

# Heckington Fen Solar Park

EN010123

**Environmental Statement | Volume 3: Technical Appendices**

**Appendix 8.6: Botany Report including Aquatic Plants and  
Rare Arable Plants – Energy Park and Cable Route Corridor**

**Applicant: Ecotricity (Heck Fen Solar) Limited**

Document Reference: 6.3.8.6

Pursuant to: APFP Regulation 5(2)(a)

February 2023



## **APPENDIX 8.6- BOTANY REPORT INCLUDING AQUATIC PLANTS AND RARE ARABLE PLANTS – ENERGY PARK AND CABLE ROUTE CORRIDOR**

| <b>Document Properties</b>                    |   |                       |
|---|---|-----------------------|
| <b>Regulation Reference</b>                   | Regulation 5(2)(a)  |                       |
| <b>Planning Inspectorate Scheme Reference</b> | EN010123  |                       |
| <b>Application Document Reference</b>         | 6.3.8.6   |                       |
| <b>Title</b>                                  | Appendix 8.6 - Botany Report Including Aquatic Plants and Rare Arable Plants – Energy Park and Cable Route Corridor |                       |
| <b>Prepared By</b>                            | Heckington Fen Energy Park Project Team (RSK Biocensus)   |                       |
| <b>Version History</b>                        |   |                       |
| <b>Version</b>                                | <b>Date</b>   | <b>Version Status</b> |
| Rev 1   | February 2023   | Application Version   |





Ecotricity (Heck Fen Solar) Limited

# Heckington Fen Energy Park and Grid Route

## Route

Phase 2 Botanical Surveys

2483649

SEPTEMBER 2022

## RSK GENERAL NOTES

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**Project No.:** 2483649

**Title:** Heckington Fen – Phase 2 Botanical Surveys

**Client:** Ecotricity (Heck Fen Solar) Limited

**Date:** September 2022

**Office:** Tonbridge

**Status:** Rev 00

|               |            |                                       |            |
|---------------|------------|---------------------------------------|------------|
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| Date:         | 02/09/2022 | Date:                                 | 05/09/2022 |

## EXECUTIVE SUMMARY

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- Initial Phase 1 habitat surveys of the Heckington Fen Solar Park area indicated the possible existence of priority aquatic and arable habitats on the site and recommended further surveys for rare and notable species.
- National Vegetation Classification (NVC) surveys of ditches and arable surveys using the Plantlife Important Arable Plant Area (IAPA) methodology were requested for both the solar park site and indicative extent of the cable route.
- RSK Biocensus ecologists visited the site in May 2022 and surveyed the area, 37 quadrats of ditch habitats were taken, and 15 arable sites were surveyed.
- Aquatic habitats of moderate species-richness were found, although no individual species of conservation concern were identified. Signs of eutrophication, most notably Duckweeds (*Lemna* sp.) and algal blooms, were in evidence throughout the survey area.
- Arable habitats were found to be of low biodiversity value, with the very richest on site plots only scoring 3 points on the Plantlife Important Arable Plant Area (IAPA) scale (15 points are needed in order for a site to be considered of County importance). Four species of local concern were found, none of which are afforded any special protection by law.
- Ditch habitats are important for a wide range of species and provide linear connectivity throughout the landscape. These areas should be protected from adverse impacts during the construction phase. The removal of the land at the proposed solar park from arable production might be expected to be accompanied by an uplift in the biodiversity value of nearby ditch habitats, particularly if it is accompanied by a sympathetic management regime.
- Arable plant assemblages will mostly benefit from both the disturbance and relaxation of cultivation regimes associated with the construction phase in the area of the cable route. A single plot surveyed onsite on the solar park is currently in the process of succeeding to grassland, which would not necessarily diminish its floristic diversity.

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# 1.0 INTRODUCTION

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## 1.1 Background

- 1.1.1 This report details the results of phase 2 botanical surveys including National Vegetation Classification (NVC) surveys of ditches and surveys of arable flora using Plantlife Important Arable Plant Area (IAPA) methodology at the site of the proposed Heckington Fen Energy Park, as well as the area of influence of the proposed cable routes to Bicker Fen Substation. Both solar park and cable terminus are located in Lincolnshire, UK, between the villages of Heckington in the west and Swineshead in the east.
- 1.1.2 A Preliminary Ecological Appraisal (PEA) of the site (RSK, 2022), otherwise known as a Phase 1 Habitat survey, was carried out in April 2022. This identified areas of species-rich ditch and arable margins. These were selected for further botanical surveys.

## 1.2 Purpose of this report

- 1.2.1 This report presents the results of botanical surveys of ditches and arable land within the survey area shown in *Figure 1*.
- 1.2.2 The aims of the surveys are to evaluate the importance of each area for nature conservation, appraising them in terms of the 'Ratcliffe criteria': size, diversity, naturalness, rarity, fragility, typicalness, recorded history, position in an ecological/geographical unit, potential value and intrinsic appeal.
- 1.2.3 This report aims to address the comments received at scoping from NKDC and AECOM regarding the presence of notable flora on the site.

## 1.3 Landscape Context

- 1.3.1 The site is located in the Lincolnshire Fens between the villages of Heckington and Swineshead. To the north of the A17 west of Swineshead Bridge is the 620 ha site of the proposed solar park. The current footprint of the proposed cable route has been kept large in order to allow for a number of different route options, and the survey area in this case was 1,260 ha. The majority of this latter area is bordered by Hammond Beck in the east and South Forty-foot Drain in the west.
- 1.3.2 The topology of the site and surrounding area is flat; woodlands and hedgerows are few. Arable farming is the predominant land use on the site and in the surrounding area, with fields devoted to growing barley, oil-seed rape, with some wheat, bulbs and green manure. Fields are typically bordered by ditches of varying widths and depths; some being dry at the time of survey. These range from narrow, dry field drains dominated by terrestrial vegetation to wide watercourses rich in aquatic species. They are typically long, straight structures with banks sloping at 30-45° and a freeboard depth of 1-2.5 m. The slopes comprised semi-natural grassland, extending into a level field margin between 0.5 m – 3 m wide at the summit. Ditch management varies widely and included dredging, cutting of tall grasses and mowing of banks, with arisings left in situ.



- 1.3.3 Arable areas are also varied. Fields are typically large and intensively farmed, and assemblages of arable weed species are confined to occasional field corners, strips cultivated for low-input seed, nectar and green manure crops, and arable areas set aside because of work on cable routes.
- 1.3.4 Other land use includes a small amount of pasture, grazed by cows and sheep, as well as residential properties and farm buildings. The Bicker Fen Wind Farm is located to the south of the site and there are two electricity generating stations nearby. At the time of the survey, access roads were being constructed for other cable route excavations, and a review of aerial photographs and Ordnance Survey maps shows evidence of recent previous excavations which have now wholly or partially revegetated.



## 2.0 METHODS

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### 2.1 Surveys

2.1.1 The botanical surveys were undertaken on 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup> May 2022 by Pete Flood and Kate Gwynn. Pete is a Senior Ecological Consultant with a MSc in Plant Diversity and a Field Identification Skills Certificate (FISC) at Level 6. Kate is an Aquatic Consultant with extensive experience of macrophyte surveys. The surveys were carried out in weather which was largely dry and sunny, with sustained rainfall on the 11<sup>th</sup> May.

### 2.2 National Vegetation Classification

#### Field Survey

2.2.1 A walkover survey was first undertaken of each area to identify and map the principal vegetation types. Ditches were sampled using quadrats of 1 x 4 m or 2 x 8 m depending on their size. Grapnels and poles were used to obtain samples from the water where necessary. All species of vascular plants and bryophytes were recorded, as were larger macroalgae (although these are not featured in NVC methodology).

2.2.2 The NVC is a system which aims to describe every broad plant community type in the British Isles, and standard methods are used in the field and for data analysis (Rodwell, 1991a, 1991b, 1992, 1995, 2000). Species are assigned estimates of abundance within quadrats of various sizes depending on the habitat being sampled.

2.2.3 Vegetation abundance is measured using the Domin-scale which gives a percentage-cover class for every species as follows: 10 = 100-91%; 9 = 76%-90%; 8 = 75-51%; 7 = 50-34%; 6 = 33-26%; 5 = 25-11%; 4 = 10-5%; 3 = 4-1% cover; 2 = several individuals but less than 1% cover; 1 = few individuals, no measurable cover.

2.2.4 Ditches and likely quadrat sites were selected during initial Phase 1 habitat surveys carried out in April 2022. The criteria used for site selection were as follows in order of importance:

- Species-rich aquatic plant communities;
- Individual species, and;
- Coverage of the entire site, with some quadrats taken in areas of low diversity to illustrate typical communities found in that area.

2.2.5 Care was taken to avoid transitional vegetation and boundaries between vegetation, so that the perceived types were adequately sampled. That said, aquatic vegetation is usually more patchily-distributed than terrestrial vegetation, and it is often impossible to reconcile the dual requirements of using a quadrat of a certain size and sampling from contiguous stands as vegetation types undergo major changes over comparatively smaller areas than on dry land. For this reason the emphasis was placed upon capturing the range of species present, with the characterization of vegetation according to NVC communities a secondary aim.

2.2.6 Notes were made for each quadrat on management, ditch freeboard, water depth, turbidity, flow and vegetation height, and quadrats were documented photographically.

## Data analysis

- 2.2.7 Analysis of quadrat data was carried out using the computer programme MAVIS (CEH 2017) which helps assign vegetation records to an NVC habitat classification.
- 2.2.8 Species % cover from each quadrat (plot) was inputted and plots combined to provide a measure of constancy (frequency) for each species surveyed. The analysis also provided Ellenberg scores (see below) for light, fertility, wetness and substrate pH and % 'best fit' to NVC grassland types.
- 2.2.9 Keys for aquatic communities (A) and swamps and tall-herb fens (S) were also used (Rodwell 1992) to determine NVC community type. Results were compared with NVC descriptions (Rodwell 1992; Cooper 2017) to check whether the 'best fit' NVC types produced by MAVIS matched the actual community description.
- 2.2.10 Plants rely on various environmental factors in different proportions. Some of the common environmental factors that have a huge influence on the survival and optimal growth of plants are Light, Temperature, Continentality, Moisture, Soil PH, Nitrogen, and Salinity. Ellenberg indicator values are based on a simple ordinal classification of plants according to the position of their realised ecological niche along an environmental gradient. In MAVIS analysis they are cover-weighted by species abundance within plots and/or groups of plots. Indicator values do not give information about the physiological requirements of a species but provide information on the ecological performance of species under competition, i.e. the performance of a plant in its niche. They can be used to estimate (abiotic) conditions/key parameters at a site and can also be used to monitor changes of key parameters over time. The table below gives an illustration of some indicator values for various environmental factors - the indicator values refer to the conditions the plant prefers.

**Table 1. Ellenberg values**

| Environmental Factor        | Indicator value  |
|-----------------------------|--|
| Light value                 | 1=deep shade, 5=semi-shade, 9=full light                         |
| Moisture value              | 1=strong soil dryness, 5=moist, 9=wet, 10=aquatic, 12=underwater |
| Reaction of soil value (PH) | 1=extremely acidic, 5=mildly acidic, 9=alkaline                  |
| Nitrogen value              | 1=least, 5=average, 9=excessive supply                           |

## 2.3 Arable surveys

- 2.3.1 Arable weed communities form a distinct group of annual ruderal and ephemeral plants which, because of their casual nature, are poorly covered under the National Vegetation Classification (although open habitat communities (OV) do include some of the more characteristic assemblages that arise on different soil types).
- 2.3.2 Within this informal group lie some of our rarest and most-threatened species, with populations of once-common plants such as Corncockle (*Agrostemma githago*) dwindling to extinction in the wild with the advent of chemical weedkillers and mechanised agriculture. In addition, rapid worldwide changes to agricultural methods have made it difficult for ecological monitoring to keep on top of the international conservation status of these plants, making them a ‘conservation blind spot’. Few of these species are currently recognized as threatened (i.e. Critically Endangered, Endangered or Vulnerable) on IUCN Red Lists for Europe, and while some qualify for a small degree of protection under the NERC act (2006), only the few unquestionably native species are included on the Schedule 8 of the Wildlife and Countryside Act (1981)(as amended), making the future survival of some species quite perilous.
- 2.3.3 A recent study by Plantlife (Plantlife, 2015c) highlighted the importance of National Character Area (NCA) 46 (the Fens) for the assemblage of arable plants found in this area. Heckington Fen site is located in the northern part of NCA 46, which itself sits in the highest band in terms of arable plant species richness. The study admits that the baseline information used is out of date, and the geographic areas too large, but with these caveats it provides a useful snapshot of arable plant species richness in England, and a compelling rationale for these surveys.
- 2.3.4 A comprehensive collection of arable survey sites were selected during fieldwork. Arable species often have seeds which persist for years in the seedbank, so areas of recent excavation were included despite a lack of recent arable cultivation. Arable headlands and margins, as well as strips farmed for low-input seed, nectar and green manure crops were selected during preliminary Phase 1 surveys on the basis of species-richness and the conservation value of individual species. During Phase 2 surveys these areas were surveyed in depth, with a full species list produced.
- 2.3.5 The methods used in surveys for this group was derived from Criterion B of the Plantlife Important Arable Plant Areas (IAPA) methodology (Plantlife, 2015b). This assigns a score

between 1 and 9 to a range of threatened arable species based on conservation status, using data from IUCN Red Book listings and distribution data from the Botanical Society of Britain and Ireland (BSBI) database:

**Table 2. IAPA scores for individual species and their relation to rarity**

| Score | Status  |
|-------|---|
| 9     | IUCN Red List Critically Endangered (CR) or Extinct (EX)  |
| 8     | IUCN Red List Endangered (EN)   |
| 7     | IUCN Red List Vulnerable (VU)   |
| 6     | IUCN Red List Near-threatened (NT) or Nationally Rare (found in 1-15 10-km squares)                       |
| 5     | Nationally Scarce: found in 16-50 10-km squares OR 51 to 100 10-km squares AND change index of -1 or less |
| 4     | Nationally Scarce: other Nationally Scarce not covered by the above category                              |
| 3     | Species of local concern: 101 to 500 10-km squares  |
| 2     | Species of local concern: 501 to 1000 10-km squares   |
| 1     | Species of local concern: 1001 to 5001 10-km squares AND change index less than 0.0                       |

2.3.6 The individual scores for plants on the IAPA list are summed to give a score for each area surveyed. Proposed thresholds have been set by Plantlife (2015c) for sites of county, national and European importance, with the threshold value depending on soil type. The thresholds for the clay loams of fenland are shown in Table 3, below:

**Table 3: Threshold scores for assessing the importance of arable plants at the field level (Plantlife, 2015c)**

|                     | Chalky and limestone-derived free-draining and calcareous soils | Clay and slowly-impermeable soils (including calcareous clays) | Sandy loams, shale and free-draining soils |
|---------------------|---|--|--|
| European importance | 45+   | 40+  | 45+  |
| National importance | 25-44   | 25-39  | 30-44                                      |
| County importance   | 15-24   | 15-24  | 15-29                                      |

## 2.4 Nomenclature

2.4.1 Vascular plant nomenclature in this report follows Stace (2019) for native and naturalised species of vascular plant. Bryophyte nomenclature follows Hill et al., (2021) and Lichen nomenclature follows Dobson (2018). The names of NVC communities and sub-communities follow Rodwell (1992).

## 2.5 Constraints and limitations

2.5.1 The surveys were completed in early May. This is an acceptable time for both aquatic and arable vegetation communities, as most plants will be present in a vegetative state at least. Arable sites may lack certain late-flowering members of families such as Amaranthaceae and Polygonaceae, but the value of the assemblage can be gauged by the presence of other species. Aquatic sites may similarly lack visible Hydrocharitaceae and Butomaceae, with identification efforts hampered by non-flowering Callitrichaceae and *Sparganium* sp, but visibility is often better than later in the year because of the lesser proliferation of duckweeds and algae.

2.5.2 The vast majority of vascular plants and bryophytes were confidently identified to species level. Most specimens were identified in the field, but some bryophytes and members of critical groups such as Potamogetonaceae, Callitrichaceae and Characeae required microscopy for confident identification. Furthermore, some non-flowering aquatic plants were impossible to determine to species level. In this respect the report follows Landsdown (2009) in terms of limitations on the identification of certain taxa from vegetative characteristics alone.

2.5.3 The land surveyed is in active arable production, with a range of activities which might impact the future integrity and composition of the habitats sampled, including aquatic management such as dredging and mowing, and arable activities such as harvesting and sowing.



- 2.5.4 Additionally, many of the communities sampled are transitory by nature. While all habitats will evolve over time, more rapid change is to be expected in communities dominated by ruderal and ephemeral plants as they succeed to grassland and scrub. The snapshot presented here is therefore time-limited.
- 2.5.5 Surveys were not accompanied by detailed analysis of soils and substrates, and therefore some assumptions have been made about current and historical conditions and processes onsite.
- 2.5.6 The surveys do not provide species lists for the entire site, being limited to the particular habitats sampled. A full species list for the cable route site can be found in the appendices of 2483649 Heckington Fen Cable Route - Phase 1 Report (document reference 6.3.8.5).

## 3.0 RESULTS AND EVALUATION

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### 3.1 NVC Surveys of Ditches

3.1.1 Thirty-seven quadrats were taken in 20 informal series across the site. Species-richness varied from the 4 taxa recorded in quadrats 4.1 and 14.1, to 19 taxa recorded in quadrat 5.2. Mean species-richness was 8.4 species per quadrat. Forty-seven macrophyte taxa were recorded in total, comprising:

- 9 submerged species;
- 3 free-floating species;
- 3 species with floating leaves and roots in the substrate;
- 27 emergent species;
- 2 bryophytes, and;
- 3 macroalgae (including 1 stonewort).

3.1.2 Ditches containing greater-than-average plant diversity included:

- the Labour in Vain drain and drain to the north on the solar park site around TF 1956 4541 (series 1, 18 and 19)
- ditches northeast of the substation on Double-twelves Drove around TF 1986 4043 (series 5, 6, 7 and 8).

3.1.3 Lower-than-average plant diversity was found:

- on the eastern side of the solar park site around Six Hundreds Farm (ditches here were often dry or shaded);
- on land between Timm's Drove and South Forty-foot Drain (ditches here were generally dry, the exception being the semi-dry quadrat 3.1 which had average diversity but few obligate aquatics);
- on land around Lowgrounds Farm and Tilebarn Lane (ditches here were often dry, while those that were wet often littered with agrochemical drums, with cultivation typically continuing to the edge of the ditch with no margin of semi-natural grassland).

3.1.4 Quadrats at Mill Drain (series 10 and 11) were of average-to-low species diversity but contained species not often seen elsewhere during the surveys, such as Horned Pondweed (*Zannichellia palustris*) and Fan-leaved Water-crowfoot (*Ranunculus circinatus*).

#### Species composition

3.1.5 Species found in more than 50% of quadrats included Mare's-tail (*Hippuris vulgaris*) (54%), Nuttall's Waterweed (*Elodea nuttallii*) (51%) and Thread-leaved Water-crowfoot (*Ranunculus trichophyllus*) (51%). Nuttall's Waterweed, found in extensive wefts throughout the ditches of the site, is an invasive species listed on Schedule 9 of the wildlife and Countryside Act (1981) (as amended). Water-starworts (*Callitriche* sp.) were present

in 67% of quadrats. Non-flowering specimens could not be determined to species level, but some flowering populations were determined to Common Water-starwort (*Callitriche stagnalis*), so it is unclear whether this common taxon represents the most common species present. Among submerged species, Curled Pondweed (*Potamogeton crispus*) was the only other common species, found in 46% of quadrats.

- 3.1.6 Duckweeds and floating algae, both representative of eutrophication, were ubiquitous; Fat Duckweed (*Lemna gibba*) was present in 27% of quadrats. Tapeweed (*Ulva flexuosa*) was seen in 30% of quadrats. However, quadrat recording was avoided in areas with abundant populations of these plants so actual cover by these species was far higher.
- 3.1.7 Many ditches had a margin of emergent grasses and tall herbs, including Reed Canary-grass (*Phalaris arundinacea*), Common Reed (*Phragmites australis*), Bur-reeds (*Sparganium* sp.) and Reed Sweet-grass (*Glyceria maxima*), strangely all present in 32% of quadrats though in differing quantities).
- 3.1.8 Ditches in the process of drying out often had a flora adapted to a slightly drier hydrological regime such as that found on the draw-down zone of lake margins or in winter-wet hollows. Celery-leaved Buttercup (*Ranunculus sceleratus*), Pink Water-speedwell (*Veronica catenata*) and False Fox-sedge (*Carex otrubae*) were characteristic of these semi-dry ditches.

#### **Notable species**

- 3.1.9 All species recorded during the NVC surveys were relatively common and neither rare or scarce (i.e. recorded in fewer than 100 hectads in Britain in the period 1987-1999). No species have been afforded an IUCN Red List for England status of Vulnerable (VU) or higher (most are Least Concern (LC), with some Data Deficient (DD)).
- 3.1.10 Detailed species lists and notes from the quadrats can be found in Appendix B.

## **3.2 Arable Surveys**

- 3.2.1 Fifteen areas were selected and surveyed. Of the ninety-one species recorded in surveys, only four were on the IAPA list of species of conservation concern: Green Field-speedwell (*Veronica agrestis*), Smooth Tare (*Ervum tetraspermum*), Small-flowered Crane's-bill (*Geranium pusillum*) and Wild Radish (*Raphanus raphanistrum* ssp. *raphanistrum*). These species were species of local concern with scores of 1-2 only. Consequently, the arable plots surveyed achieved low scores, with four plots scoring 3 marks, two plots scoring 2 marks, one plot scoring 1 mark and eight plots lacking any species on the IAPA list.
- 3.2.2 Sown arable crops were dominated by Two-rowed Barley (*Hordeum distichon*), Oilseed Rape, with some Bread Wheat (*Triticum aestivum*). Production was intensive on all arable land except that set aside for seed/nectar forage or green manure. Within the selected quadrat most crops were 99-100% weed-free beyond a narrow margin on the field edge, and such margins typically contained only common species such as Black Grass (*Alopecurus myosuroides*) (13 plots); Groundsel (*Senecio vulgaris*) (10 plots); Creeping Thistle (*Cirsium arvense*) (9 plots); Bristly Oxtongue (*Helminthotheca echioides*) (9 plots) and Charlock (*Sinapis arvensis*) (9 plots). Brassicaceous arable species such as Shepherd's-purse (*Capsella bursa-pastoris*); Hedge Mustard (*Sisymbrium officinale*) and Wild Radish were noticeably more common on the margins of Oilseed Rape fields than

elsewhere, while crop remnants such as Two-rowed Barley; Oilseed Rape; Cabbage (*Brassica oleracea*); Broad Bean (*Vicia faba*) and Sugar Beet (*Beta vulgaris*) were characteristic of land that had been set aside from cultivation.

3.2.3 The single rarest record was that of Eastern Groundsel (*Senecio vernalis*), a plant only found in 25 10km squares in the UK, recorded in Heckington Fen in a green manure field dominated by Common Vetch (*Vicia sativa*) and White Clover (*Trifolium repens*). This plant is non-native, forming somewhat persistent casual colonies from contaminated grass seed. It is reportedly increasing in the UK.

3.2.4 Detailed species lists of arable survey plots can be found in Appendix C.

## 4.0 DISCUSSION

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### 4.1 Value of habitats

#### NVC surveys of ditches

- 4.1.1 Labour in Vain Drain and the ditches around Double-twelves Drove have a good diversity of aquatic species, and adverse impacts upon their flora should be avoided during the construction and operational phases.
- 4.1.2 Factors likely to harm ditch biodiversity include shading; increased turbidity from construction or other in-stream activities; pollution from agricultural run-off or construction sites; excessive mowing or dredging and unchecked growth of invasive non-native species. At present there is no question that ditch environments on the site are quite eutrophic: the Ellenberg N value for all quadrats, a measure of onsite nitrogen levels, is 7.2 (out of 9), a score indicative of richly fertile sites caused by farming practices. This figure is backed up by the high frequency of Duckweeds (*Lemna* sp.) and algae found across the site. The major cause of inputs of nitrogen into the watercourse is likely to be run-off and spray-drift from arable farming. Within the site of the solar park, the cessation of inputs of agrochemicals is likely to cause a net increase in biodiversity so long as other adverse impacts can be avoided and a degree of sympathetic management can be carried out.
- 4.1.3 Even when artificially boosted by agricultural run-off, eutrophic waters are valuable for their high productivity. Algae and zooplankton are numerous, supporting many species of fish and invertebrate and creating favourable conditions for waterfowl (JNCC, 2008b).
- 4.1.4 Management activities likely to create favourable conditions for biodiversity include a mowing regime for the banks which prevents scrub encroachment but leaves long grass in place throughout the dry months. Ideally this would consist of a cut-and-collect in September/October, with perhaps a spring cut if needed. Cutting of tall aquatic vegetation may be needed in areas dominated by Common Reed (*Phragmites australis*) and Reed Canary-grass (*Phalaris arundinacea*), and light dredging of a central strip (or in patches) may be required if ditches are prone to becoming choked with silt and other organic matter. Dredging of the entire channel should be avoided, but as some early-successional species such as Stoneworts and Hairlike Pondweed (*Potamogeton trichoides*) (not recorded during surveys but there are previous records in the south of the site) colonise recently-dredged ditches, it may be worth designating one or more areas for annual dredging back to the substrate.
- 4.1.5 The invasive species Nuttall's Waterweed (*Elodea nuttallii*) is present throughout the survey area, sometimes as the dominant species. This species is on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), making it an offence to plant it or cause it to grow in the wild. It propagates from tiny fragments and is therefore almost impossible to eradicate, particularly in cases such as this, where it will most likely be present in ditches throughout the wider area. Targeted removal of heavy infestations in the summer months may be an effective way of making more space for the native flora.
- 4.1.6 On the course of the cable route, impacts to watercourse biodiversity should be avoided by a combination of route-planning and directional drilling under ditches (if possible). If the



latter is not possible, temporary bunds should be used to limit the area of disturbance. Although outside the scope of this report, the draining of ditches may require measures to be put in place for fish rescue.

### **Arable surveys**

- 4.1.7 Arable land across the Heckington Fen survey area was surprisingly lacking in plant communities of importance to conservation. This raises the question of whether surveys later in the year might have found more plants. While this is possible, most late-flowering species were present in vegetative form, and consequently identified. A further, later survey might have added one or two more species to the list, but not enough to raise the score to the fifteen points necessary for a site to achieve County Importance. August surveys of a nearby site for another project did indeed find more common species of Goosefoot and Knotgrass, but an otherwise similar assemblage of plants.
- 4.1.8 Species adapted to life on the margins of arable land are tolerant of, and often dependent on a degree of disturbance. A period of excavation might paradoxically give them an opportunity to complete their life-cycle that modern intensive agriculture denies. For this reason, short of the avoidance of polluting inputs, no further action will be necessary to safeguard arable habitats if the planned works involve restitution of the ground after the cable-laying works have concluded.
- 4.1.9 Within the proposed solar park it is to be expected that a cessation of cultivation removes the conditions conducive to the flourishing of arable plant communities and habitats subsequently revert to grassland. This area had only a single plot which merited survey – an uncultivated field corner in the process of succeeding to grassland. A single plant on the IAPA list, Smooth Tare, was found here. This is a reasonably common species (found in 1468 10km squares in Great Britain), found both in grassland and arable habitats. It is not protected, and it could reasonably be expected to survive a change of land use.
- 4.1.10 Despite the low IAPA score of the plots surveyed, most fall comfortably within the JNCC priority habitat definition of an arable field margin (with the exception of areas succeeding to grassland at plots 13 and 15). These areas may be of value to breeding farmland birds or nectar-foraging invertebrate species despite their relatively species-poor floristic diversity.

## **4.2 Value of species**

- 4.2.1 Despite the varying value of the habitats surveyed, most species found on the site are common. No notable or protected species were identified during the surveys. Desk study of botanical records within 1km using the background data search provided by the Local Environmental Record Centre (LERC) as well as the BSBI database revealed no protected species with records in the nearby vicinity. Both arable and aquatic habitats can host plants such as Ribbon-leaved Water-plantain (*Alisma gramineum*) or Ground-pine (*Ajuga chamaepitys*) with long-lived seeds and sporadic germination rates. Species such as this may go unrecorded due to diminutive stature or a preference for inaccessible areas, and appear after long absences. It is therefore impossible to offer definitive proof that plants of conservation concern are not present in these areas. However, given the longstanding intensity of land use within the Heckington Fen solar park site and cable route, it is

extremely unlikely that any relic populations of protected vascular plant species are present.

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# FIGURES

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Figure 1: Heckington Fen Site Location Plan

Figure 2: NVC series and quadrats

Figure 3: Arable Plots









**Legend:**

- Indicative DCO Extent

**Aquatic NVC Quadrat Group**

- 1
- 18
- 19
- 20

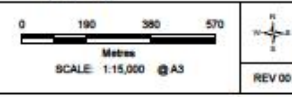


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| 00  | 18/08/2022 | 2483649     | WF  | Rev | PF  |

**Solar Park, Heckington Fen**



TITLE: Figure 2:  
 NVC Aquatic Quadrat  
 Page 1 of 3







**Legend:**

- Indicative DCO Extent

**Aquatic NVC Quadrat Group**

- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10



| Rev | Date       | Description | Dim | Chk | App |
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Solar Park, Heckington Fen

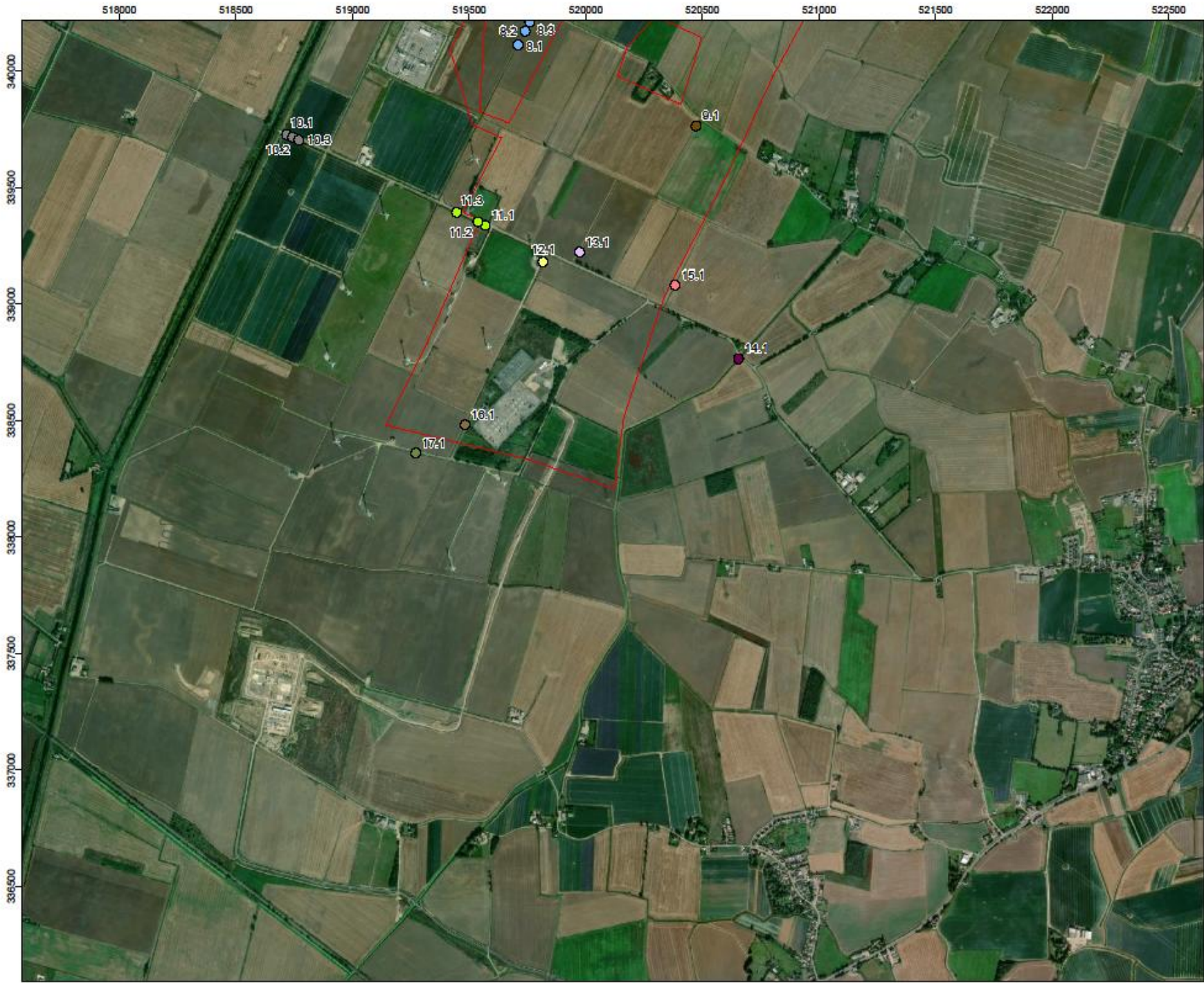


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NVC Aquatic Quadrat  
Page 2 of 3



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**Legend:**

- Indicative DCO Extent
- Aquatic NVC Quadrat Group
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  - 9
  - 10
  - 11
  - 12
  - 13
  - 14
  - 15
  - 16
  - 17

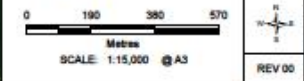


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Solar Park, Heckington Fen

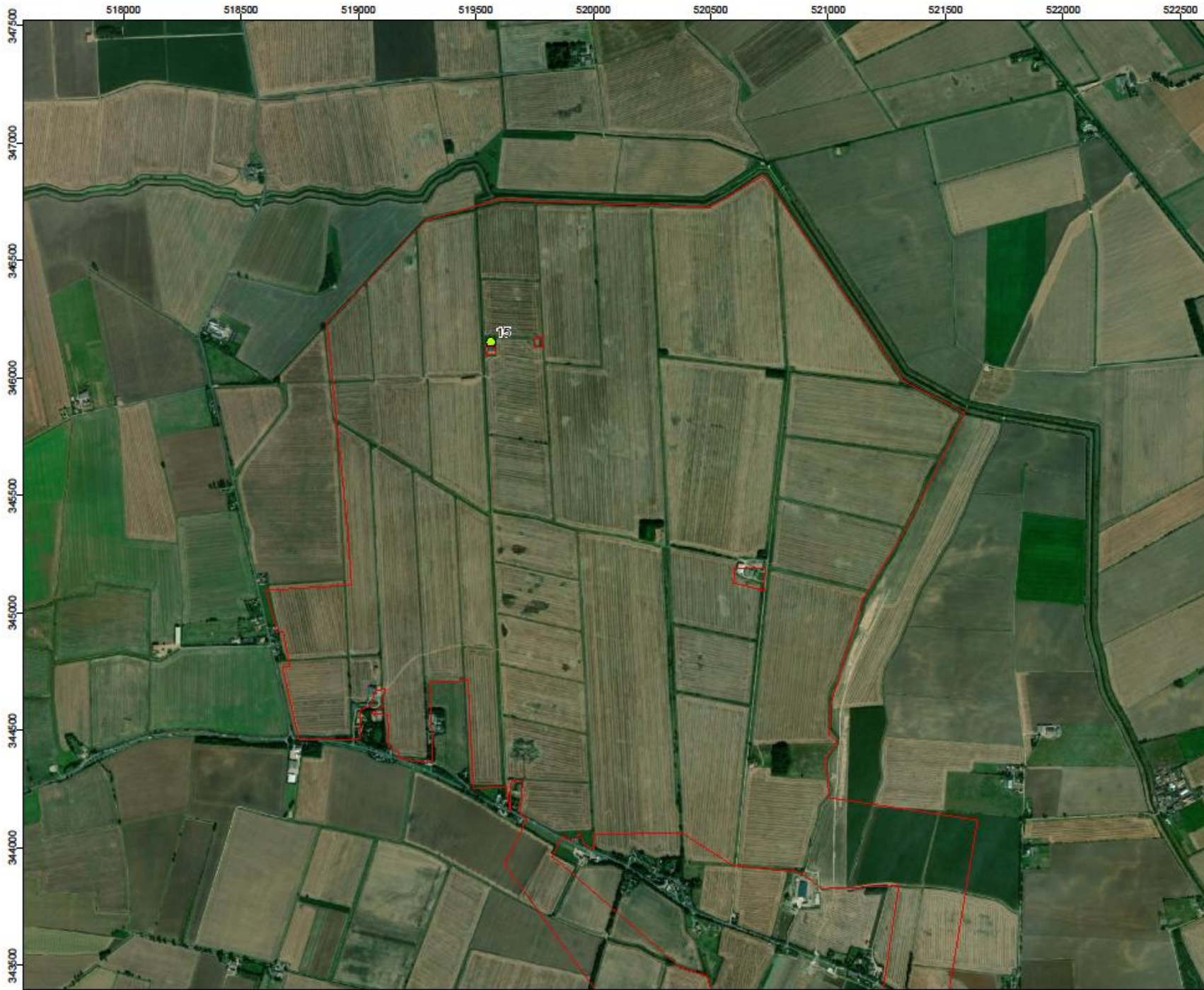
EXPERTS IN ECOLOGY

TITLE: Figure 2:  
NVC Aquatic Quadrat  
Page 3 of 3



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Aerial Imagery: Maxar, Airbus  
OS Open Features, Contains OS data © Crown Copyright and database right 2020





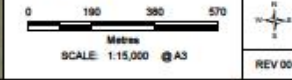
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**Solar Park, Heckington Fen**



**TITLE: Figure 2:**  
**Arable Plant Survey Plot**  
 Page 1 of 3







- Legend:**
- Indicative DCO Extent
  - Arable Plant Survey Plot



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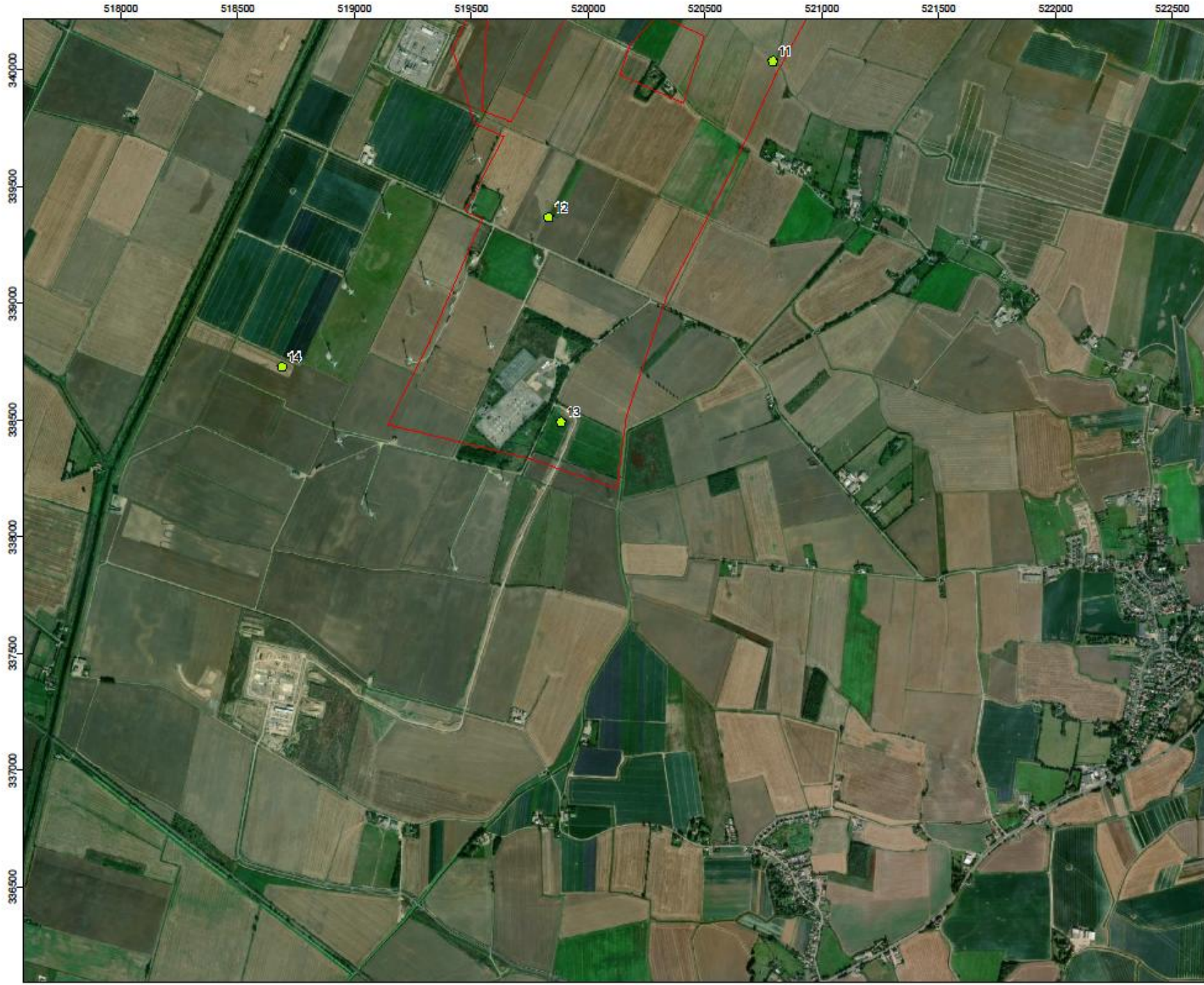
Solar Park, Heckington Fen



TITLE: Figure 2:  
Arable Plant Survey Plot  
Page 2 of 3







- Legend:**
- Indicative DCO Extent
  - Arable Plant Survey Plot

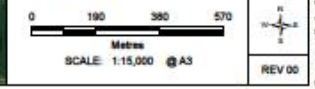


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| Rev | Date       | Description | Dm | Chk | App |

Solar Park, Heckington Fen



TITLE: Figure 2:  
Arable Plant Survey Plot  
Page 3 of 3





## APPENDIX A – PHOTOGRAPHS



1: NVC ditch surveys – quadrat 2.4 with *Potamogeton lucens* and *Brassica rapa* ssp. *sylvestris*



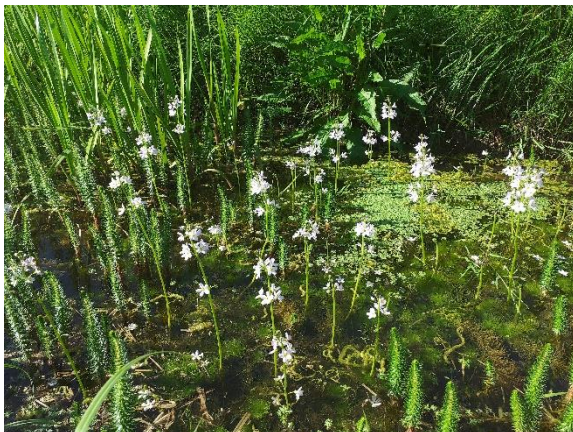
2: NVC ditch surveys – quadrat 4.1 with bloom of *Ulva flexuosa* and well-developed arable margin



3: NVC ditch surveys – quadrat 5.2, narrow shallow ditch with *Hippuris vulgaris* and *Iris pseudacorus*



4: NVC ditch surveys – quadrat 7.1. Mown banks, recent dredging, ditch dominated by *Callitriche stagnalis* agg.



5: NVC ditch surveys – quadrat 18.1 with *Hottonia palustris*, *Hippuris vulgaris*, *Callitriche* sp. and some *Ulva flexuosa*



6: NVC ditch surveys – quadrat 19.2 with *Hottonia palustris*, *Potamogeton natans*, *Potamogeton lucens*, *Hippuris vulgaris* and *Glyceria fluitans*





7: Arable surveys – plot 2



8: Arable surveys – plot 5



9: Arable surveys – plot 6, with *Capsella bursa-pastoris* and *Tripleurospermum inodorum*



10: Arable surveys – plot 7, with *Senecio vulgaris* and *Zea mays*



11: Arable surveys – *Senecio vernalis* in plot 8



12: Arable surveys – plot 15, uncultivated ground succeeding to grassland

## APPENDIX B – NVC TABLES

**Table A3: Three 4x1m quadrats at Labour in Vain Drain**

| Description: 2 m wide fen drain between 2 cereal fields. Banks approx. 2 m high with c. 40° slope, with 3 m margins of semi-improved grassland on each side. Marginal vegetation is regularly mowed and there is some evidence of dredging. Unshaded throughout length. |     |     |     | Max. water depth: 20cm |       |
|---|-----|-----|-----|------------------------|-------|
| Name  | 1.1 | 1.2 | 1.3 | Freq.                  | Range |
| <i>Hippuris vulgaris</i> (Mare's-tail)  | 2   | 6   | 6   | V                      | 2-6   |
| <i>Glyceria maxima</i> (Reed Sweet-grass)   | 5   | 5   | 5   | V                      | 5     |
| <i>Callitriche</i> sp. (a Water-starwort)   | 4   | 4   | 4   | V                      | 4     |
| <i>Agrostis stolonifera</i> (Creeping Bent)   | 2   | 1   | 3   | V                      | 1-3   |
| <i>Lemna gibba</i> (Fat Duckweed)   | 1   | 1   | 2   | V                      | 1-2   |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)  | 2   | -   | 5   | III                    | 0-5   |
| <i>Carex riparia</i> (Greater Pond-sedge)   | 4   | 4   | -   | III                    | 0-4   |
| <i>Veronica catenata</i> (Pink Water-speedwell)   | 3   | -   | 2   | III                    | 0-3   |
| <i>Potamogeton crispus</i> (Curled Pondweed)  | 2   | 2   | -   | III                    | 0-2   |
| <i>Ranunculus sceleratus</i> (Celery-leaved Buttercup)  | 1   | 1   | -   | III                    | 0-1   |
| <i>Hottonia palustris</i> (Water-violet)  | -   | 6   | -   | I                      | 0-6   |
| <i>Nasturtium officinale</i> (Water-cress)  | 2   | -   | -   | I                      | 0-2   |
| <i>Stuckenia pectinata</i> (Fennel Pondweed)  | -   | 2   | -   | I                      | 0-2   |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)   | -   | 1   | -   | I                      | 0-1   |
| <i>Glyceria fluitans</i> (Floating Sweet-grass)   | -   | 1   | -   | I                      | 0-1   |
| Matching co-efficients: OV32 36.26; A1 30.18; A8b 25.56; A5a 24.07; A11c 23.9; S5 23.88; S5b 22.28; A16 21.74; A16b 20.83; S5a 20.53  |     |     |     |                        |       |

**Table A4: Five 4x1m quadrats in ditch south of Hall Farm**

| Description: 3 m wide fen drain between 2 cereal fields. Banks approx. 2 m high with c. 40° slope, with 2 m margins of semi-improved grassland on each side. Evidence of recent dredging. Unshaded throughout length. |     | Max. water depth: 30 cm<br>Mean depth: 12 cm |     |     |     |       |       |
|---|-----|--|-----|-----|-----|-------|-------|
| Name  | 2.1 | 2.2  | 2.3 | 2.4 | 2.5 | Freq. | Range |
| <i>Potamogeton pusillus</i> (Lesser Pondweed)   | 2   | 3  | 5   | 5   | 5   | V     | 2-5   |
| <i>Glyceria maxima</i> (Reed Sweet-grass)   | 3   | 4  | 2   | 3   | 3   | V     | 0-4   |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)   | 3   | 5  | -   | 7   | 4   | IV    | 0-7   |
| <i>Sparganium erectum</i> (Branched Bur-reed)   | 3   | 4  | 4   | -   | -   | III   | 0-4   |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)  | -   | 3  | -   | 2   | 2   | III   | 0-3   |
| <i>Hydrodictyon reticulatum</i> (Water Net)   | -   | 6  | 1   | -   | -   | II    | 0-6   |
| <i>Potamogeton lucens</i> (Shining Pondweed)  | 6   | -  | -   | 5   | -   | II    | 0-6   |
| <i>Callitriche</i> sp. (a Water-starwort)   | -   | -  | -   | 2   | 5   | II    | 0-5   |
| <i>Hippuris vulgaris</i> (Mare's-tail)  | 2   | -  | -   | -   | 5   | II    | 0-5   |
| <i>Phragmites australis</i> (Common Reed)   | -   | 2  | 2   | -   | -   | II    | 0-2   |
| <i>Potamogeton berchtoldii</i> (Small Pondweed)   | -   | -  | 4   | -   | -   | I     | 0-4   |
| <i>Glyceria fluitans</i> (Floating Sweet-grass)   | -   | -  | -   | 2   | -   | I     | 0-2   |
| <i>Leptodictyum riparium</i> (Knieff's Feather-moss)  | 2   | -  | -   | -   | -   | I     | 0-2   |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)   | -   | -  | -   | -   | 2   | I     | 0-2   |
| Matching co-efficients: S5b 43.48; S5 40.09; A11a 37.27; S5a 30.97; S4 30.53; A11 26.39; S14 25.41; A8c 24.92; S14b 24.87; A11b 23.56   |     |  |     |     |     |       |       |

**Table A5: One 4x1m quadrat in ditch north of Timm's Drove**

| Description: Semi-dry ditch with set-aside margin to w and arable field to e. Banks approx. 1.2 m high with c. 30° slope, with 1.5 m margins of semi-improved grassland on each side. Unshaded throughout length. |     | Max. water depth: 3 cm |
|---|-----|------------------------|
| Name  | 3.1 |                        |
| <i>Nasturtium officinale</i> (Water-cress)  | 8   |                        |
| <i>Veronica catenata</i> (Pink Water-speedwell)   | 4   |                        |

|   |                        |  |
|---|------------------------|--|
| Description: Semi-dry ditch with set-aside margin to w and arable field to e. Banks approx. 1.2 m high with c. 30° slope, with 1.5 m margins of semi-improved grassland on each side. Unshaded throughout length. | Max. water depth: 3 cm |  |
| Name  | 3.1                    |  |
| <i>Callitriche</i> sp. (a Water-starwort)   | 3                      |  |
| <i>Juncus effusus</i> (Soft-rush)   | 3                      |  |
| <i>Phragmites australis</i> (Common Reed)   | 3                      |  |
| <i>Ranunculus sceleratus</i> (Celery-leaved Buttercup)  | 3                      |  |
| <i>Epilobium hirsutum</i> (Great Willowherb)  | 2                      |  |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)   | 2                      |  |
| <i>Tussilago farfara</i> (Colt's-foot)  | 2                      |  |
| <i>Galium uliginosum</i> (Fen Bedstraw)   | 1                      |  |

**Table A6: One 4x2m quadrat of ditch south of Timm's Drove**

|   |                         |  |
|---|-------------------------|--|
| Description: 2.5 m wide fen drain with cereal field to w and arable set-aside to e. Banks approx. 2 m high with c. 40° slope, with 2 m margins of semi-improved grassland on each side. Unshaded throughout length. | Max. water depth: 12 cm |  |
| Name  | 4.1                     |  |
| <i>Ulva flexuosa</i> (Tape Weed)  | 7                       |  |
| <i>Potamogeton pusillus</i> (Lesser Pondweed)   | 6                       |  |
| <i>Callitriche</i> sp. (a Water-starwort)   | 4                       |  |
| <i>Phragmites australis</i> (Common Reed)   | 4                       |  |

**Table A7: Two 4x0.5m quadrats of ditches on margins of North Drove**

|  |                        |     |
|--|------------------------|-----|
| Description: 0.75 m wide ditch, dry in places, with cereal field to n and track to s. Banks approx. 1 m high with c. 40° slope, with <1 m strip of semi-improved grassland on each side. Unshaded throughout length. | Max. water depth: 2 cm |     |
| Name   | 5.1                    | 5.2 |
| <i>Juncus articulatus</i> (Jointed Rush)   | 7                      | 4   |
| <i>Hippuris vulgaris</i> (Mare's-tail)   | 2                      | 6   |



|  |                        |     |
|--|------------------------|-----|
| Description: 0.75 m wide ditch, dry in places, with cereal field to n and track to s. Banks approx. 1 m high with c. 40° slope, with <1 m strip of semi-improved grassland on each side. Unshaded throughout length. | Max. water depth: 2 cm |     |
| Name   | 5.1                    | 5.2 |
| <i>Nasturtium officinale</i> (Water-cress)   | 5                      | 2   |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)   | 5                      | 2   |
| <i>Ulva flexuosa</i> (Tape Weed)   | 3                      | 2   |
| <i>Agrostis stolonifera</i> (Creeping Bent)  | 6                      | -   |
| <i>Iris pseudacorus</i> (Yellow Iris)  | -                      | 5   |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)   | 4                      | -   |
| <i>Glyceria fluitans</i> (Floating Sweet-grass)  | -                      | 4   |
| <i>Eleocharis palustris</i> (Common Spike-rush)  | -                      | 3   |
| <i>Lemna minor</i> (Common Duckweed)   | -                      | 3   |
| <i>Lemna gibba</i> (Fat Duckweed)  | -                      | 3   |
| <i>Lemna trisulca</i> (Ivy-leaved Duckweed)  | -                      | 3   |
| <i>Potamogeton pusillus</i> (Lesser Pondweed)  | -                      | 3   |
| <i>Veronica catenata</i> (Pink Water-speedwell)  | 3                      | -   |
| <i>Drepanocladus aduncus</i> (Knieff's Hook-moss)  | -                      | 2   |
| <i>Epilobium hirsutum</i> (Great Willowherb)   | -                      | 2   |
| <i>Leptodictyum riparium</i> (Knieff's Feather-moss)   | -                      | 2   |
| <i>Potamogeton crispus</i> (Curled Pondweed)   | -                      | 2   |
| <i>Carex otrubae</i> (False Fox-sedge)   | 1                      | -   |
| <i>Ranunculus repens</i> (Creeping Buttercup)  | -                      | 1   |

**Table A8: One 4x0.5m quadrat of ditch north of North Drove**

|  |                        |  |
|--|------------------------|--|
| Description: 0.5 m wide ditch, dry in places, with cereal fields to e and w. Banks approx. 1 m high with c. 45° slope and 1 m strip of semi-improved grassland on each side. Water surface covered in filamentous algae. Unshaded throughout length. | Max. water depth: 2 cm |  |
| Name   | 6.1                    |  |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)   | 7                      |  |
| <i>Ranunculus sceleratus</i> (Celery-leaved Buttercup)   | 5                      |  |

|  |                        |
|--|------------------------|
| Description: 0.5 m wide ditch, dry in places, with cereal fields to e and w. Banks approx. 1 m high with c. 45° slope and 1 m strip of semi-improved grassland on each side. Water surface covered in filamentous algae. Unshaded throughout length. | Max. water depth: 2 cm |
| Name   | 6.1                    |
| <i>Agrostis stolonifera</i> (Creeping Bent)  | 4                      |
| <i>Nasturtium officinale</i> (Water-cress)   | 4                      |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)  | 4                      |
| <i>Iris pseudacorus</i> (Yellow Iris)  | 3                      |
| <i>Juncus articulatus</i> (Jointed Rush)   | 3                      |
| <i>Veronica catenata</i> (Pink Water-speedwell)  | 3                      |
| <i>Glyceria</i> sp. (a Sweet-grass)  | 2                      |
| <i>Carex otrubae</i> (False Fox-sedge)   | 1                      |
| <i>Alisma plantago-aquatica</i> (Water-plantain)   | 1                      |

**Table A9: One 4x1m quadrat of ditch south of Double Twelves Drove, near corner of North Drove**

|  |                       |
|--|-----------------------|
| Description: 1 m wide wet ditch with cereal field to s and track to n. Banks approx. 1 m high with c. 40° slope and 1 m strip of semi-improved grassland on each side. Unshaded throughout length. | Max water depth: 7 cm |
| Name   | 7.1                   |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)   | 7                     |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)   | 6                     |
| <i>Nasturtium officinale</i> (Water-cress)   | 4                     |
| <i>Veronica catenata</i> (Pink Water-speedwell)  | 4                     |
| <i>Alisma plantago-aquatica</i> (Water-plantain)   | 3                     |
| <i>Ranunculus sceleratus</i> (Celery-leaved Buttercup)   | 3                     |
| <i>Agrostis stolonifera</i> (Creeping Bent)  | 2                     |
| <i>Epilobium hirsutum</i> (Great Willowherb)   | 2                     |
| <i>Persicaria maculosa</i> (Redshank)  | 2                     |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)  | 2                     |
| <i>Carex otrubae</i> (False Fox-sedge)   | 1                     |



**Table A10: Three 4x1m quadrats of ditch south of Double Twelves Drove**

| Description: 1.5 m wide wet ditch with cereal fields to w and e. Banks approx. 1.5 m high with c. 40° slope and 2 m strip of semi-improved grassland on each side. Unshaded throughout length. |     | Max. water depth: 20 cm |     |       |       |
|--|-----|-------------------------|-----|-------|-------|
| Name   | 8.1 | 8.2                     | 8.3 | Freq. | Range |
| <i>Potamogeton berchtoldii</i> (Small Pondweed)  | 8   | 7                       | 3   | V     | 3-8   |
| <i>Potamogeton crispus</i> (Curled Pondweed)   | 2   | 6                       | 4   | V     | 2-6   |
| <i>Ulva flexuosa</i> (Tape Weed)   | 5   | 3                       | 6   | V     | 3-6   |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)  | 4   | 4                       | 4   | V     | 4     |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)  | 4   | 3                       | 3   | V     | 3-4   |
| <i>Glyceria</i> sp. (a Sweet-grass)  | 3   | 4                       | 2   | V     | 2-4   |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)   | 3   | 2                       | 2   | V     | 2-3   |
| <i>Sparganium erectum</i> (Branched Bur-reed)  | 4   | 4                       | -   | III   | 0-4   |
| <i>Callitriche</i> sp. (a Water-starwort)  | 3   | -                       | 4   | III   | 0-4   |
| <i>Hippuris vulgaris</i> (Mare's-tail)   | 3   | -                       | 4   | III   | 0-4   |
| <i>Ranunculus sceleratus</i> (Celery-leaved Buttercup)   | 1   | 1                       | -   | III   | 0-1   |
| <i>Iris pseudacorus</i> (Yellow Iris)  | -   | 5                       | -   | I     | 0-5   |
| <i>Persicaria amphibia</i> (Amphibious Bistort)  | 4   | -                       | -   | I     | 0-4   |
| <i>Agrostis stolonifera</i> (Creeping Bent)  | 2   | -                       | -   | I     | 0-2   |
| <i>Carex otrubae</i> (False Fox-sedge)   | -   | 2                       | -   | I     | 0-2   |
| <i>Drepanocladus aduncus</i> (Knieff's Hook-moss)  | 2   | -                       | -   | I     | 0-2   |
| <i>Lemna minor</i> (Common Duckweed)   | 1   | -                       | -   | I     | 0-1   |
| <i>Potamogeton pusillus</i> (Lesser Pondweed)  | -   | 2                       | -   | I     | 0-2   |
| Bare substrate   | 4   | 5                       | 7   | -     | -     |
| Matching co-efficients: S14d 30.55; A8b 30.06; A11c 29.88; S14 28.57; A11 27.21; A11b 27.06; A8 27.00; A8c 26.03; S14b 23.72; A13a 23.60   |     |                         |     |       |       |

**Table A11: One 4x1m quadrat of ditch south of North Drove, east of White House Farm**

|  |                         |
|--|-------------------------|
| Description: 1.5 m wide wet ditch with cereal fields to w and e. Banks approx. 1.5 m high with c. 35° slope and 2.5 m strip of semi-improved grassland on each side. Unshaded throughout length. | Max. water depth: 10 cm |
| Name   | 9.1                     |
| <i>Hippuris vulgaris</i> (Mare's-tail)   | 8                       |
| <i>Glyceria</i> sp. (a Sweet-grass)  | 6                       |
| <i>Agrostis stolonifera</i> (Creeping Bent)  | 5                       |
| <i>Helosciadium nodiflorum</i> (Fool's Water-cress)  | 4                       |
| <i>Callitriche</i> sp. (a Water-starwort)  | 2                       |

**Table A12: Three 8x2m quadrats of Mill Drain south of Bicker Drove, near confluence with South Forty Foot Drain**

| Description: Substantial > 3m wide, deep drain with cereal field to s and drove to n. Banks approx. 2 m high with c. 45° slope and 3 m strip of semi-improved grassland on each side. Little evidence of bankside management or dredging, and a little shading from low Bramble scrub. | Max. water depth: >50 cm |      |      |       |       |
|--|--------------------------|------|------|-------|-------|
| Name   | 10.1                     | 10.2 | 10.3 | Freq. | Range |
| <i>Potamogeton natans</i> (Broad-leaved Pondweed)  | 5                        | 6    | 7    | V     | 5-7   |
| <i>Sparganium</i> sp. (a Bur-reed)   | 3                        | 4    | 4    | V     | 3-4   |
| <i>Lemna gibba</i> (Fat Duckweed)  | 3                        | 2    | 2    | V     | 2-3   |
| <i>Phragmites australis</i> (Common Reed)  | 5                        | 4    | -    | III   | 0-5   |
| <i>Hippuris vulgaris</i> (Mare's-tail)   | 2                        | -    | 3    | III   | 0-3   |
| <i>Glyceria maxima</i> (Reed Sweet-grass)  | -                        | 3    | 3    | III   | 0-3   |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)  | -                        | -    | 4    | I     | 0-4   |
| <i>Helosciadium nodiflorum</i> (Fool's Water-cress)  | -                        | -    | 4    | I     | 0-4   |
| <i>Lemna trisulca</i> (Ivy-leaved Duckweed)  | -                        | 3    | -    | I     | 0-3   |
| <i>Persicaria amphibia</i> (Amphibious Bistort)  | -                        | -    | 4    | I     | 0-4   |
| <i>Potamogeton crispus</i> (Curled Pondweed)   | -                        | -    | 2    | I     | 0-2   |
| <i>Typha latifolia</i> (Bulrush)   | -                        | -    | 2    | I     | 0-2   |
| Bare substrate   | 8                        | 7    | 2    |       |       |

| Description: Substantial > 3m wide, deep drain with cereal field to s and drove to n. Banks approx. 2 m high with c. 45° slope and 3 m strip of semi-improved grassland on each side. Little evidence of bankside management or dredging, and a little shading from low Bramble scrub. |      |      | Max. water depth: >50 cm |       |       |
|--|------|------|--------------------------|-------|-------|
| Name   | 10.1 | 10.2 | 10.3                     | Freq. | Range |
| Matching co-efficients: A1 32.67; S26d 29.81; S4 27.78; A11b 27.57; S14b 27.27; A8c 26.28; A11 24.97; S4a 24.79; S5 23.95; A8 23.88  |      |      |                          |       |       |

**Table A13: Three 8x2m quadrats of Mill Drain south of Bicker Drove, near Villa Farm**

| Description: Substantial > 3m wide, deep drain with cereal field to s and drove/derelict farm buildings to n. Banks approx. 2 m high with c. 45° slope and 3 m strip of semi-improved grassland on each side. Little evidence of bankside management or dredging, and a little shading from low Bramble scrub. |      |      | Max. water depth: c. 40 cm |       |       |
|--|------|------|----------------------------|-------|-------|
| Name   | 11.1 | 11.2 | 11.3                       | Freq. | Range |
| <i>Potamogeton crispus</i> (Curled Pondweed)   | 8    | 8    | 4                          | V     | 4-8   |
| <i>Phragmites australis</i> (Common Reed)  | 5    | 5    | 5                          | V     | 5     |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)  | 3    | 4    | 4                          | V     | 3-4   |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)   | -    | 4    | 2                          | III   | 0-4   |
| <i>Ranunculus circinatus</i> (Fan-leaved Water-crowfoot)   | -    | -    | 3                          | I     | 0-3   |
| <i>Lemna gibba</i> (Fat Duckweed)  | 2    | -    | -                          | I     | 0-2   |
| <i>Lemna trisulca</i> (Ivy-leaved Duckweed)  | 2    | 1    | -                          | I     | 0-2   |
| <i>Zannichellia palustris</i> (Horned Pondweed)  | -    | 2    | -                          | I     | 0-2   |
| Bare substrate   | 4    | 4    | 8                          |       |       |
| Matching co-efficients: A5a 37.21; A5 34.68; A8b 32.84; A8 32.61; S4a 32.00; A2b 28.64; A11b 28.29; A12 28.04; S4 26.73; A1 26.61  |      |      |                            |       |       |
| Diagnosis:   |      |      |                            |       |       |

**Table A14: One 4x1m quadrat of ditch south of Mill Drain, east of Poplartree Farm**

|   |                        |
|---|------------------------|
| Description: 1 m wide wet ditch with cereal fields to w and e, a wind turbine to the w, and some recent disruption from previous cable works. Banks approx. 1.5 m high with c. 35° slope and 2. m strip of semi-improved grassland on each side. Unshaded throughout length. Black substrate noted. | Max. water depth: 5 cm |
| Name  | 12.1                   |
| <i>Hydrodictyon reticulatum</i> (Water Net)   | 6                      |
| <i>Lemna trisulca</i> (Ivy-leaved Duckweed)   | 4                      |
| <i>Phragmites australis</i> (Common Reed)   | 4                      |
| <i>Potamogeton crispus</i> (Curled Pondweed)  | 4                      |
| <i>Ulva flexuosa</i> (Tape Weed)  | 4                      |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)   | 3                      |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)  | 3                      |
| Bare substrate  | 6                      |

**Table A15: One 4x1m quadrat of ditch north of Mill Drain, east of Poplartree Farm**

|  |                        |
|--|------------------------|
| Description: 1 m wide wet ditch with cereal fields to w and e. Banks approx. 1 m high with c. 40° slope and 1/1.5 m strips of semi-improved grassland to w and e respectively. Unshaded throughout length. | Max. water depth: 5 cm |
| Name   | 13.1                   |
| <i>Glyceria fluitans</i> (Floating Sweet-grass)  | 5                      |
| <i>Hippuris vulgaris</i> (Mare's-tail)   | 5                      |
| <i>Agrostis stolonifera</i> (Creeping Bent)  | 4                      |
| <i>Callitriche</i> sp. (a Water-starwort)  | 4                      |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)  | 4                      |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)   | 3                      |
| <i>Ulva flexuosa</i> (Tape Weed)   | 3                      |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)  | 2                      |
| <i>Juncus effusus</i> (Soft-rush)  | 1                      |

**Table A16: One approx. 8x2m quadrat. Binocular survey of Hammond Beck from Cowbridge Road bridge**

|  |                          |
|--|--------------------------|
| Description: Substantial modified river with arable fields to w and e. Channel is 3 m wide, with banks approx. 2 m high with c. 40° slope and 6/3 m strips of semi-improved grassland to w and e respectively. | Max water depth: unknown |
| Name   | 14.1                     |
| <i>Ulva flexuosa</i> (Tape Weed)   | 5                        |
| <i>Callitriche</i> sp. (a Water-starwort)  | 5                        |
| <i>Phragmites australis</i> (Common Reed)  | 4                        |
| <i>Lemna gibba</i> (Fat Duckweed)  | 2                        |

**Table A17: One 4x1m quadrat of ditch north of Cowbridge Road, near Bicker Drove**

|   |                        |
|---|------------------------|
| Description: 1.5 m wide semi-dry ditch with arable field to w and e. Banks approx. 1.5 m high with c. 40° slope and 5/2 m strip of semi-improved grassland to w and e respectively. Unshaded throughout length. | Max. water depth: 3 cm |
| Name  | 15:1                   |
| <i>Agrostis stolonifera</i> (Creeping Bent)   | 7                      |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)  | 6                      |
| <i>Chara vulgaris</i> (Common Stonewort)  | 4                      |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)  | 3                      |
| <i>Ranunculus repens</i> (Creeping Buttercup)   | 2                      |
| <i>Carex otrubae</i> (False Fox-sedge)  | 1                      |
| <i>Veronica catenata</i> (Pink Water-speedwell)   | 1                      |
| Bare substrate  | 4                      |

**Table A18: One 4x1m quadrat of ditch west of Electricity Substation, north of Vicarage Drive**

|  |                         |
|--|-------------------------|
| Description: 1.5 m wide wet ditch with arable field to w and substation to e. Banks approx. 2 m high with c. 40° slope and 2 m strip of semi-improved grassland on both sides. Unshaded throughout length. | Max. water depth: 10 cm |
| Name   | 16.1                    |
| <i>Hippuris vulgaris</i> (Mare's-tail)   | 8                       |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)   | 6                       |
| <i>Agrostis stolonifera</i> (Creeping Bent)  | 4                       |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)  | 4                       |
| <i>Glyceria fluitans</i> (Floating Sweet-grass)  | 4                       |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)   | 3                       |
| Bare substrate   | 2                       |

**Table A19: One 4x1m quadrat of ditch south of Vicarage Drive**

|   |                         |
|---|-------------------------|
| Description: 2 m wide ditch with arable field to s and drove to n. Banks approx. 2 m high with c. 40° slope and 6/3 m strip of semi-improved grassland to n and s respectively. Unshaded throughout length. | Max. water depth: 10 cm |
| Name  | 17.1                    |
| <i>Potamogeton crispus</i> (Curled Pondweed)  | 8                       |
| <i>Sparganium</i> sp. (a Bur-reed)  | 5                       |
| <i>Glyceria maxima</i> (Reed Sweet-grass)   | 4                       |
| <i>Persicaria amphibia</i> (Amphibious Bistort)   | 4                       |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)  | 3                       |
| <i>Agrostis stolonifera</i> (Creeping Bent)   | 2                       |
| <i>Hippuris vulgaris</i> (Mare's-tail)  | 2                       |
| <i>Nasturtium officinale</i> (Water-cress)  | 2                       |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)  | 2                       |
| <i>Veronica catenata</i> (Pink Water-speedwell)   | 2                       |
| Bare substrate  | 2                       |

**Table A20: Three 4x1m quadrats at Labour in Vain Drain**

| Description: 2 m wide fen drain between 2 cereal fields. Banks approx. 2 m high with c. 40° slope, with 3 m margins of semi-improved grassland on each side. Marginal vegetation is regularly mowed and there is some evidence of dredging. Unshaded throughout length. |      |      |      | Max. water depth: 20 cm |       |
|---|------|------|------|-------------------------|-------|
| Name  | 18.1 | 18.2 | 18.3 | Freq.                   | Range |
| <i>Hippuris vulgaris</i> (Mare's-tail)  | 8    | 5    | 6    | V                       | 5-8   |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)  | 4    | 8    | 7    | V                       | 4-8   |
| <i>Carex riparia</i> (Greater Pond-sedge)   | 4    | 3    | 4    | V                       | 3-4   |
| <i>Agrostis stolonifera</i> (Creeping Bent)   | -    | 3    | 2    | III                     | 0-3   |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)   | -    | 2    | 2    | III                     | 0-2   |
| <i>Potamogeton crispus</i> (Curled Pondweed)  | -    | 3    | 7    | III                     | 0-7   |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)  | 3    | -    | 4    | III                     | 0-4   |
| <i>Ulva flexuosa</i> (Tape Weed)  | 6    | 3    | -    | III                     | 0-6   |
| <i>Glyceria</i> sp. (a Sweet-grass)   | 4    | -    | -    | I                       | 0-4   |
| <i>Hottonia palustris</i> (Water-violet)  | 4    | -    | -    | I                       | 0-4   |
| <i>Potamogeton natans</i> (Broad-leaved Pondweed)   | -    | 4    | -    | I                       | 0-4   |
| <i>Alisma plantago-aquatica</i> (Water-plantain)  | -    | 3    | -    | I                       | 0-3   |
| <i>Phragmites australis</i> (Common Reed)   | -    | 3    | -    | I                       | 0-3   |
| <i>Carex otrubae</i> (False Fox-sedge)  | -    | 2    | -    | I                       | 0-2   |
| <i>Lemna minor</i> (Common Duckweed)  | -    | -    | 2    | I                       | 0-2   |
| <i>Ranunculus sceleratus</i> (Celery-leaved Buttercup)  | -    | -    | 2    | I                       | 0-2   |
| Bare substrate  | 2    | 2    | 2    |                         |       |
| Matching co-efficients: S4 28.50; A8c 25.84; A11c 25.79; S14b 25.57; A8b 25.35; A16 24.82; S6 24.59; A16a 24.05; A8 24.00; A16b 23.65   |      |      |      |                         |       |



**Table A21: Three 8x2m quadrats, drain north of Labour in Vain**

| Description: 2 m wide fen drain between cereal fields. Banks approx. 2 m high with c. 40° slope, with 3 m margins of semi-improved grassland on each side. Marginal vegetation was unmanaged at the time of survey, with some scrub growth in the north which provides limited shading. |      |      |      | Max. water depth: 30 cm |       |
|---|------|------|------|-------------------------|-------|
| Name  | 19.1 | 19.2 | 19.3 | Freq.                   | Range |
| <i>Potamogeton lucens</i> (Shining Pondweed)  | 4    | 2    | 7    | V                       | 2-7   |
| <i>Potamogeton natans</i> (Broad-leaved Pondweed)   | 6    | 6    | 6    | V                       | 6     |
| <i>Glyceria fluitans</i> (Floating Sweet-grass)   | 3    | 4    | 4    | V                       | 3-4   |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)   | 3    | 2    | 3    | V                       | 2-3   |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)   | 7    | 4    | -    | III                     | 0-7   |
| <i>Hottonia palustris</i> (Water-violet)  | -    | 7    | 2    | III                     | 0-7   |
| <i>Potamogeton crispus</i> (Curled Pondweed)  | 5    | 3    | -    | III                     | 0-5   |
| <i>Sparganium</i> sp. (a Bur-reed)  | -    | 4    | 1    | III                     | 0-4   |
| <i>Carex riparia</i> (Greater Pond-sedge)   | -    | 2    | 3    | III                     | 0-3   |
| <i>Hippuris vulgaris</i> (Mare's-tail)  | -    | 6    | -    | I                       | 0-6   |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)  | 4    | -    | -    | I                       | 0-4   |
| <i>Zannichellia palustris</i> (Horned Pondweed)   | 2    | -    | -    | I                       | 0-2   |
| <i>Lemna minor</i> (Common Duckweed)  | -    | 1    | -    | I                       | 0-1   |
| <i>Leptodictyum riparium</i> (Knieff's Feather-moss)  | 1    | -    | -    | I                       | 0-1   |
| Bare substrate  | 4    | 2    | 4    |                         |       |
| Matching co-efficients: A11b 27.87; A8c 27.74; A8b 27.62; A11a 26.47; A8 26.32; A9 26.06; A9b 26.02; A11 25.89; A15 24.88; S22a 24.52   |      |      |      |                         |       |

**Table A22: One 4x1m quadrat, Labour in Vain Drain north of East Heckington Church**

| Description: 2 m wide fen drain between cereal fields. Banks approx. 2 m high with c. 40° slope, with 3 m margins of semi-improved grassland on each side. Marginal vegetation had been recently mown at time of survey. Unshaded throughout length. |      | Max. water depth: 30 cm |
|--|------|-------------------------|
| Name   | 20.1 |                         |
| <i>Callitriche stagnalis</i> agg. (a Water-starwort)   | 8    |                         |

|  |                         |
|--|-------------------------|
| Description: 2 m wide fen drain between cereal fields. Banks approx. 2 m high with c. 40° slope, with 3 m margins of semi-improved grassland on each side. Marginal vegetation had been recently mown at time of survey. Unshaded throughout length. | Max. water depth: 30 cm |
| Name   | 20.1                    |
| <i>Nasturtium officinale</i> (Water-cress)   | 6                       |
| <i>Ranunculus sceleratus</i> (Celery-leaved Buttercup)   | 6                       |
| <i>Glyceria maxima</i> (Reed Sweet-grass)  | 4                       |
| <i>Carex otrubae</i> (False Fox-sedge)   | 2                       |
| <i>Hippuris vulgaris</i> (Mare's-tail)   | 2                       |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)  | 2                       |
| Bare substrate   | 1                       |

**Table A23: Compiled list of species recorded during NVC surveys**

| Species   | Number of quadrats |
|---|--------------------|
|   | Total = 37         |
| a) Submerged species  |                    |
| <i>Elodea nuttallii</i> (Nuttall's Waterweed)   | 19                 |
| <i>Potamogeton berchtoldii</i> (Small Pondweed)   | 4                  |
| <i>Potamogeton crispus</i> (Curled Pondweed)  | 17                 |
| <i>Potamogeton lucens</i> (Shining Pondweed)  | 5                  |
| <i>Potamogeton pusillus</i> (Lesser Pondweed)   | 8                  |
| <i>Ranunculus circinatus</i> (Fan-leaved Water-crowfoot)  | 1                  |
| <i>Ranunculus trichophyllus</i> (Thread-leaved Water-crowfoot)  | 19                 |
| <i>Stuckenia pectinata</i> (Fennel Pondweed)  | 1                  |
| <i>Zannichellia palustris</i> (Horned Pondweed)   | 2                  |
| b) Free-floating species  |                    |
| <i>Lemna gibba</i> (Fat Duckweed)   | 10                 |
| <i>Lemna minor</i> (Common Duckweed)  | 3                  |
| <i>Lemna trisulca</i> (Ivy-leaved Duckweed)   | 4                  |
| c) Species with floating leaves   |                    |
| <i>Callitriche</i> sp. (a Water-starwort) (all records, whether to genus or aggregate, including those without surface leaf-rosettes at the time of survey) | 25                 |
| <i>Persicaria amphibia</i> (Amphibious Bistort)   | 3                  |
| <i>Potamogeton natans</i> (Broad-leaved Pondweed)   | 7                  |
| d) Emergent species, and predominantly terrestrial species capable of spreading into watercourses from the margins  |                    |
| <i>Agrostis stolonifera</i> (Creeping Bent)   | 14                 |

|   |    |
|---|----|
| <i>Alisma plantago-aquatica</i> (Water-plantain)  | 3  |
| <i>Carex otrubae</i> (False Fox-sedge)  | 7  |
| <i>Carex riparia</i> (Greater Pond-sedge)   | 7  |
| <i>Eleocharis palustris</i> (Common Spike-rush)   | 1  |
| <i>Epilobium hirsutum</i> (Great Willowherb)  | 3  |
| <i>Galium uliginosum</i> (Fen Bedstraw)   | 1  |
| <i>Glyceria fluitans</i> (Floating Sweet-grass)   | 9  |
| <i>Glyceria maxima</i> (Reed Sweet-grass)   | 12 |
| <i>Glyceria</i> sp. (Sweet-grass)(all non-flowering <i>Glyceria</i> recorded excluding <i>Glyceria maxima</i> ) | 6  |
| <i>Helosciadium nodiflorum</i> (Fool's Water-cress)   | 2  |
| <i>Hippuris vulgaris</i> (Mare's-tail)  | 20 |
| <i>Hottonia palustris</i> (Water-violet)  | 4  |
| <i>Iris pseudacorus</i> (Yellow Iris)   | 3  |
| <i>Juncus articulatus</i> (Jointed Rush)  | 3  |
| <i>Juncus effusus</i> (Soft-rush)   | 2  |
| <i>Nasturtium officinale</i> (Water-cress)  | 8  |
| <i>Persicaria maculosa</i> (Redshank)   | 1  |
| <i>Phalaris arundinacea</i> (Reed Canary-grass)   | 12 |
| <i>Phragmites australis</i> (Common Reed)   | 12 |
| <i>Ranunculus repens</i> (Creeping Buttercup)   | 2  |
| <i>Ranunculus sceleratus</i> (Celery-leaved Buttercup)  | 14 |
| <i>Sparganium erectum</i> (Branched Bur-reed)   | 5  |
| <i>Sparganium</i> sp. (a Bur-reed)(non-flowering specimens)   | 7  |
| <i>Tussilago farfara</i> (Colt's-foot)  | 1  |
| <i>Typha latifolia</i> (Bulrush)  | 1  |
| <i>Veronica catenata</i> (Pink Water-speedwell)   | 8  |
| e) Bryophytes   |    |
| <i>Drepanocladus aduncus</i> (Knieff's Hook-moss)   | 2  |
| <i>Leptodictyum riparium</i> (Knieff's Feather-moss)  | 3  |
| f) Stoneworts and algae   |    |
| <i>Chara vulgaris</i> (Common Stonewort)  | 1  |
| <i>Hydrodictyon reticulatum</i> (Water Net)   | 3  |
| <i>Ulva flexuosa</i> (Tape Weed)  | 11 |
| g) Marginal species of ditch banks  |    |
| <i>Anthriscus sylvestris</i> (Cow Parsley)  |    |
| <i>Arrhenatherum elatius</i> (False Oat-grass)  |    |
| <i>Brassica napus</i> ssp. <i>oleifera</i> (Oil-seed Rape)  |    |
| <i>Brassica rapa</i> ssp. <i>sylvestris</i> (Bargeman's Cabbage)  |    |
| <i>Cirsium arvense</i> (Creeping Thistle)   |    |
| <i>Dactylis glomerata</i> (Cock's-foot)   |    |
| <i>Geranium pyrenaicum</i> (Hedgerow Crane's-bill)  |    |
| <i>Heracleum sphondylium</i> (Hogweed)  |    |
| <i>Holcus lanatus</i> (Yorkshire-fog)   |    |
| <i>Oxyrrhynchium hians</i> (Neat Feather-moss)  |    |

|  |  |
|--|--|
| <i>Plantago lanceolata</i> (Ribwort Plantain)              |  |
| <i>Rubus fruticosus</i> agg. (Bramble)                     |  |
| <i>Rumex conglomeratus</i> (Clustered Dock)                |  |
| <i>Sambucus ebulus</i> (Dwarf Elder)                       |  |
| <i>Sinapis arvensis</i> (Charlock)                         |  |
| <i>Taraxacum</i> sect. <i>taraxacum</i> (Common Dandelion) |  |
| <i>Tragopogon pratensis</i> (Goat's-beard)                 |  |
| <i>Urtica dioica</i> (Common Nettle)                       |  |
| <i>Vulpia myuros</i> (Rat's-tail Fescue)                   |  |

## APPENDIX C – ARABLE PLOTS

Table A22: Species recorded during IAPA in arable plots, 9<sup>th</sup>-12<sup>th</sup> May 2022

| Species   | IATA score | Plot number |   |   |   |   |   |   |   |   |    |    |    |    |    |    | No. plots |
|---|------------|-------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|-----------|
|   |            | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |           |
| <i>Alopecurus myosuroides</i> (Black-grass)             |            | x           | x | x | x | x | x | x | x | x | x  | x  | x  |    | x  |    | 13        |
| <i>Senecio vulgaris</i> (Groundsel)                     |            |             |   |   | x | x | x | x | x | x | x  | x  | x  |    | x  |    | 10        |
| <i>Cirsium arvense</i> (Creeping Thistle)               |            | x           |   |   |   | x | x | x | x | x | x  |    | x  |    | x  |    | 9         |
| <i>Helminthotheca echioides</i> (Bristly Oxtongue)      |            | x           | x | x |   |   | x | x | x |   |    |    | x  |    | x  | x  | 9         |
| <i>Sinapis arvensis</i> (Charlock)                      |            | x           |   |   |   | x | x |   | x | x | x  | x  | x  |    | x  |    | 9         |
| <i>Capsella bursa-pastoris</i> (Shepherd's-purse)       |            | x           | x |   |   | x | x |   | x | x |    | x  | x  |    |    |    | 8         |
| <i>Geranium dissectum</i> (Cut-leaved Crane's-bill)     |            | x           | x | x | x |   |   | x |   |   | x  |    |    |    | x  | x  | 8         |
| <i>Sonchus asper</i> (Prickly Sow-thistle)              |            |             |   | x | x | x |   |   | x | x |    |    | x  |    | x  | x  | 8         |
| <i>Veronica persica</i> (Common Field-speedwell)        |            | x           |   | x |   | x | x | x |   | x |    | x  | x  |    |    |    | 8         |
| <i>Hordeum distichon</i> (Two-rowed Barley)             |            | x           | x | x |   | x | x |   |   |   | x  |    |    |    | x  |    | 7         |
| <i>Epilobium tetragonum</i> (Square-stalked Willowherb) |            |             |   |   | x | x | x | x |   |   |    |    | x  |    | x  |    | 6         |
| <i>Lolium perenne</i> (Perennial Rye-grass)             |            |             | x | x |   |   |   |   |   |   | x  | x  |    | x  | x  |    | 6         |
| <i>Matricaria chamomila</i> (Scented Mayweed)           |            |             |   |   |   |   | x | x | x |   |    | x  | x  |    | x  |    | 6         |
| <i>Agrostis stolonifera</i> (Creeping Bent)             |            | x           |   | x |   | x |   |   |   | x |    |    |    | x  |    |    | 5         |
| <i>Cirsium vulgare</i> (Spear Thistle)                  |            |             |   |   |   |   |   | x |   |   |    |    | x  | x  | x  | x  | 5         |
| <i>Rumex obtusifolius</i> (Broad-leaved Dock)           |            |             |   |   |   | x | x | x |   |   |    |    | x  |    |    | x  | 5         |
| <i>Trifolium repens</i> (White Clover)                  |            |             |   |   | x |   |   |   | x |   | x  | x  |    |    |    | x  | 5         |
| <i>Zea mays</i> (Maize)                                 |            |             |   |   | x |   |   | x |   |   | x  | x  |    |    | x  |    | 5         |
| <i>Veronica agrestis</i> (Green Field-speedwell)        | 1          | x           | x | x |   | x |   |   |   |   | x  |    |    |    |    |    | 5         |
| <i>Dactylis glomerata</i> (Cock's-foot)                 |            |             |   |   |   |   |   |   | x |   |    |    | x  | x  |    | x  | 4         |
| <i>Galium aparine</i> (Cleavers)                        |            |             |   |   |   | x |   | x |   | x |    |    | x  |    |    |    | 4         |
| <i>Jacobaea vulgaris</i> (Common Ragwort)               |            |             |   |   |   |   |   |   |   | x |    |    | x  |    | x  | x  | 4         |

| Species  | IATA score | Plot number |   |   |   |   |   |   |   |   |    |    |    |    |    |    | No. plots |
|--|------------|-------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|-----------|
|  |            | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |           |
| <i>Poa annua</i> (Annual Meadow-grass)                     |            |             |   |   |   | x | x | x |   |   |    |    | x  |    |    |    | 4         |
| <i>Schedonorus arundinaceus</i> (Tall Fescue)              |            | x           | x |   |   |   |   |   |   |   |    |    |    | x  |    | x  | 4         |
| <i>Sisymbrium officinale</i> (Hedge Mustard)               |            |             |   |   |   | x |   | x |   | x |    |    | x  |    |    |    | 4         |
| <i>Sonchus oleraceus</i> (Smooth Sow-thistle)              |            |             |   |   |   | x | x |   |   | x |    |    |    |    | x  |    | 4         |
| <i>Stellaria media</i> (Common Chickweed)                  |            |             |   |   |   | x |   | x |   | x |    |    |    |    | x  |    | 4         |
| <i>Tripleurospermum inodorum</i> (Scentless Mayweed)       |            | x           | x | x |   | x |   |   |   |   |    |    |    |    |    |    | 4         |
| <i>Vicia sativa</i> (Common Vetch)                         |            |             | x |   |   |   |   |   | x |   | x  | x  |    |    |    |    | 4         |
| <i>Alopecurus geniculatus</i> (Marsh Foxtail)              |            |             |   |   |   |   |   | x | x |   |    |    |    | x  |    |    | 3         |
| <i>Brassica napus</i> ssp. <i>oleifera</i> (Oilseed Rape)  |            |             |   |   |   |   |   |   | x | x | x  |    |    |    |    |    | 3         |
| <i>Equisetum arvense</i> (Field Horsetail)                 |            | x           |   |   |   |   |   |   |   |   | x  |    | x  |    |    |    | 3         |
| <i>Ervum tetraspermum</i> (Smooth Tare)                    | 2          | x           |   | x |   |   |   |   |   |   |    |    |    |    |    | x  | 3         |
| <i>Heracleum sphondylium</i> (Hogweed)                     |            | x           |   |   |   |   |   |   |   |   |    |    | x  |    |    | x  | 3         |
| <i>Lamium album</i> (White Dead-nettle)                    |            |             |   |   |   | x |   |   |   | x |    |    |    |    |    | x  | 3         |
| <i>Lamium hybridum</i> (Cut-leaved Dead-nettle)            |            |             |   |   |   | x | x | x |   |   |    |    |    |    |    |    | 3         |
| <i>Ranunculus repens</i> (Creeping Buttercup)              |            |             |   | x |   |   |   |   |   |   |    |    |    | x  |    | x  | 3         |
| <i>Taraxacum</i> sect. <i>Ruderalia</i> (Common Dandelion) |            |             |   |   |   | x |   |   |   | x |    |    |    |    |    | x  | 3         |
| <i>Urtica urens</i> (Small Nettle)                         |            |             |   |   |   | x |   |   |   |   |    |    | x  |    | x  |    | 3         |
| <i>Achillea millefolium</i> (Yarrow)                       |            |             |   |   |   |   |   |   | x |   |    | x  |    |    |    |    | 2         |
| <i>Anthriscus sylvestris</i> (Cow Parsley)                 |            |             |   |   |   |   |   |   |   |   |    |    |    | x  |    | x  | 2         |
| <i>Bellis perennis</i> (Daisy)                             |            |             |   |   |   | x |   |   |   |   |    |    |    |    |    | x  | 2         |
| <i>Brassica oleracea</i> (Cabbage)                         |            |             |   |   |   |   |   | x |   |   |    |    | x  |    |    |    | 2         |
| <i>Bromus hordeaceus</i> (Soft-brome)                      |            |             |   |   |   |   |   |   |   | x |    |    |    |    |    | x  | 2         |
| <i>Cerastium glomeratum</i> (Sticky Mouse-ear)             |            |             | x |   |   | x |   |   |   |   |    |    |    |    |    |    | 2         |
| <i>Convolvulus arvensis</i> (Field Bindweed)               |            |             |   |   |   | x |   |   |   |   |    |    | x  |    |    |    | 2         |
| <i>Euphorbia helioscopia</i> (Sun Spurge)                  |            |             |   |   |   |   | x | x |   |   |    |    |    |    |    |    | 2         |
| <i>Fumaria officinalis</i> (Common Fumitory)               |            |             |   |   |   | x |   | x |   |   |    |    |    |    |    |    | 2         |

| Species   | IATA score | Plot number |   |   |   |   |   |   |   |   |    |    |    |    |    |    | No. plots |
|---|------------|-------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|-----------|
|   |            | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |           |
| <i>Geranium pusillum</i> (Small-flowered Crane's-bill)              | 2          |             |   |   |   | x |   |   |   | x |    |    |    |    |    |    | 2         |
| <i>Lactuca serriola</i> (Prickly Lettuce)                           |            |             |   |   |   |   |   |   |   |   |    | x  |    |    | x  |    | 2         |
| <i>Lapsana communis</i> (Nipplewort)                                |            |             |   | x |   |   |   |   |   |   |    |    |    |    | x  |    | 2         |
| <i>Matricaria discoidea</i> (Pineappleweed)                         |            |             |   |   |   | x |   |   |   | x |    |    |    |    |    |    | 2         |
| <i>Medicago lupulina</i> (Black Medick)                             |            |             | x |   |   |   |   |   |   |   |    |    |    |    |    | x  | 2         |
| <i>Phacelia tanacetifolia</i> (Phacelia)                            |            |             |   |   |   |   |   | x |   |   |    | x  |    |    |    |    | 2         |
| <i>Plantago lanceolata</i> (Ribwort Plantain)                       |            |             |   | x |   |   |   |   |   |   |    |    |    |    |    | x  | 2         |
| <i>Plantago major</i> (Greater Plantain)                            |            |             |   |   |   | x |   | x |   |   |    |    |    |    |    |    | 2         |
| <i>Polygonum aviculare</i> (Knotgrass)                              |            |             |   |   |   | x |   |   |   |   |    | x  |    |    |    |    | 2         |
| <i>Raphanus raphanistrum</i> ssp. <i>raphanastrum</i> (Wild Radish) | 1          |             |   |   |   |   |   |   |   | x | x  |    |    |    |    |    | 2         |
| <i>Trifolium pratense</i> (Red Clover)                              |            |             |   |   |   |   |   |   |   |   | x  | x  |    |    |    |    | 2         |
| <i>Urtica dioica</i> (Common Nettle)                                |            |             |   |   |   |   |   |   |   | x |    |    | x  |    |    |    | 2         |
| <i>Veronica arvensis</i> (Wall Speedwell)                           |            |             |   |   |   |   |   |   |   |   |    | x  |    |    |    | x  | 2         |
| <i>Vicia faba</i> (Broad Bean)                                      |            |             |   |   | x |   |   |   |   |   |    | x  |    |    |    |    | 2         |
| <i>Alopecurus pratensis</i> (Meadow Foxtail)                        |            |             |   |   |   |   |   |   |   |   |    |    |    | x  |    |    | 1         |
| <i>Anisantha sterilis</i> (Barren Brome)                            |            |             |   |   |   |   |   |   |   |   |    |    |    |    | x  |    | 1         |
| <i>Arctium minus</i> (Lesser Burdock)                               |            |             |   |   |   |   |   |   |   |   |    |    |    |    |    | x  | 1         |
| <i>Arrhenatherum elatius</i> (False Oat-grass)                      |            |             |   | x |   |   |   |   |   |   |    |    |    |    |    |    | 1         |
| <i>Avena sativa</i> (Oat)   |            |             |   |   |   |   |   |   |   |   |    | x  |    |    |    |    | 1         |
| <i>Beta vulgaris</i> (Sugar Beet)                                   |            |             |   |   |   | x |   |   |   |   |    |    |    |    |    |    | 1         |
| <i>Carex hirta</i> (Hairy Sedge)                                    |            | x           |   |   |   |   |   |   |   |   |    |    |    |    |    |    | 1         |
| <i>Cerastium fontanum</i> (Common Mouse-ear)                        |            |             |   |   |   |   |   |   |   |   |    |    |    |    | x  |    | 1         |
| <i>Chenopodium album</i> (Fat-hen)                                  |            |             |   |   |   |   |   | x |   |   |    |    |    |    |    |    | 1         |
| <i>Epilobium parviflorum</i> (Hoary Willowherb)                     |            |             |   |   |   |   |   |   |   |   |    |    | x  |    |    |    | 1         |
| <i>Festuca rubra</i> (Red Fescue)                                   |            |             |   |   |   |   |   |   |   |   |    |    |    |    |    | x  | 1         |
| <i>Galium album</i> (Hedge Bedstraw)                                |            |             |   |   |   |   |   |   |   |   |    |    |    |    |    | x  | 1         |



| Species   | IATA score | Plot number |    |    |   |    |    |    |    |    |    |    |    |    |    |    | No. plots |
|---|------------|-------------|----|----|---|----|----|----|----|----|----|----|----|----|----|----|-----------|
|   |            | 1           | 2  | 3  | 4 | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 |           |
| <i>Helianthus annuus</i> (Sunflower)              |            |             |    |    |   |    |    |    |    |    |    |    | x  |    |    |    | 1         |
| <i>Holcus lanatus</i> (Yorkshire-fog)             |            | x           |    |    |   |    |    |    |    |    |    |    |    |    |    |    | 1         |
| <i>Jacobaea erucifolia</i> (Hoary Ragwort)        |            | x           |    |    |   |    |    |    |    |    |    |    |    |    |    |    | 1         |
| <i>Lamium purpureum</i> (Red Dead-nettle)         |            |             |    |    |   |    |    |    |    | x  |    |    |    |    |    |    | 1         |
| <i>Lepidium coronopus</i> (Swinecress)            |            |             |    |    |   | x  |    |    |    |    |    |    |    |    |    |    | 1         |
| <i>Lysimachia arvensis</i> (Scarlet Pimpernel)    |            |             |    |    |   | x  |    |    |    |    |    |    |    |    |    |    | 1         |
| <i>Malva sylvestris</i> (Common Mallow)           |            |             |    |    |   | x  |    |    |    |    |    |    |    |    |    |    | 1         |
| <i>Myosotis ramosissima</i> (Early Forget-me-not) |            |             |    |    |   |    |    |    |    |    |    | x  |    |    |    |    | 1         |
| <i>Oxyrhynchium hians</i> (Swartz's Feather-moss) |            | x           |    |    |   |    |    |    |    |    |    |    |    |    |    |    | 1         |
| <i>Panicum miliaceum</i> (Common Millet)          |            |             |    |    |   |    |    |    | x  |    |    |    |    |    |    |    | 1         |
| <i>Papaver rhoeas</i> (Common Poppy)              |            |             |    |    |   |    |    |    |    |    | x  |    |    |    |    |    | 1         |
| <i>Poa trivialis</i> (Rough Meadow-grass)         |            |             |    |    |   |    |    |    |    |    |    |    | x  |    |    |    | 1         |
| <i>Rumex conglomeratus</i> (Clustered Dock)       |            |             |    |    |   |    |    |    |    |    |    |    |    | x  |    |    | 1         |
| <i>Rumex crispus</i> (Curled Dock)                |            |             | x  |    |   |    |    |    |    |    |    |    |    |    |    |    | 1         |
| <i>Senecio vernalis</i> (Eastern Groundsel)       |            |             |    |    |   |    |    |    |    | x  |    |    |    |    |    |    | 1         |
| <i>Silene dioica</i> (Red Campion)                |            |             |    |    |   |    |    |    |    |    |    |    | x  |    |    |    | 1         |
| <i>Thlaspi arvense</i> (Field Penny-cress)        |            |             |    |    |   | x  |    |    |    |    |    |    |    |    |    |    | 1         |
| Species per plot                                  |            | 19          | 13 | 15 | 8 | 35 | 17 | 22 | 15 | 23 | 15 | 17 | 29 | 10 | 21 | 23 |           |
| IAPA score  |            | 3           | 1  | 3  | 0 | 3  | 0  | 0  | 0  | 3  | 2  | 0  | 0  | 0  | 0  | 2  |           |