Oxtongue *Helminthotheca echioides*, Creeping Thistle *Cirsium arvense*, and Wild Oat *Avena fatua*.

4.2.2. Barren Brome was one of the most abundant species in all three margins and Soft Brome was one of the most abundant species in two of the three margins. Of the 44 species recorded 30 species were only recorded in one of the three arable field margins.

4.2.3. Important Arable Plant Areas (IAPAs) are a method of assessing arable sites based on the presence of threatened species and/or exceptional assemblages.

4.2.4. Threatened species are those listed as Critically Endangered, Endangered or Vulnerable on the Red List for either the UK or England. The survey of the arable field margins within the Survey Area did not identify any species listed as threatened.

4.2.5. For outstanding assemblages, IAPAs are selected based on a weighted scoring system regarding each species individual rarity. One scoring species, Smooth Tare, was recorded from arable field margin 2, giving this field margin an IAPA Outstanding Assemblage Score of 2. The other two field margins did not have any scoring species recorded. A score of 15 – 24 is the threshold for county importance for an individual field on clay soils and therefore none of the surveyed field margins recorded an outstanding assemblage.

4.2.6. Therefore, it can be concluded that none of the field margins within the Survey Area qualify as an IAPA.

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Table 4-3 – Plant species recorded in arable field margins, with IAPA outstanding assemblage score where relevant, where a species is most abundant in a margin this is illustrated (*).

Species	Scientific Name	Arable Field Margin 1	Arable Field Margin 2	Arable Field Margin 3	IAPA Outstanding Assemblage Score
Wild Oat	*Avina fatua*	Yes*	Yes	Yes	N/A
Cleavers	*Galium aparine*	Yes*	Yes	No	N/A
Barren Brome	*Bromus sterilis*	Yes*	Yes*	Yes*	N/A
Charlock	*Sinapis arvensis*	Yes	Yes	No	N/A
White Dead-Nettle	*Lamium album*	Yes	No	No	N/A
Common Nettle	*Urtica dioica*	Yes	No	No	N/A
Soft Brome	*Bromus hordeaceus*	Yes	Yes*	Yes*	N/A
Squirrel-Tail Fescue	*Vulpia bromoides*	Yes	No	No	N/A
Perennial Sow-Thistle	*Sonchus arvensis*	Yes	No	No	N/A
Cow Parsley	*Anthriscus sylvestris*	Yes	No	No	N/A
Couch Grass	*Elymus repens*	Yes	Yes	No	N/A
False Oat-Grass	*Arrhenatherum elatius*	Yes	Yes	No	N/A
Rough Chervil	*Chaerophyllum temulum*	Yes	No	No	N/A
Garlic Mustard	*Alliaria petiolata*	Yes	No	No	N/A
Fool's-Parsley	*Aethusa cynapium*	Yes	No	No	N/A

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Species	Scientific Name	Arable Field Margin 1	Arable Field Margin 2	Arable Field Margin 3	IAPA Outstanding Assemblage Score
Field Bindweed	*Convolvulus arvensis*	Yes	Yes	No	N/A
Hemlock	*Conium maculatum*	Yes	No	No	N/A
Creeping Thistle	*Cirsium arvense*	Yes	Yes	Yes*	N/A
Perennial Rye-Grass	*Lolium perenne*	Yes	Yes	No	N/A
Dandelion	*Taraxacum* agg.	Yes	Yes	No	N/A
Petty Spurge	*Euphorbia peplus*	Yes	No	No	N/A
Bristly Oxtongue	*Helminthotheca echioides*	Yes	Yes	Yes	N/A
Cut-Leaved Crane's-Bill	*Geranium dissectum*	Yes	No	Yes	N/A
Greater Burdock	*Arctium lappa*	Yes	No	No	N/A
Hoary Willowherb	*Epilobium parviflorum*	Yes	No	No	N/A
Wild Parsnip	*Pastinaca sativa*	Yes	No	Yes	N/A
Ground-Ivy	*Glechoma hederacea*	Yes	Yes	No	N/A
Smooth Tare	*Vicia tetrasperma*	No	Yes	No	2
Dove's-Foot Cranesbill	*G. molle*	No	Yes	Yes	N/A
Hogweed	*Heracleum sphondylium*	No	Yes	No	N/A

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Species	Scientific Name	Arable Field Margin 1	Arable Field Margin 2	Arable Field Margin 3	IAPA Outstanding Assemblage Score
Smooth Sow Thistle	*S. oleraceus*	No	Yes	No	N/A
Spear Thistle	*C. vulgare*	No	Yes	No	N/A
Rough Meadow Grass	*Poa trivialis*	No	Yes	No	N/A
Hop Trefoil	*Trifolium campestre*	No	Yes	No	N/A
Bramble	*Rubus fruticosus* agg.	No	Yes	No	N/A
Prickly Lettuce	*Lactuca serriola*	No	Yes	No	N/A
Wood Dock	*Rumex sanguineus*	No	Yes	No	N/A
Black-Grass	*Alopecurus myosuroides*	No	No	Yes	N/A
Groundsel	*Senecio vulgaris*	No	No	Yes	N/A
Common Field Speedwell	*V. persica*	No	No	Yes	N/A
Square Stalked Willowherb	*E. tetragonum*	No	No	Yes	N/A
Sheep's Fescue	*F. ovina*	No	No	Yes	N/A
Cocksfoot	*Dactylis glomerata*	No	No	Yes	N/A
Goat's-Beard	*Tragopogon pratensis*	No	No	Yes	N/A
				Total:	2

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5 Summary

5.1.1. An NVC survey was undertaken using standard methodologies of one area of grassland which will be directly impacted by the Scheme and had not already been surveyed by Cambridge Ecology.

5.1.2. The grassland did not fit well into any NVC community, this could be partly due to the young age of the habitat. Through MAVIS analysis and reference to NVC keys and community descriptions in British Plant Communities, it was concluded that the grassland best fit MG6c but was likely previously OV23c. MG6c is a relatively species poor grassland with constant species including Perennial Rye-Grass, Smaller Cat's-Tail, Common Mouse Ear and Red Fescue. OV23c is more species poor than MG6c and is generally associated with urban and amenity grasslands, with constant species including Perennial Rye-Grass and forbs such as Dandelion which indicate poor condition habitat.

5.1.3. Three arable field margins were surveyed which are likely to be directly impacted by the Scheme and had not been surveyed by Cambridge Ecology. These were analysed in relation to IAPA criteria set out by Plantlife. None of the arable field margins qualified as an IAPA.

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Annex 5.4.1

Study & Survey Areas

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Legend
— Red Line Boundary
— Arable Field Margins Surveyed
■ NVC MG6c

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Drawing Status
DRAFT

Job Title
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Drawing Title
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Scale at A1   1:3,000

Drawn   UKJIF001

| Stage 1 Check | Stage 2 Check | Originated | Date |
| XX | XX | JF | 26/10/2022 |

0 40 80 120 160 200 m

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1

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0   60   120   180   240   300 m

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2

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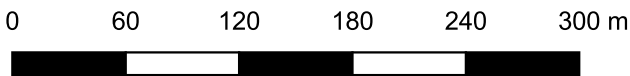
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