

SUNNICA ENERGY FARM

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6.2 Appendix 8D: Terrestrial invertebrate survey report

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and
Procedure) Regulations 2009



Planning Act 2008

**The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009**

Sunnica Energy Farm

Appendix 8D: Terrestrial invertebrate survey report

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Executive Summary

In March 2019, AECOM (on behalf of Sunnica Limited) undertook a Preliminary Ecological Appraisal (PEA) for the proposed Sunnica Energy Farm (hereafter referred to as the Scheme). This PEA identified that terrestrial invertebrate surveys were required within areas of suitable habitat within the Scheme boundary (the Development Consent Order (DCO) Site) (the DCO Site)) (also referred to as the Order limits), to characterise the terrestrial invertebrate assemblage present. Therefore, AECOM was instructed by Sunnica Limited to undertake surveys of terrestrial invertebrates within the Order limits.

This report is a technical appendix to accompany the Environmental Statement (ES) for the DCO application.

A scoping survey to evaluate the potential of habitats for terrestrial invertebrates was carried out in May and August 2019, in which the Order limits was visually assessed 'on the ground'. Following the scoping survey, which considered all four Scheme areas (see section 1.2.6 of this report), grassland areas were assessed for 'breck integrity' and Sunnica East Site B had a significant mosaic of breck grassland habitat and thus the target survey area for full invertebrate survey was identified and further refined within this region.

A total of 610 invertebrate species (not including aggregates of species, species complexes and unresolved species pairs) was recorded during twelve site visits between 2019 and 2020.

Using Colin Plant Associates (UK Consultant Entomologists) guidelines for assessing the significance of invertebrate habitat (see **Table 5-3**, compartments A, E12 and E13 (margins) would all qualify as being of between County and Regional Value for their invertebrate fauna, based on the definitions provided in section 3.4. The marginal grassland that flanks the eastern edge of E13 is likely to be approaching Regional importance, due to the presence here of no less than 41 breck-associated invertebrate species of designated status 'Nationally Scarce' or 'Rare', and to this grassland also supporting one of only two British populations of the leafhopper *Arocephalus languidus*, which is probably an overlooked native species rather than a recent colonist to Britain or introduction. In considering the Pantheon analysis and species assemblages, that the north margin of E13 and sites A and E12 should be considered of County value.

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1 Introduction

1.1.1 In March 2019, AECOM (on behalf of Sunnica Limited) undertook a Preliminary Ecological Appraisal¹ (PEA) for the proposed Sunnica Energy Farm (hereafter referred to as the Scheme). This PEA identified that terrestrial invertebrate surveys were required within areas of suitable habitat within the Scheme boundary (the Development Consent Order (DCO) Site) (the DCO Site)) (also referred to as the Order limits), to characterise the terrestrial invertebrate assemblage present. Therefore, AECOM was instructed by Sunnica Limited to undertake surveys of terrestrial invertebrates within the Order limits.

1.2 The Scheme

1.2.1 Sunnica Energy Farm (the Scheme) is a new solar energy farm proposal that will deliver electricity to the national electricity transmission network. Sunnica Limited is proposing to install ground mounted solar photovoltaic (PV) panel arrays to generate electrical energy from the sun and combine these with a Battery Energy Storage System (BESS) which will connect to Burwell National Grid Substation in Cambridgeshire.

1.2.2 Electricity will be generated at Sunnica East Site A, near Isleham in Cambridgeshire; Sunnica East Site B, near Worlington and Freckenham in Suffolk; Sunnica West Site A near Chippenham and Kennett in Cambridgeshire; and Sunnica West Site B, near Snailwell in Cambridgeshire. All locations will comprise ground mounted solar PV panel arrays, supporting electrical infrastructure and, with the exception of Sunnica West Site B, a BESS.

1.2.3 Supporting electrical infrastructure will include on-site substations on Sunnica East Site A and Sunnica East Site B and Sunnica West Site A, and on-site cabling between the different electrical elements across the Scheme. The generating equipment of the Scheme will be fenced and protected via security measures such as Closed Circuit Television. Inside the fenced areas, in addition to the generating equipment will be, internal access tracks, and drainage. It is not proposed for any area to be continuously lit.

1.2.4 Visual, ecological and archaeological mitigation is proposed which includes proposed grassland planting and new woodland; retention of existing woodland, wetlands and other vegetation; provision of replacement habitat; and offsetting areas, where there will be no development. The BESSs will consist of a compound and battery array to allow for the importation, storage and exportation of energy to the National Grid. There will also be areas at Sunnica East Site A and Sunnica East Site B for office and storage facilities for use during the Scheme's operation.

1.2.5 The Scheme will be connected to a new substation extension at the existing Burwell National Grid Substation, using 132 kilovolt (kV) cables buried underground. The cables will run between Sunnica East Site A, Sunnica East Site B and Sunnica West Site A (Grid Connection Route A), and then from Sunnica West Site A to Sunnica West B and onwards to the Burwell National Grid Substation (Grid Connection Route B). The Burwell National Grid Substation Extension will convert the 132kV to 400kV. The 400kV cables will be buried and

¹ AECOM (2020) Preliminary Ecological Appraisal Report

will connect the Scheme to the existing Burwell National Grid Substation to allow distribution to the national transmission network.

- 1.2.6 The Scheme will have two main access points, one north of Elms Road at Sunnica East Site B and one south of La Hogue Road at Sunnica West Site A. The main access route to Sunnica West Site A will be via the Chippenham junction of the A11, to the north of junction 38 of the A14. Sunnica East Site B will be accessed via the A11 and B1085. A number of secondary access points are proposed to access the individual land parcels through construction, operation, and decommissioning phases.
- 1.2.7 The Scheme is defined as a Nationally Significant Infrastructure Project (NSIP) and will require a Development Consent Order (DCO) from the Secretary of State for Business, Energy and Industrial Strategy (Secretary of State), due to its generating capacity exceeding 50 megawatts (MW).
- 1.2.8 The Scheme comprises the following key areas:
- a. Solar Farm Sites:
 - i. Sunnica East Site A;
 - ii. Sunnica East Site B;
 - iii. Sunnica West Site A; and
 - iv. Sunnica West Site B.
 - b. associated electrical infrastructure areas for connection to the national transmission system:
 - i. Grid Connection Route A (connecting the Sunnica East Site A with the Sunnica East Site B and then connecting to the Sunnica West Site A);
 - ii. Grid Connection Route B (connecting the Sunnica West Site A and Sunnica West Site B and the Burwell National Grid Substation); and
 - iii. Burwell National Grid Substation Extension.
 - iv. Figure 1 in Annex A shows the locations of these key areas.

1.3 Site description

- 1.3.1 A summary description of the habitats within the Scheme boundary, made up of the four Sites, (see section 1.2.1) is provided below and a more detailed description of the habitats is provided in the PEA report (Ref 1). The extent of the Scheme is shown in **Figure 1**.

Sunnica East site

- 1.3.2 Sunnica East is split into two sub-sites, one to the north of Freckenham (referred to as Sunnica East Site A) and the other to the south of Worlington (referred to as Sunnica East Site B). These two sites are approximately 1km apart and are separated by agricultural fields. The Sunnica East Site A encompasses an area of approximately 224ha and includes land within the county of Suffolk and Cambridgeshire. Sunnica East Site B lies within Suffolk and encompasses an area of approximately 319ha (**Figure 1**).
- 1.3.3 The landscape features within the Sunnica East Site A and Sunnica East Site B consist of arable agricultural fields interspersed with individual trees, hedgerows, linear tree belts, small woodland blocks, farm access tracks and local roads.

- 1.3.4 The landscape features immediately surrounding the Sunnica East Site A and Sunnica East Site B comprise small rural villages, including Worlington to the north, Barton Mills to the north-east, Red Lodge and Freckenham to the south and Isleham to the west. Industrial land uses adjoin the A11 to the south of the Sunnica East Site with an industrial installation of a 7.5MW solar farm situated adjacent to the south-eastern extent of the Sunnica East Site and an anaerobic digestion (AD) plant located to the south of the Sunnica East Site.

Sunnica West site

- 1.3.5 The Sunnica West Site is located within the East Cambridgeshire District Council administrative area, approximately 3km north east of Newmarket and 6.5km east of Burwell.
- 1.3.6 Sunnica West is split into two sub-sites, one to the south-east (referred to as Sunnica West Site A) and the other to the north-west of Snailwell (referred to as Sunnica West Site B). These two sites are approximately 1 km apart, separated by agricultural fields and Chippenham Road. The Sunnica West Site A encompasses an area of approximately 373ha and includes land to the east and west of the A11, consisting of agricultural fields bounded by trees, managed hedgerows, linear tree shelter belts, small woodland and copses and farm access tracks. Sunnica West Site B encompasses an area of approximately 66ha and comprise of agricultural fields, grassland, small woodland and copses, farm access tracks and irrigation ditches fed by the River Snail which runs along the western and northern boundaries of the Site (**Figure 1**).
- 1.3.7 The surrounding landscape comprises regularly shaped arable fields interspersed with managed hedgerows, tall shelter belts of trees and in the Chippenham Hall area, a parkland landscape with mature individual trees. Much of the area is also characterised by grazed paddocks, horse gallops and exercise tracks.

Cable route corridors

- 1.3.8 The Scheme will connect to the existing Burwell National Grid Substation via a cable route corridor. The cable route corridors under consideration are Grid Connection Route A, which connects the Sunnica East Site A with the Sunnica East Site B and then runs between the Sunnica West Site A and the Sunnica East Site B; and Grid Connection Route B, between the Sunnica West Site A and Sunnica West Site B and the Burwell National Grid Substation.

Grid Connection Route A

- 1.3.9 Grid Connection Route A connects the Sunnica East Site A with Sunnica East Site B and crosses two minor roads and arable farmland (**Figure 1**).
- 1.3.10 Heading south from the Sunnica East Site B, the cable route corridor for Grid Connection Route A crosses the River Kennett, pastoral farmland, the Chippenham footpath 49/7 (a Public Right of Way (PRoW)) and B1085 (**Figure 1**).

Grid Connection Route B

- 1.3.11 Heading east from the Burwell National Grid Substation, the cable route corridor for Grid Connection Route B crosses agricultural fields and a number of roads

including the B1102 and A142. Grid Connection Route B also crosses a number of watercourses, including the Burwell Lode, New River, and the River Snail, as well as a number of drainage ditches associated with Burwell Fen, Little Fen, the Broads, and agricultural drains (**Figure 1**).

- 1.3.12 The cable route corridor for Grid Connection Route B crosses a PRow (footpath 92/19) before crossing the railway line and the A142 Newmarket / Fordham Road. The Route then runs alongside Snailwell Road and across the River Snail into Sunnica West Site B.

Burwell National Grid Substation Extension

- 1.3.13 The habitat within the Burwell National Grid Substation Extension (surrounding the existing substation) comprises small grassland fields to the east of the existing substation (bordered by hedgerows and mature trees) and arable land to the south and west of the existing substation.

1.4 Scope of the report

- 1.4.1 The objective of the terrestrial invertebrate survey, reported in this document, is to:
- a. identify any protected and/or notable invertebrate species;
 - b. assess and identify the types of invertebrate assemblages' present; and
 - c. identify the presence of any habitat features of value to invertebrate species and assemblages.
- 1.4.2 This report is a technical appendix to accompany the Environmental Statement (ES) for the DCO application.

2 Legislation and policy

2.1 Legislation and guidance

2.1.1 The national significance of species recorded in this survey is assessed in this report with reference to the following designations and conservation status.

Wildlife and Countryside Act 1981 (as amended) Schedule 5

2.1.2 Schedule 5 of the Wildlife and Countryside Act, 1981 (as amended) (Ref 2) lists animals and species that are protected under Section 9. Section 9 prohibits the intentional killing, injuring or taking of the species listed in Schedule 5 and also prohibits their possession and the trade in the wild animals listed. The species listed are also further protected from disturbance by prohibiting actions that affect places they use for shelter.

2.1.3 A total of 40 invertebrate species are afforded protection in the UK under Schedule 5 Section 9.1 of the Wildlife & Countryside Act 1981, (as amended) which makes it an offence to kill, injure or take any of the species listed. A further four species are afforded protection under Section 9.4 which provides for protection of their habitat and a further 27 species are listed under Section 9.5 which prevents them from being sold or transported.

Conservation of Habitats and Species Regulations 2017 (as amended)

2.1.4 The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref 3) transpose Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive), into national law.

2.1.5 Three invertebrate species are protected within the UK under these regulations: Fisher's Estuarine Moth (*Gortyna borellii lunata*), Large Blue Butterfly (*Phengaris arion*) and Lesser Whirlpool Ramshorn Snail (*Anisus vorticulus*). For these species, it is illegal to capture, kill, disturb or injure them; damage or destroy their breeding or resting places or obstruct access to their resting or sheltering places (either deliberately or accidentally).

Species of Principal Importance (SPIs)

2.1.6 The Natural Environment and Rural Communities (NERC) list of Species of Principal Importance (Ref 4) is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under Section 40 of the NERC Act (2006); under Section 40 every public authority (e.g. a local authority or local planning authority) must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity.

2.1.7 In addition, with regard to those species on the list of Species of Principal Importance listed under Section 41 (S41), the Secretary of State must:

“(a) take such steps as appear to the Secretary of State to be reasonably practicable to further the conservation of the living organisms and types of habitat included in any list published under this section, or

(b) promote the taking by others of such steps.”

- 2.1.8 The UK Biodiversity Action Plan (UKBAP) was launched in 1994 and established a framework and criteria for identifying species of conservation concern. From this list, action plans for priority species of conservation concern were published and have subsequently been succeeded by the UK Post-2010 Biodiversity Framework (July 2012) (Ref 5). The UK Post 2010 Development Framework is relevant in the context of Section 40 of the NERC Act 2006, meaning that Priority Species are material considerations in planning. These species are identified as those of conservation concern due to their rarity or a declining population trend.
- 2.1.9 In the region of 400 invertebrate species are listed as Priority Species under Section 41 (S41) of the NERC Act, 2006 (Ref 4) and the presence of any of these on a development site is therefore of material consideration in the determination of planning decisions.

3 Methods

3.1 Scoping survey

- 3.1.1 A scoping survey to evaluate the potential of habitats for terrestrial invertebrates was carried out by invertebrate ecologist Steve Lane on 7, 9 and 27 May 2019; and 27 August 2019, in which the Order limits was visually assessed 'on the ground'. The scoping survey considered the habitats present within the Order limits and the potential impacts of the Scheme and identified grassland habitats within the Order limits with the potential to support notable invertebrate species and assemblages. Surveys concentrated on these habitats. Boundary features, such as isolated trees, hedgerows, copses and plantation blocks will be avoided and not impacted by the Scheme and therefore, not subject to detailed survey.
- 3.1.2 The survey identified target areas that comprise both permanent and disturbed grassland. The latter includes the margins of pig fields and also plots of land that have been mechanically cultivated to attract Stone-curlew *Burhinus oedicanus*.
- 3.1.3 **Table 3-1** sets out the areas within the Order limits that were evaluated and those that were recommended to be the subject of further invertebrate survey. These areas are presented in Annex A, **Figure 2**.

Table 3-1: Areas identified for invertebrate surveys

Site Code	Brief Habitat Description	Invertebrate Survey Techniques
A	Grassland with yarrow, carrot, plantain, cranesbill and much bramble and rose scrub. A smaller area of rabbit-grazed short turf within a woodland clearing close to, and NE of 'A' had greater interest but was rather small and due to its position within woodland, of no consequence regarding development impact.	No
B	Pig farm, with heavily disturbed sandy margins, dominated by small nettle, mayweed, chenopods and groundsel etc – poor biodiversity.	No
C	Mainly tall herb, ungrazed grassland, with consolidated vegetation structure with <i>Taraxacum</i> , plantain and cranesbill. Mainly poor botanical diversity.	No
D	Grassland on aerial photos, but freshly ploughed at time of scoping survey.	No
E	Mechanically disturbed area with further continual disturbance from mole activity. Good botanical diversity includes <i>Erodium</i> and <i>Echium</i> . Very sandy soil and sparsely vegetated. Probably indicative of good breck invertebrate assemblages. Invertebrates were briefly sampled during scoping survey.	Pitfall trapping and observation/sweeping.
F	Pig farm, with interesting margins. In the east, the margin is large and the vegetation forming a consolidated short turf mat, probably rabbit-grazed, but with minimal substrate showing. Has potential to support interesting breck invertebrate assemblage. Margin along western edge is more disturbed, and of interest, but the botanical diversity decreases in the northernmost section.	Pitfall trapping and observation/sweeping.
G	Pig farm with heavily disturbed margins recalling those of area 'B'. Typically with small nettle, groundsel and mayweed. Poor botanical diversity.	No

Site Code	Brief Habitat Description	Invertebrate Techniques	Survey
I	Ungrazed, short turf grassland, with consolidated vegetation structure, but containing relatively diverse communities. Nature of the area changes significantly such that the northernmost margin appears to be poor rank grassland (ex-cultivation) and the southernmost area has evidently also been cultivated fairly recently and is due for cultivation again.	No	
J	Horse grazed short-turf pasture grassland with similar plant communities to 'I' but more disturbed. Dung fauna was briefly sampled during scoping survey.	No if grazing still present in 2020	
O	Former pig farm, now occupied by horse paddocks and chicken barns, the margins of which have been controlled for weeds. Some short turf margins running parallel to the road hedgerow have interest with <i>Erodium</i> mats, yarrow, bugloss etc, but this area is small relative to other areas in the target survey.	No	
S	Large pig farm, with generally very heavily disturbed margins containing small nettle, chenopods, groundsel and mayweeds, but margin of north-south trackway of better interest with flixweed, mallow, etc. and worthy of further investigation.	Observation and sweeping.	
Z	Tall herb grassland grown as a nectaring/pollen crop. <i>Phacelia</i> very evident in western half. Potential for significant ground-nesting Breck Hymenopteran fauna to be using this as a resource. Ground vegetation mostly consolidated, but some short turf communities at margin of field could be sampled by observation and grubbing during visits.	Spot-sampling and netting for Hymenoptera; grubbing at margins of field for ground-dwelling inverts	
BB	South area is semi-improved pasture grassland with scattered trees including some old willow pollards and a flowing stream in the west. North area is of ungrazed rank grassland with hogweed, creeping thistle, vetches, ground ivy, ox-eye daisy, yarrow, lady's bedstraw, knapweed and plantain, etc. – some seasonally inundated areas with <i>Juncus</i> , etc., but these were mainly dry during scoping survey. This area of grassland is similar to an area on opposite side of River Snail surveyed by this surveyor two years ago and which has since been destroyed. That area was found to be unexceptional.	No	
CC	An area of scrub (hawthorn, dogwood, rose, etc.) and probable calcareous grassland through which a public footpath meanders. In the southernmost section this broadens out into a woodland or plantation belt. The grassland in the north has some potential for notable invertebrate assemblages.	No	
DD	Hardstanding with weedy ephemeral vegetation including St John's wort, yarrow, trefoils etc. Broadens into ungrazed tall sward grassland at its eastern end.	No	
EE	Ungrazed tall sward grassland flanking the south edge of a water course. The habitat here is botanically unexceptional and rather uniform in character.	No	
FF	An area of set-aside dominated by mugwort, with poppies, white campion, field pansy and interestingly, several stands of <i>Nepeta</i> . <i>Meligethes incanus</i> (a Nationally Scarce pollen beetle) was tapped off this plant here. Excepting this, the habitat appears to have very little potential to support significant invertebrate assemblages.	No	

3.2 Field survey

Survey area

- 3.2.1 Following the scoping survey, which considered all four Scheme areas (see section 1.2.1 of this report), grassland areas were assessed for 'breck integrity'. If the grassland was subject to disturbance by grazing or mechanical means and was of a characteristic short sward with the vegetation interspersed by patches of bare sandy ground, it was considered worthy of further investigation and full invertebrate surveys. This decision was further influenced by the presence of a diverse plant community and areas with *e.g.* mats of *Erodium*. Tall sward and rank grassland with no grazing or disturbance and poor botanical diversity were considered unworthy of further attention for the purposes of this survey. Although these habitats would doubtless have some value for invertebrates, the emphasis of the survey was on breckland assemblages, as it is these which are of particular significance in this geographical region of Britain.
- 3.2.2 Of the four Scheme areas (see section 1.2.1 of this report), only Sunnica East Site B had a significant mosaic of breck grassland habitat, and thus the target survey area for full invertebrate survey was identified and further refined within this region.
- 3.2.3 The River Snail and its riparian habitats are likely to support notable invertebrate species but given these areas will be avoided and not impacted by the Scheme, no further survey was recommended.

Field survey

- 3.2.4 The survey was undertaken by Steve Lane. The survey used a range of techniques as described in Natural England Research Report NERR005 (Ref 6), and recently updated by BugLife (2014). These included sweep netting of vegetation, direct observation of invertebrates on vegetation or on the wing and grubbing in suitable habitats and refugia searching. No passive (trapping) techniques were utilised during the survey.
- 3.2.5 The full-survey sampling and pitfall-trapping was undertaken on the following dates:
- 27 September 2019;
 - 4 and 18 October 2019;
 - 14, 15 and 27 May 2020;
 - 5 June 2020;
 - 17 July 2020; and
 - 12 August 2020.
- 3.2.6 A variety of field techniques were used in the survey. Sweep-netting was conducted by sweeping vegetation with a large heavy-duty net on a metal frame. Beating employed the use of a collapsible sheet on a frame of wood and plastic, and a pole, to beat branches and dislodge arboreal invertebrates from tree and scrub foliage. Some attention was paid to any standing dead or dying wood such as old dead boughs as these can support scarce and threatened saproxylic species (*i.e.* those that require dead wood as a medium in which to develop). However, sampling of this habitat type was very casual compared to grassland survey.

- 3.2.7 Grubbing (searching at ground level) and sieving with a bowl and standard mesh plastic garden sieve, were methods that were regularly employed across the site on most visits. These methods were most useful as a means of sampling invertebrates in moss, in horse dung, compacted chicken litter, under vegetation mats and in carrion. Natural refugia were lifted such as large stones and logs. Close observation was used. This involved studying small areas of exposed or sparsely-vegetated ground for invertebrates.
- 3.2.8 A certain amount of identification was carried out in the field, but where positive identification required the use of microscopic examination and identification literature ('keys'), specimens were collected. The bio-catches from each habitat and compartment were kept separate from one another.
- 3.2.9 The most significant of the survey methodologies was the use of pitfall-trapping at selected sampling points across the site. Targeted areas were in short turf grassland that had potential to support species of insolated (sun-exposed) habitats and breck-type assemblages. Pitfall-trapping is a useful method that utilises beakers sunk into the ground, flush with the ground surface, to passively collect diurnal and nocturnal ground-active species such as ground beetles, ground bugs and rove beetles as well as ground-active spiders. The beaker holes are dug with a bulb-corer and the beakers dropped neatly into the holes. The beakers are then charged with saturated salt solution or propylene glycol and a coarse-mesh gauze placed over the opening to prevent reptiles, amphibians and small mammals from falling in. The beakers are then left in situ and serviced by emptying the contents after a period of between one and four weeks.
- 3.2.10 **Figure 3** shows the locations of pitfall-trapping during the survey.
- 3.2.11 The individual traps within each series of pitfalls varied in number between sites and in the duration for which they were left in-situ. Some damage was noted to traps, particularly at E12 (Figure 3) where it is assumed that corvids, or perhaps Stone-curlew had pulled a number of beakers out of the ground. At E11 (Figure 3), a number of beakers were missing when the surveyor went to empty them, but the 'roof' gauzes had been neatly replaced over the trap pits, which suggests human rather than animal intervention. Some of the traps, most notably those at the south-east corner of the horse paddocks (compartment 'B', Figure 3) had completely dried out during drought conditions in May 2020, but the invertebrate sample material was mostly salvaged.

3.3 Interpretation and analysis

- 3.3.1 The result of any site survey depends both on the amount of effort put into recording that location and the inherent ecological value of the site which is influenced by its size, geographical location, surrounding landscape and habitat biodiversity. For comparison to be most accurate, all locations within a site would have to be surveyed with the same measured effort, using standardised sampling techniques. The lead surveyor's preferred methodology is to intuitively spend more time on areas that are obviously more diverse and that have the potential to support rare species or assemblages. An 'exhaustive approach' is taken, meaning that sampling is only stopped in a 'productive' area when new species cease to be recorded there. By using these criteria, there is a greater likelihood of finding at least some of the scarcer species on the site, and often many more. A standardised methodology

can miss these scarce species and produce a generalised list of nothing but common species.

- 3.3.2 The software 'ISIS' (Invertebrate Species-habitat Information System) was developed largely by Natural England in 2006 for the purpose of analysing species composition of a surveyed locality, and interpreting this data in terms of habitat/species associations and species richness. Shortfalls in this database tool resulted in the development of a successor 'Pantheon', in 2018. This was created by The Centre for Ecology & Hydrology in association with Natural England and improves on the ISIS process by adding, amongst other criteria, associated habitats and resources and habitat fidelity scores, against each taxon in a survey list. The Pantheon database deals with around 11,000 invertebrate species, including all of the most familiar and widely surveyed insect Orders.
- 3.3.3 In common with ISIS, the Pantheon programme is most effectively used where standardised sampling techniques have been employed in survey work. It enables comparison of resulting data from a fixed frequency of site visits over a fixed time period and could indicate whether the ecological value of a site in terms of its invertebrate fauna, is either improving or deteriorating. This interpretation tool is much less useful for the present survey which is based on a 'snapshot' sample taken over a relatively short period and one that is naturally biased towards finding the scarcer invertebrates that the site supports. Even so, it can still be a useful tool for producing a hierarchy of significance in terms of species habitat associations and assemblages at any given site and in particular for comparing habitats which are surveyed at approximately the same time of the year as each other, using approximately the same techniques and with approximately the same amount of effort.
- 3.3.4 The scoring systems in Pantheon use species richness, threat status, rarity and characteristic species for each broad biotope, habitat and resource. The two Pantheon generated scores used to interpret the survey findings in terms of the habitats and associated invertebrate assemblages, are 'Conservation Status' and the 'SQI' (Species Quality Index) value defined as:
- 3.3.5 Conservation Status - threat and rarity status from published reviews. The conservation status is also used to generate the Species Quality Indices (see below). Statuses in square brackets indicates that these are considered out of date and should be used with caution.
- 3.3.6 SQI - each species recorded from a site list is scored according to its conservation status and the SQI is calculated by dividing this score by the number of species in the sample and multiplying by 100. SQI's for species lists with 15 or fewer species are understandably unreliable.
- 3.3.7 Pantheon, like ISIS, can identify whether a site is in a favourable or unfavourable condition. Thus if a site is considered 'favourable' in the analysis, then it can be loosely construed that the state of the habitat analysed is favourable for the indicator species which are present and for the assemblage for that habitat-type as a whole. The term can indicate if the conservation management at a site is favourable for that particular habitat.

3.4 Assessment criteria

Nationally rare and nationally scarce species

- 3.4.1 Invertebrate surveys conducted between the late 1980s and 2010 relied in their interpretation of species recorded, on published Red Data Books and Lists of Scarce and Threatened Species which created British-specific rarity statuses for individual taxa, based on restricted distribution rather than population threat or risk. At the time, the term 'Nationally Scarce', originally coined for plants, was applied to invertebrate species that were known to occur in 16 to 100 10km squares (hectads).
- 3.4.2 Early assessments of invertebrate taxa used the term 'Nationally Notable' for these Nationally Scarce species and, for some taxa, this category was further split into 'Notable A' (Na) for species occurring in 16 to 30 hectads of the National Grid and 'Notable B' (Nb) for those occurring in 31 to 100 hectads. A further category used was 'Red Data Book' which equates to 'Nationally Rare'. This category was used for species that occurred in 15 or fewer hectads in Britain. It was further subdivided depending on the perceived or actual degree of rarity, e.g. 'RDB2' as Vulnerable, 'RDB1' as Endangered, 'RDBI' as 'Red Data Book Indeterminate' and 'RDBK' as 'Red Data Book Insufficiently Known'.
- 3.4.3 Recently, since 2010, IUCN Reviews have been produced for many invertebrate groups and these are continuing to be written. In the recent IUCN Reviews, the restricted distribution categories have now been standardised to 'Nationally Rare' (NR) and 'Nationally Scarce' (NS) without further subdivision. The GB system of assessing rarity based solely on distribution is used alongside IUCN criteria which, although they also use measures of geographical extent, are primarily concerned with assessing National and International Threat in terms of decline of species populations.
- 3.4.4 In this report, for the taxa found at the site, the newly-adopted GB Rarity categories 'NS' (Nationally Scarce) and 'NR' (Nationally Rare) has been used, where these appear in IUCN Reviews. Otherwise, where no such IUCN reviews yet exist for the species recorded, they are referred to, in the Appendix only, to the older categorisations of Nationally Scarce 'Notable Nb', 'Notable Na' and 'Notable' and for Red Data Book species, 'RDB' categories. The situation is currently complex, but it will eventually become simpler as further invertebrate groups are assessed for IUCN Reviews and the terminology becomes standardised.

3.5 Survey limitations and assumptions

- 3.5.1 The weather conditions on each date were generally optimal for invertebrate survey and have not been recorded. Heavy rainfall was observed on one of the August 2020 survey visits in which the aim of that visit was solely to service the pitfall traps, so there was no detriment to invertebrate sampling on that occasion.
- 3.5.2 Natural England published guidelines (Ref 7) for conducting invertebrate surveys (Drake et. al., 2007) in which they suggest that '*a reasonable thorough survey of a terrestrial habitat can be made through seven visits at monthly intervals between April and October*', but that 'four or five visits over this period will capture most species'. The timing and frequency of the 2019 and 2020 survey visits of the Sunnica East Site B complex were ideal for sampling species through all seasons, providing (sometimes multiple) visits during the months of May, June, July, August, September and October.

- 3.5.3 The temporary nature of some of the farmed and cultivated areas meant that the habitats changed significantly from one year to the next according to land use. In addition, the plots occupied by Stone-curlew in 2019 were not always the same as those occupied in 2020, so this introduced a level of uncertainty and unpredictability as to which areas would be accessible during the 2020 season. A third factor creating uncertainty in the survey was that the boundaries of the development were subject throughout to changes. Many of the sites visited in the scoping survey in May 2019, were later removed from the Order limits.
- 3.5.4 No surveys are recommended for terrestrial invertebrates within the Grid Connection Routes as the temporary nature of the construction of the cable corridor will not significantly impact upon any terrestrial invertebrates in these areas.
- 3.5.5 No further surveys are required for the Burwell National Grid Substation Extension as this habitat is unlikely to support significant invertebrate assemblages and, or rare or scarce individual taxa.

4 Results

4.1.1 A total of 610 invertebrate species (not including aggregates of species, species complexes and unresolved species pairs) was recorded during twelve site visits. This total includes 412 *Coleoptera* (beetles), 86 *Hemiptera* (true bugs), 29 Spiders and 21 *Hymenoptera* (bees, wasps, sawflies and ants).

4.1.2 No species that are afforded full protection under UK or International legislation were recorded during the survey. However, one NERC Act 2006 Section 41 moth, one beetle and one spider were recorded. These are Cinnabar Moth *Tyria jacobaeae*, Brush-thighed Seed-eater *Harpalus froelichii* and the Foliage-running Spider *Agroeca cuprea*. The NERC Act legislation requires that the presence of these 'high priority' species needs to be taken into consideration by a public body (the planning authority) when performing any of its functions (determining the impact of planning applications) with a view to conserving biodiversity.

4.2 Nationally Rare and Nationally Scarce Species

4.2.1 Eighty-two species of Nationally Scarce ('Notable A', 'Notable B', 'Notable', 'NS') status were recorded during the survey. Fifteen species of Nationally Rare status (including category Red Data Book status) were recorded and these are listed in **Table 4-1**.

4.2.2 The main categories in the IUCN Reviews which deal with Threat status are, in order of increasing threat status; 'Least Concern', 'Near Threatened', 'Vulnerable', 'Endangered', 'Critically Endangered' and 'Extinct'. Analysis for each species is based on the area that it occupies and/or population statistics with an emphasis on trends of decline and the magnitude of such trends. Three taxa with 'Near Threatened' IUCN status were recorded during the survey, along with one of 'Vulnerable' status. These species are also listed in **Table 4-1**.

4.2.3 Individual species accounts are provided for each Nationally Rare species recorded during the survey and are included in Annex A.

Table 4-1: Taxa recorded alongside Nationally rare British rarity status, and/ or NERC s.41 status and/ or IUCN Threat Status

Taxon	Description	British Status	Rarity	NERC s.41	IUCN Threat Status	Location (see Figure 3)
<i>Agroeca cuprea</i>	A running foliage spider	NR		Yes	Near Threatened	Sunnica East Site B, E13 (north)
<i>Aleochara verna</i>	A rove beetle	[NR]		No	Not evaluated	Sunnica East Site B, E12
<i>Arocephalus languidus</i>	A leafhopper	Not evaluated	2nd British record	No	Not evaluated	Sunnica East Site B, E13 (east)
<i>Cryptophagus schmidtii</i>	A silken fungus beetle	NR		No	Not evaluated	Sunnica East Site B, Reservoir margin

Taxon	Description	British Status	Rarity	NERC s.41	IUCN Threat Status	Location (see Figure 3)
<i>Glocianus pilosellus</i>	A weevil	NR		No	Not evaluated	Sunnica East Site B, compartment B
<i>Gronops inaequalis</i>	A weevil	NR		No	Not evaluated	Sunnica East Site B, E13 (east)
<i>Harpalus froelichii</i>	Brush-thighed Seed-eater (a ground beetle)	NR		Yes	Near Threatened	Sunnica East Site B, E12, E13 (east) and E13 (north)
<i>Harpalus pumilus</i>	A ground beetle	NR		No	Near Threatened	Sunnica East Site B, E13 (east)
<i>Heliothis virescens</i>	Marbled Clover (a moth)	NR		No	Not evaluated	Sunnica East Site B, E13 (east)
<i>Hedychrum niemelai</i>	A ruby-tailed wasp	NR		No	Not evaluated	Sunnica East Site B, compartment A
<i>Isochnus sequens</i>	A jumping weevil	[NR]		No	Not evaluated	Sunnica East Site B, compartment A
<i>Labarrus (Aphodius) lividus</i>	A dung beetle	NR		No	Vulnerable	Sunnica East Site B, E13 (east) and E13 (south)
<i>Longitarsus quadriguttatus</i>	A flea beetle	NR		No	Least Concern	Sunnica East Site B, compartment A
<i>Nephus quadrimaculatus</i>	A ladybird	[NR]		No	Not evaluated	Sunnica East Site B, diagonal footpath and compartment A
<i>Psammotettix alienus (= striatus)</i>	A leafhopper	NR		No	Not evaluated	Sunnica East Site B, E13 (north)
<i>Tachyporus scitulus</i>	A rove beetle	NR		No	Least concern	Sunnica East Site B, E12 and E13 (east) and compartment A
<i>Tyria jacobaeae</i>	Cinnabar moth	None		Yes (research only)	Not evaluated	Sunnica East Site B, compartment A

Note on Table 4-1: Square brackets indicates a taxon in need of status re-evaluation due to recent range expansion or which was formerly under-recorded

4.3 Priority species (research only) lepidoptera

4.3.1 A number of Lepidoptera species are of National BAP Priority (Research Only) status and as such they fall under the NERC Act 2006, Section 41. Species “of principal importance for the purpose of conserving biodiversity” are covered under

section 41, which requires that these species need to be taken into consideration by a public body when performing any of its functions with a view to conserving biodiversity.

- 4.3.2 There is often a misconception among Ecological Consultants that these BAP (Research Only) Lepidoptera species are highly significant. However, for the most part, they are not treated Nationally through formal individual Species Action Plans and are not intended to play a role in site protection. There is valid concern however, that these Lepidoptera have declined in the UK in the last 25 to 35 years, despite still being common and widespread, so they are flagged as Priority BAP species to encourage awareness of their presence at sites and to promote recording and monitoring.
- 4.3.3 At the survey sites, one species falls into this category; the Cinnabar moth *Tyria jacobaeae*, a ragwort feeder of widespread and relatively common distribution.

5 Evaluation and Conclusions

- 5.1.1 A total of 610 invertebrate species (not including aggregates of species, species complexes and unresolved species pairs) was recorded during twelve site visits between 2019 and 2020.
- 5.1.2 Comparing the total numbers of invertebrates with British Rarity status for each site, the most significant sites for invertebrate assemblages appear to be E12, E13 and A (see Table 5-1). In terms of the proportion of invertebrates of rarity status as a percentage of all species recorded at each site, these three sites again appear to be significant. Between one in six and one in five of all species sampled here are Nationally Scarce or Rare. Site B (south-east corner of horse paddocks) has a particularly high score, but this can be explained by reliance entirely on pitfall-trapping at this site, a methodology that is particularly productive for sampling short sward breckland assemblages and which has proven, unsurprisingly, to be exceptional for sampling the scarce fauna of this habitat on the present survey.

Table 5-1: Distribution across the main Sunnica East Site B compartments sampled, for all British Rarity-designated (Nationally Scarce and Nationally Rare) invertebrates recorded in 2019 and 2020

Site	Number of British rarity-designated species	Total species recorded	% of British rarity-designated species at site
E11	11	72	15
E12	30	168	18
E13 (all)	60	366	16
E13 (east margin)	41	233	18
E23 (CWS)	6	61	10
A	33	196	17
B	15	50	30
Diagonal footpath	3	63	5
reservoir	3	35	9

- 5.1.3 Table 5-2 presents Pantheon analysis results for habitat and assemblages at Sunnica East Site B main sample sites. The highlighted rows in Table 5-2 are those for which reliability can be placed on the resulting statistics. For these data, the number of represented species meets or exceeds the lower limit of 15. It is suggested by Pantheon that where the number falls below this minimum threshold, the statistical analysis is potentially unreliable. The SQI score that Pantheon uses is based on the sum of the conservation scores of the British Rarity-designated species in a sample divided by the total number of species in that sample multiplied by 100. On condition that the No. of species is 15 or more, then the higher the SQI figure, the higher the value of the site for invertebrate assemblages. Pantheon works best where standardised sampling is employed at a site because in that situation, the statistical comparison between sites is at its most reliable. The pitfall-trapping although varying slightly in terms of quantity of traps and duration of traps between sites, as well as the unwanted attention from corvid vandals, does offer some reliability in terms of the Pantheon analysis because the traps were set and serviced in a synchronised way across the main locations and could be seen to

collect a large biomass of ground-dwelling species where they were used (E11, E12, E13, A and B).

Table 5-2: Pantheon analysis results for habitat and assemblages at Sunnica East Site B main sample sites

Site Name	Broad biotope	Habitat	Habitat sub-category	No. of species	% representation	SQI	Reported condition
A	open habitats	short sward & bare ground	bare sand & chalk	22	5	318	Favourable
A	open habitats	short sward & bare ground	open short sward	16	8	181	Favourable
A	tree-associated	decaying wood	bark & sapwood decay	5	<1	175	Unfavourable (5 of 19 species)
A	open habitats		scrub edge	2	<1	100	Unfavourable (2 of 11 species)
A	open habitats		rich flower resource	2	<1	100	Unfavourable (2 of 15 species)
A	open habitats		scrub-heath & moorland	2	<1	100	Unfavourable (2 of 9 species)
B	open habitats	short sward & bare ground	bare sand & chalk	16	4	331	Unfavourable (16 of 19 species)
B	open habitats	short sward & bare ground	open short sward	4	2	175	Unfavourable (4 of 13 species)
B	open habitats		scrub-heath & moorland	1	<1	100	Unfavourable (1 of 9 species)
diagonal footpath	tree-associated	decaying wood	bark & sapwood decay	8	2	100	Unfavourable (8 of 19 species)
diagonal footpath	open habitats		scrub edge	3	1	100	Unfavourable (3 of 11 species)
diagonal footpath	open habitats	short sward & bare ground	open short sward	2	1	100	Unfavourable (2 of 13 species)
diagonal footpath	open habitats	short sward & bare ground	bare sand & chalk	1	<1	100	Unfavourable (1 of 19 species)
diagonal footpath	open habitats		rich flower resource	1	<1	100	Unfavourable (1 of 15 species)

Site Name	Broad biotope	Habitat	Habitat sub-category	No. of species	% representation	SQI	Reported condition
diagonal footpath	tree-associated	decaying wood	heartwood decay	1	<1	100	Unfavourable (1 of 6 species)
diagonal footpath	open habitats		scrub-heath & moorland	1	<1	100	Unfavourable (1 of 9 species)
E11	tree-associated	decaying wood	bark & sapwood decay	8	2	213	Unfavourable (8 of 19 species)
E11	open habitats	short sward & bare ground	bare sand & chalk	7	2	314	Unfavourable (7 of 19 species)
E11	open habitats	short sward & bare ground	open short sward	7	4	186	Unfavourable (7 of 13 species)
E11	open habitats		scrub-heath & moorland	1	<1	100	Unfavourable (1 of 9 species)
E12	open habitats	short sward & bare ground	bare sand & chalk	24	5	329	Favourable
E12	open habitats	short sward & bare ground	open short sward	14	7	143	Favourable
E12	open habitats		scrub-heath & moorland	3	<1	200	Unfavourable (3 of 9 species)
E12	open habitats		rich flower resource	1	<1	100	Unfavourable (1 of 15 species)
E13 (all)	open habitats	short sward & bare ground	bare sand & chalk	41	9	318	Favourable
E13 (all)	open habitats	short sward & bare ground	open short sward	18	9	135	Favourable
E13 (all)	open habitats		scrub-heath & moorland	13	4	146	Favourable
E13 (all)	open habitats		scrub edge	10	4	100	Unfavourable (10 of 11 species)
E13 (all)	tree-associated	decaying wood	bark & sapwood decay	8	2	150	Unfavourable (8 of 19 species)
E13 (all)	open habitats		rich flower resource	3	1	100	Unfavourable (3 of 15 species)

Site Name	Broad biotope	Habitat	Habitat sub-category	No. of species	% representation	SQI	Reported condition
E13 (all)	coastal	saltmarsh	saltmarsh & transitional brackish marsh	2	2	100	Unfavourable (2 of 9 species)
E13 (all)	wetland	marshland	undisturbed fluctuating marsh	1	3	100	Unfavourable (1 of 4 species)
E13 (all)	tree-associated	decaying wood	heartwood decay	1	<1	100	Unfavourable (1 of 6 species)
E13 (east only)	open habitats	short sward & bare ground	bare sand & chalk	36	8	322	Favourable
E13 (east only)	open habitats	short sward & bare ground	open short sward	15	8	140	Favourable
E13 (east only)	open habitats		scrub-heath & moorland	10	3	130	Favourable
E13 (east only)	open habitats		scrub edge	5	2	100	Unfavourable (5 of 11 species)
E13 (east only)	tree-associated	decaying wood	bark & sapwood decay	2	<1	100	Unfavourable (2 of 19 species)
E13 (east only)	open habitats		rich flower resource	1	<1	100	Unfavourable (1 of 15 species)
E23	open habitats	short sward & bare ground	open short sward	7	4	186	Unfavourable (7 of 13 species)
E23	open habitats	short sward & bare ground	bare sand & chalk	3	<1	200	Unfavourable (3 of 19 species)
E23	open habitats		scrub edge	2	<1	100	Unfavourable (2 of 11 species)
E23	open habitats		scrub-heath & moorland	2	<1	100	Unfavourable (2 of 9 species)
E23	tree-associated	decaying wood	bark & sapwood decay	1	<1	400	Unfavourable (1 of 19 species)
E23	wetland	peatland	reed-fen & pools	1	<1	100	Unfavourable (1 of 11 species)
reservoir	open habitats	short sward & bare ground	bare sand & chalk	4	<1	175	Unfavourable (4 of 19 species)

Site Name	Broad biotope	Habitat	Habitat sub-category	No. of species	% representation	SQI	Reported condition
reservoir	open habitats	short sward & bare ground	open short sward	2	1	100	Unfavourable (2 of 13 species)
reservoir	open habitats		scrub edge	1	<1	100	Unfavourable (1 of 11 species)

5.1.4 Pantheon analysis indicates that a number of the pitfall-trapped sites at Sunnica East Site B, namely compartments 'A', E12 and E13 are 'Favourable' in condition for the invertebrate assemblages associated with bare sand and chalk, and that further to this, the open short sward habitats at compartments 'A' and E13 are also 'Favourable', but less significantly so, according to the SQI values, which are lower for this habitat sub-category than they are for the bare sand and chalk habitat.

5.1.5 In summary, what this effectively means is that at these three sites, the habitat provides optimum quality for a significant breckland invertebrate fauna.

5.1.6 Using Colin Plant Associates (UK Consultant Entomologists) guidelines for assessing the significance of invertebrate habitat (see **Table 5-3**, compartments A, E12 and E13 (margins) would all qualify as being of between County and Regional Value for their invertebrate fauna, based on the definitions provided in section 3.4. The marginal grassland that flanks the eastern edge of E13 is likely to be approaching Regional importance, due to the presence here of no less than 41 breck-associated invertebrate species of designated status 'Nationally Scarce' or 'Rare', and to this grassland also supporting one of only two British populations of the leafhopper *Arocephalus languidus*, which is probably an overlooked native species rather than a recent colonist to Britain or introduction. In considering the Pantheon analysis and species assemblages, that the north margin of E13 and sites A and E12 should be considered of County value. Plant's guidelines for evaluating the value of a site at County and Regional level, are reproduced in **Table 5-3**.

Table 5-3: Guidelines for evaluating the value of a site at County and Regional level

Geographical Scale	Description
Regional	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in a region of England (i.e. East Anglia)
County	Site with populations of invertebrates or invertebrate habitats considered scarce or rare

Geographical Scale	Description	
	or threatened in the county in question	which contains or is reasonably expected to contain an assemblage of invertebrates that includes viable populations of at least five Nationally Notable species or viable populations of at least five species regarded as Regionally Scarce by the county records centres and/or field club.

5.1.7 There is a low-level of *saproxyllic* (dead-wood reliant) species in the survey area, which includes the clerid beetle *Opilo mollis* and the bark beetle *Kissophagus vicinus*, both of which are Nationally Scarce. However, since there is likely to be very minimal damage or loss to the hedgerow habitats, there is no significant impact anticipated.

5.1.8 The dung and carrion fauna is also notable with the presence of seven Nationally Scarce and one Nationally Rare (IUCN Vulnerable) beetle species associated with dung and carrion. Grazing by sheep or ponies on short sward areas would be a solution and worthy of further discussion.

6 References

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Annex A Species Accounts

Agroeca cuprea – a running foliage spider

Status: Nationally Rare, NERC s.41, IUCN Near Threatened

Despite the common name given to spiders in this family, this is a ground-dwelling species. It is typically found in dry, arid habitats, most often associated with coastal dunes, but it is also found inland in the brecks of East Anglia. The species is widespread in Britain but occurs only in highly localised pockets throughout its range. All stages are predatory. Adults are most frequently recorded in September and October. At the Sunnica site, four adult males (three are retained as vouchers) were removed from pitfall-traps at the northern margin of E13 (Sunnica East Site B) on October 18, 2019.

Aleochara verna – a rove beetle

Status: Nationally Rare (Red Data Book RDBK = 'Insufficiently Known'), IUCN status not evaluated

This small aleocharine rove beetle is found principally in dung, although it also occurs in other decaying organic matter. It is widely but locally distributed throughout Britain, although it appears to be very scarce in Scotland. There is very little information in the literature about the phenology of the species in Britain. In the surveyor's experience, adults have been recorded between June and September. Welch (1997) rightly suggested that the species is probably worthy only of 'Nationally Scarce' status. At the LOHP site an adult was recovered from a pitfall trap at E12 (Sunnica East Site B) on June 5, 2020. Associated odours relating to organic decay of the trap contents probably attracted the specimen to the trap site.

Arocephalus languidus – a leafhopper

Status: Not evaluated.

Although this small greenish leafhopper has no current rarity or threat status, it is recorded here because its presence at the Sunnica site is highly significant. The species was first found in Britain at the Stanford Military Training Area in West Norfolk breckland (Hawkes *et. al.* 2018) where it was pitfall-trapped and later recorded from water trap samples. At Sunnica East Site B, compartment E13 (east), a male and female *Arocephalus languidus* (Flor) were identified from pitfall trap material collected at TL689719 on October 4, 2019. A further two males were recovered from this same pitfall line on October 18 of that year. The habitat here comprises a broad margin of short-turf Breckland grassland which is evidently grazed by rabbits but which also appears to have been managed by mechanical means to retain a short sward. Of particular significance is the presence of the grass species *Koeleria macrantha*, the host-plant of the leafhopper. This was identified as being occasional in the sward, and in some places locally frequent. Both the grass species and the leafhopper were absent from the other trapping locations in Sunnica East Site B. The survey specimens are clearly representative of a second British population that has either been overlooked or has colonised the site. So significant is this finding, that it is being published (Lane & Padfield, in press).

Cryptophagus schmidtii – a silken fungus beetle

Status: Nationally Rare (Red Data Book RDBK = 'Insufficiently Known'), IUCN status not evaluated

This small brown and non-descript species is usually recorded from grassland sites where it is assumed to have an association with mammal runs. It might also be associated with granaries and pheasant feed, but its ecology is not fully understood. The species is very locally distributed in England. Many records are from pitfall-traps. At Sunnica East Site B, a single adult was recovered from pitfall traps at the grassland margin of the reservoir, TL686708, on October 4, 2019.

Glocianus pilosellus – a weevil

Status: Nationally Rare (Red Data Book RDB2 = 'Vulnerable'), IUCN status not evaluated

This is a small black weevil of grassland on sand dunes, downland, sandy habitats and disturbed ground. The food-plant is lesser dandelion *Taraxacum laevigatum*. The larvae probably feed in the flower-heads. In Britain, its distribution covers south and eastern England and South Wales only. It is relatively scarce in East Anglia where it is known mainly in the breckland and in breck grassland sites in north-west Norfolk. In the surveyor's experience, adults have been found in the field between April and June and in August and September. At the Sunnica East Site B, a single adult was recovered from a pitfall trap in compartment 'B' - at the south-east corner of the horse paddocks, on May 27, 2020.

Gronops inaequalis – a weevil

Status: Nationally Rare (Red Data Book RDBK = 'Insufficiently Known'), IUCN status not evaluated

This cryptically-coloured ground-dwelling weevil is usually associated with disturbed ground, including brownfield sites. At the East Kent site where it was first discovered in Britain in 1982, it was found at the roots of Spear-leaved orache *Atriplex prostrata*, but on the continent, its food-plant is fat hen *Chenopodium album* and possibly other members of that plant family. Since its discovery, it has spread so that its current range encompasses a swathe of England from North Lincolnshire down to East Kent, and it is also now present in North Wales. The beetle is mainly nocturnal, seeking refuge under vegetation mats during the day. Adults have been recorded between May and August. At the Sunnica East Site B, a single adult was recovered from pitfall traps on the east grassland margin of E13 at TL690721 on May 27, 2020.

Harpalus froelichii – Brush-thighed Seed-eater

Status: Nationally Rare, NERC s.41 National BAP, IUCN Near Threatened

This medium-sized black ground beetle is typically found on open ground on sandy soils in habitats such as heathland, calcareous grassland and cultivated disturbed ground. It is phytophagous feeding mainly on seeds of chenopods. Its British distribution is centred on the East Anglian Brecks, but there are other records up through north-west Norfolk and along the coastlines of Norfolk, Suffolk and Dorset and isolated outliers inland from the Bristol Channel. This is a well-known rarity from the brecks district, although indications are that its range is increasing in East Anglia in recent years. At the Sunnica East Site B, adults were recorded as follows: at E13 (east margin), pitfall traps held singletons on October 18, 2019, May 27, 2020 and June 5, 2020; at E13 (north margin), pitfall traps held one on October 18, 2019 and at E12, pitfall traps held one on August 12, 2020.

Harpalus pumilus – a ground beetle

Status: Nationally Rare, IUCN Near Threatened

This small dark ground beetle is associated with open or disturbed ground on sandy or gravelly soils. It is phytophagous feeding mainly on seeds. Its distribution centres on East Anglia (particularly the brecks and coast), but with widely scattered and isolated records elsewhere from the east Midlands, south and south-west England and north Wales. At the Sunnica East Site B, three adults were recorded from pitfall traps located in the east margin grassland at E13, on May 27, 2020.

Heliothis viriplaca - Marbled Clover

Status: Nationally Rare (RDB3), IUCN status not evaluated

This is a distinctive day-flying moth with straw coloured forewings and a black banding pattern on the hind wings. Its requirements are waste ground and sandy Breck heaths. The larvae feed on plants of waste ground and the adults are flower-visitors visiting species such as viper's bugloss. It is resident in the Brecks of East Anglia and up through north-west Norfolk to the coastal fringe, but although it may be spreading in its range, it is still only an occasional to rare immigrant in other south and eastern counties, notably Wiltshire and Dorset. At Sunnica East Site B, an adult was observed in daytime flight at E13 (east margin) on July 17, 2020.

Hedychrum niemelai – a ruby-tailed wasp

Status: Nationally Rare (pRDB2 (provisional status = Vulnerable), IUCN status not evaluated)

This is a brightly coloured and spectacular ruby-tailed wasp found in open, sandy localities such as dunes, quarries and tracks and pathways. As a parasitoid, its hosts are weevil-wasps or digger-wasps; species of the genus *Cerceris*. The ruby-tailed wasp seeks out nests of the host and lays its eggs in the nest. The larvae hatch and consume the grubs of the host. For nectar sources, the wasp is known to visit golden-rod, woundwort and yarrow. The species is found in southern England with records from Cornwall to Kent and north to Oxfordshire, Norfolk and Lincolnshire. It was assessed as being of provisional Red Data Book status by SJFalk in 1991, but Archer () considers that it's current status should be downgraded. In Norfolk, the species' distribution centres around The Brecks, with outlying records to the north and east. At Sunnica East Site B, an adult was recovered from a grassland pitfall trap at Site A on August 12, 2020.

Isochnus sequensi - a jumping weevil

Status: Nationally Rare (Red Data Book RDBK = 'Insufficiently Known'), IUCN status not evaluated

This small brown weevil with partly pale legs was until recently a rare species in Britain. First recorded in 1952 in Canterbury, Kent, it has since spread, being found in Sussex, Surrey, Essex, Middlesex, Norfolk, Cambridge and Huntingdonshire by 2012 and shortly thereafter from Hampshire, Staffordshire, Nottinghamshire and Derbyshire. It is currently widely distributed throughout much of England and has also been recorded from Wales. Due to this rapid colonisation, its status of RDBK is no longer justified. The species inhabits the drier part of wetlands such as at track sides, usually on *Salix fragilis* but it may also feed on other willow species. The larvae feed in blotch mines in the leaves of the host tree and pupate inside them. At the Sunnica East Site B, an adult was beaten off willow at the edge of compartment A on July 17, 2020

Labarrus (Aphodius) lividus – a dung beetle

Status: Nationally Rare, IUCN Vulnerable

This is a eurytropic beetle, occurring on pasture and also in downland and dune grassland. It is associated with sheep, cattle and horse dung and is also recorded from dog faeces. Adults are mainly active in late autumn, with a few lasting until early spring. Most records in Britain are between October and April. Hibernation is probably undertaken in egg stage, with larval hatching in early spring and developing through the summer. The species is currently very localised, though apparently increasing throughout England and Wales, perhaps due to climate change. Records that post-date 1990 are from localities in Cumbria, Caernarvonshire, Nottinghamshire, Oxfordshire, Cambridgeshire, West Norfolk, West Sussex and Surrey at least. At Sunnica East Site B, a singleton was sieved from a large manure heap in the south-east corner of E13 on May 15, 2020 and on May 27, 2020, around fifty individuals were found in a single piece of horse dung along the south edge sandy track of E13. This single piece of dung produced probably more individuals than have collectively ever been found in Britain and the date changes our understanding of its phenology significantly.

Longitarsus quadriguttatus – a flea beetle

Status: Nationally Rare, IUCN Least Concern

This small jumping beetle is associated primarily with hound's-tongue *Cynoglossum officinale*, but only where large populations of the plant exist. The adult feeding damage produces small holes in the leaves, known as 'shot-holing'. The larvae develop at the plant roots. The species is typically found in sandy habitats such as breck grassland, disturbed field margins, coastal dunes and heathland. Its current distribution is across south-east England with a concentration of records in the breckland region of East Anglia. Older records exist for other areas of southern England. Adults are mostly found between June and October. At the Sunnica East Site B, adults were observed on the food-plant in compartment A on July 17, 2020.

Nephus quadrimaculatus – a ladybird

Status: Nationally Rare (RDB2 = Vulnerable), IUCN status not evaluated

This is a diminutive dark brown species with four distinct orange patches on the wing cases. It is found in woodland, gardens and hedgerows where it feeds on coccid bugs on ivy. Adults are recorded from March and from July through to September at least. They probably hibernate in ivy vegetation. It was formerly a rare species with records only from Suffolk, but since the 1990s, it has increased in range and is now relatively frequent in south-east England and East Anglia. It has yet to be recorded from Scotland. The British Rarity status of NR (Red Data Book category Vulnerable) is certainly no longer applicable to the species' true distribution, but this status has yet to be formally re-evaluated. At the Sunnica East Site B, adults were beaten from ivy in compartment A on July 17, 2020 and along the diagonal footpath that runs through this area, on May 15, 2020.

Psammotettix alienus (= *striatus*) – a leafhopper

Status: Nationally Rare (Red Data Book RDBK = 'Insufficiently Known'), IUCN status not evaluated

Little is known about the distribution and ecology of this small brown leafhopper in Britain, but research on the species as a pest of winter barley in Germany has shown that it overwinters in the egg stage, the adults being present in the field generally between late spring and mid to late autumn. The species there feeds not only on cereal crops, but also on wild grasses. In Britain, the bug appears to be restricted to Breckland where it is reported in the literature from 'Freckenham, Suffolk'. This surveyor also knows it from the Stanford Military Training area where it was pitfall-trapped in 2015, 2016 and 2017. At the Sunnica East Site B, a female was found in a pitfall trap along the northern margin of E13 on October 4, 2019 and five males and three females were collected from pitfall traps at the same site on October 18 of that year.

Tachyporus scitulus – a rove beetle

Status: Nationally Rare. IUCN Least Concern

This is a small tear-drop shaped rove beetle which is predatory on smaller invertebrates. It is a species of insolated dry habitat mosaics including disturbed breck grassland heath on both acid and calcareous soils, disturbed short sward post-industrial ground and dune systems. Adults have been found between March and September inclusive and are most frequently recorded by grubbing at ground level. Its distribution in Britain is centred around the East Anglian breckland where it can be quite frequent, although there are a number of unverified records from inland parts of Wales. At the Sunnica East Site B, two adults were recovered from pitfall traps at E13 (east margin) on May 27, 2020, a single individual was found in a pitfall trap in compartment A on the same date, and another singleton was collected from pitfall traps at E12 on August 12, 2020.

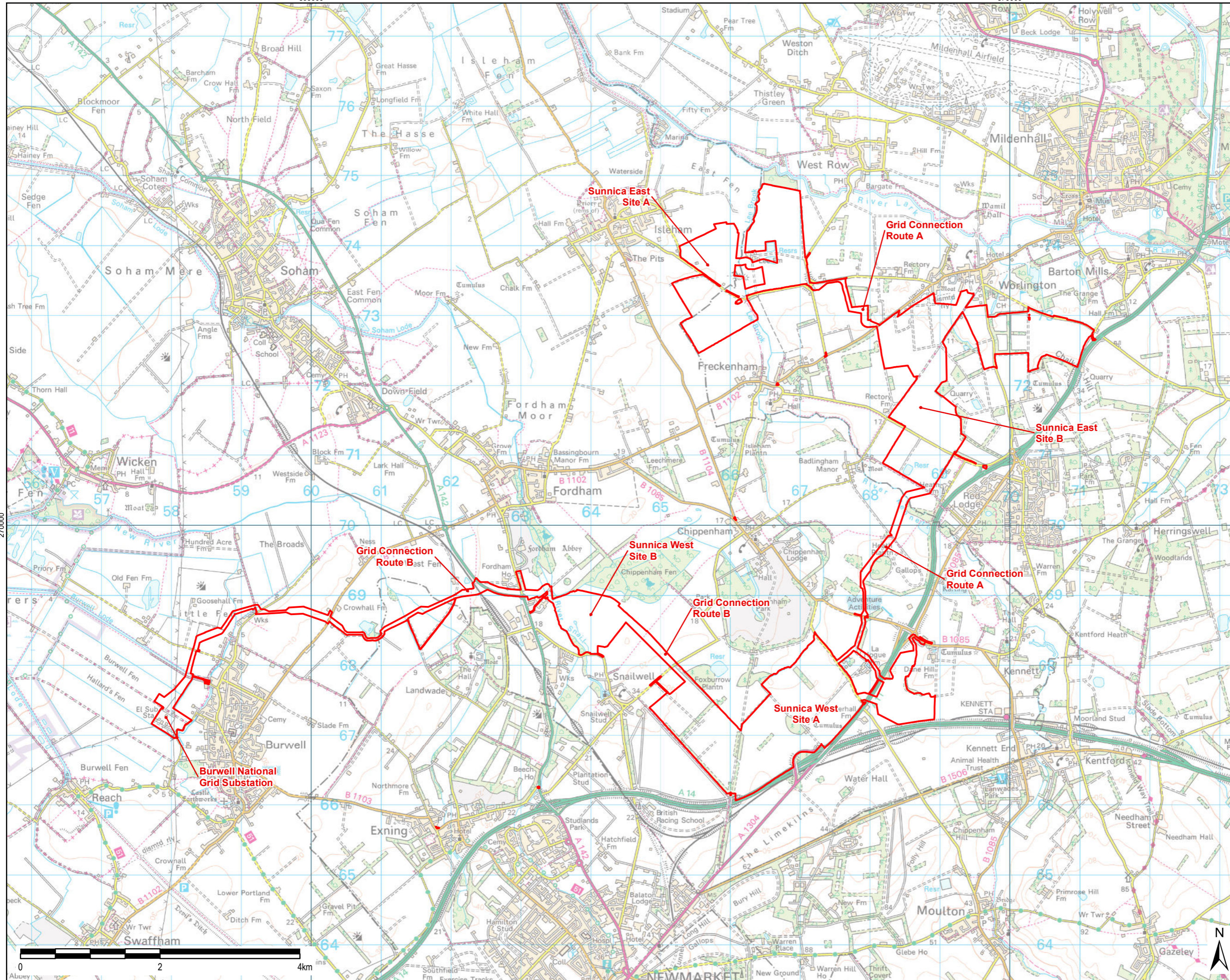
Annex B Figures

Figure 1: Order limits Boundary

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LEGEND

The Order Limits



Document Reference: EN010106/APP/6.3
APFP Regulation: 5(2)(a)

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FIGURE 1:
SITE LOCATION

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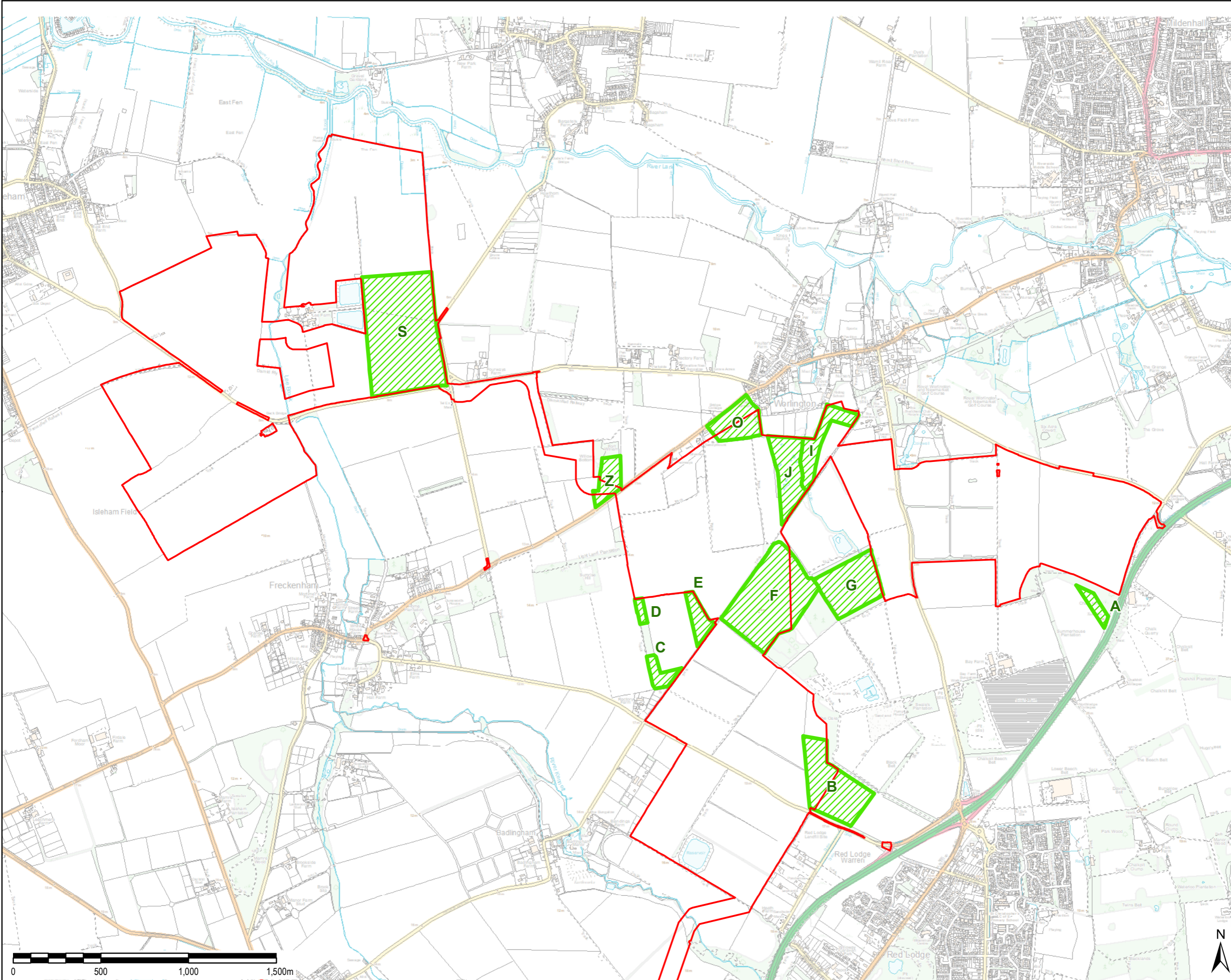
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Figure 2 Scoping Survey areas evaluated for potential to support terrestrial invertebrates

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LEGEND

-  The Order Limits
-  Location of grassland



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**FIGURE 2.1
SCOPING SURVEY AREAS
EVALUATED FOR POTENTIAL TO
SUPPORT TERRESTRIAL**

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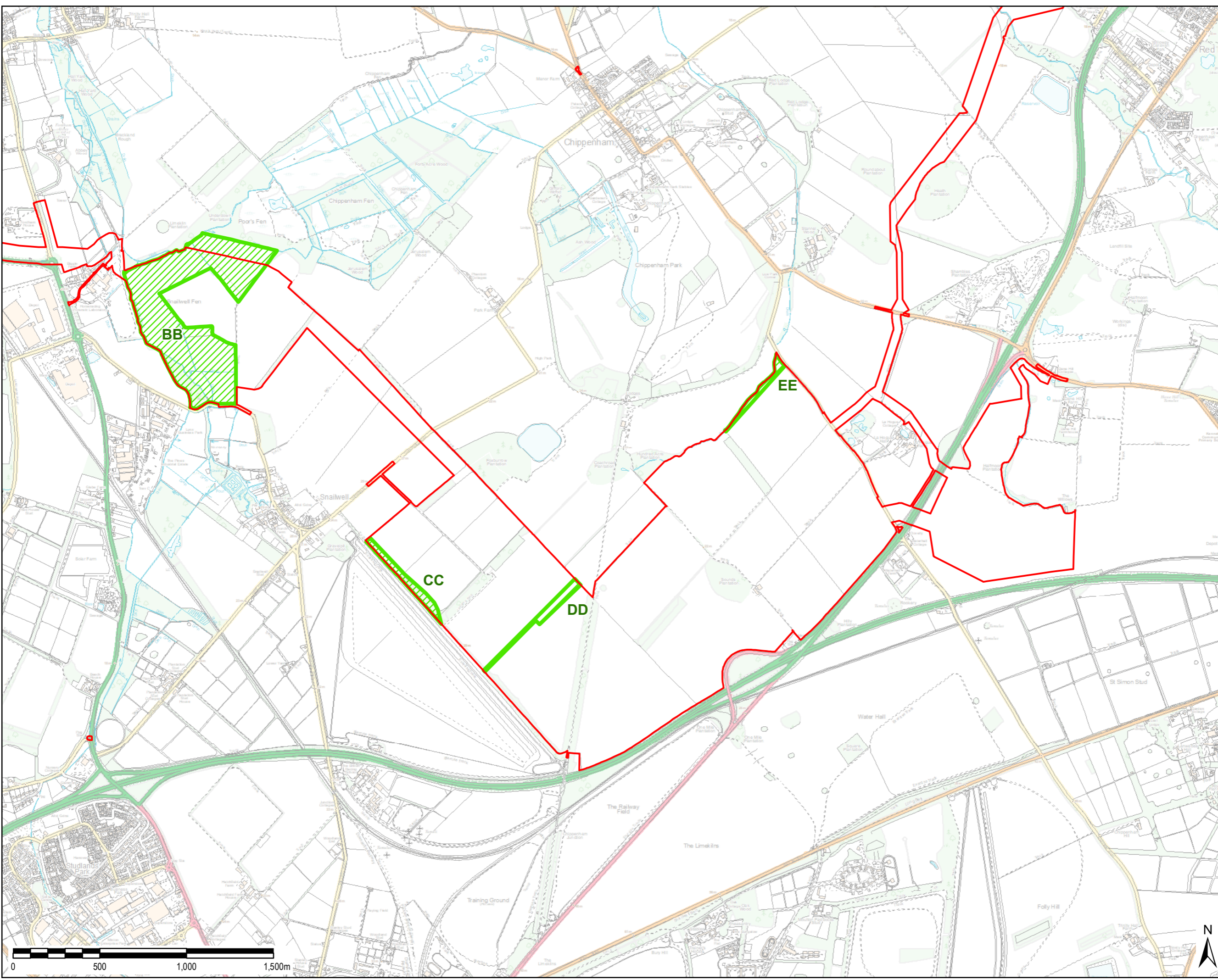
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LEGEND

-  The Order Limits
-  Location of grassland



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Drawing Title
**FIGURE 2.2
SCOPING SURVEY AREAS
EVALUATED FOR POTENTIAL TO
SUPPORT TERRESTRIAL**

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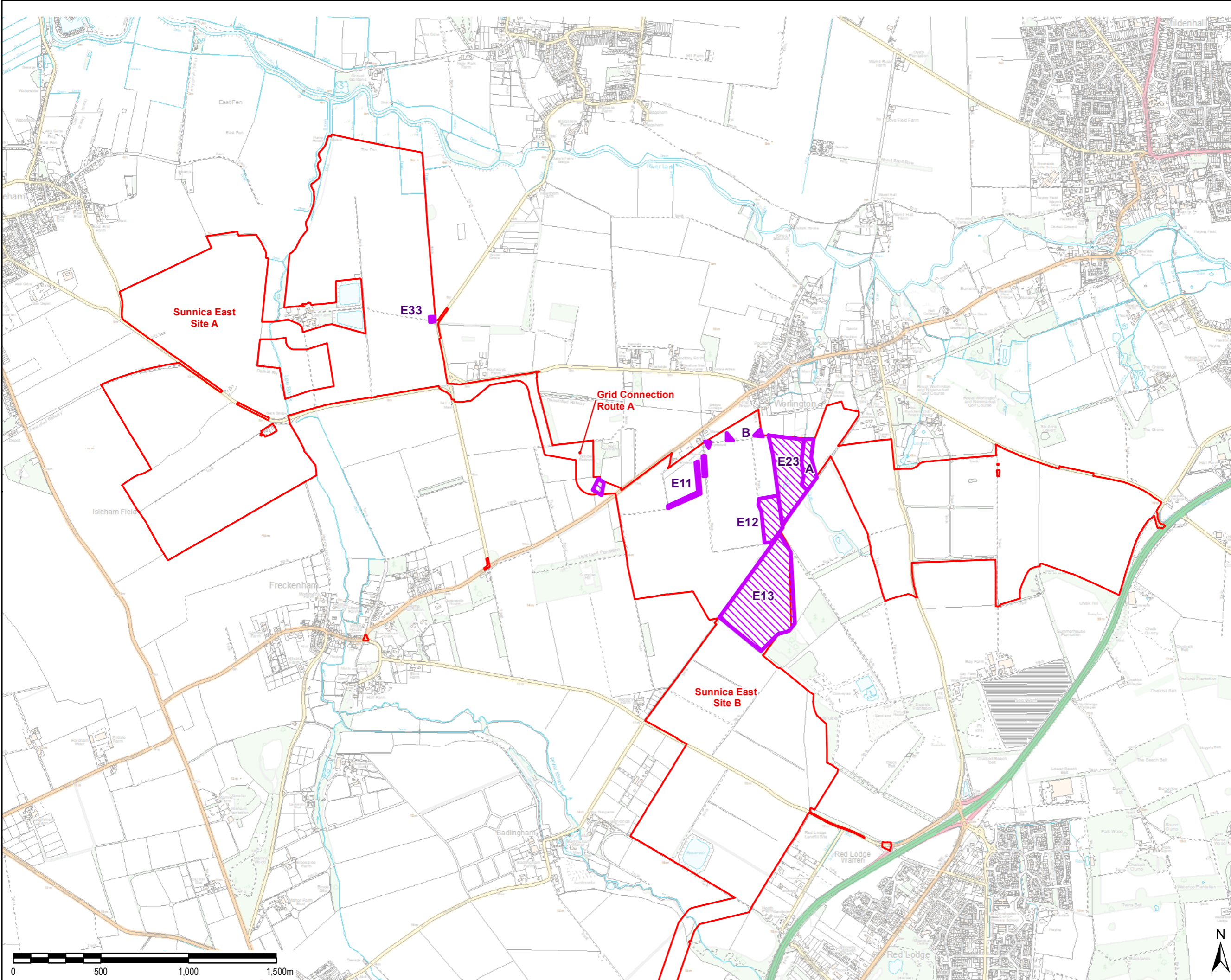
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Figure 3 Areas subject to further survey for terrestrial invertebrates

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- LEGEND**
- The Order Limits
 - Location of area subject to further terrestrial invertebrate surveys



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**FIGURE 3
AREAS SUBJECT TO FURTHER
SURVEY FOR TERRESTRIAL
INVERTEBRATES**

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