SUNNICA ENERGY FARM
DCO EXAMINATION

WRITTEN REPRESENTATION

ANNEX D – ECOLOGY AND BIODIVERSITY NET GAIN

SAY NO TO SUNNICA ACTION GROUP LTD

11 NOVEMBER 2022

Planning Act (2008)
PROPOSED SUNNICA ENERGY FARM
EN010106

Written Representation on Ecology Matters

Bioscan UK Ltd
for
Say No To Sunnica

Submitted to Examination at Deadline 2
11 November 2022

E2132R2

COMMISSIONED BY

Say No to Sunnica

PROPOSED SUNNICA ENERGY FARM

Written Representation on Ecology Matters

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Bioscan Report No.
E2132R2

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CONTENTS

Appendices

1 BACKGROUND TO THIS SUBMISSION

1.1 Background

1.1.1 In April 2022, Bioscan (UK) Limited was appointed by 'Say No to Sunnica' to review the robustness of the ecological information submitted to the Planning Inspectorate (Infrastructure Planning Commission) in support of Sunnica Ltd's application for a Development Consent Order (DCO). The project being considered is a large-scale solar installation covering land straddling the Cambridgeshire and Suffolk borders north of Newmarket.

1.1.2 Bioscan is one of the longest established and most respected names in applied ecological consultancy. The majority of the company's work is for the development sector, but an increasing number of commissions originate from concerns about the adequacy and robustness of evidential material on ecology submitted into the planning process by development applicants, driving a related demand for independent expert review of such information.

1.1.3 Projects falling within the scope of the Planning Act (2008) are required to follow the mitigation hierarchy of avoiding harm to biodiversity in the first instance and adequately mitigating or compensating for it where such harm is unavoidable. NPS EN-1 paragraph 5.3.7 states that: "*As a general principle, and subject to the specific policies below, development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives … where significant harm cannot be avoided, then appropriate compensation measures should be sought*".

1.1.4 In the case of this project, the applicant claims that "*The embedded mitigation in the Scheme includes areas of habitat creation and enhancement throughout the Sites to provide benefit to the local wildlife. A Biodiversity Net Gain Assessment … concludes that the Scheme will lead to a biodiversity net gain of 83% habitat units, 16% hedgerow units and 1% river units*." [APP-256 6.4 Environmental Statement - Non-Technical Summary para 7.4.14].

1.1.5 A particular focus of Bioscan's review was to assess the veracity of this statement and the reliability of the quantitative measures of loss versus gain in biodiversity terms that have been presented in support of it. We have also considered, as far as possible given constraints on independent access to land and redacted data, the applicant's claims that significant residual negative impacts on a range of other locally characteristic and important biodiversity assets will be avoided.

1.1.6 Our review included a desk-based review of the applicant's submission material on ecology, carried out between April and July 2022, and 'ground truthing' visits to publicly accessible parcels of land in July 2022. We then produced a report in August 2022 outlining a number of errors, information shortfalls and deficiencies we had identified in the applicant's submission material. This report is attached at Appendix 1.

1.1.7 In order to assist the Examination by narrowing points of dispute, this report was provided to Sunnica Ltd on 31st August, prior to the opening of the Examination and a response to the matters it raised was invited[1]. The report was also shared with planning officers at the relevant LPAs. We note from their submissions to the Examination in the Local Impact Report (LIR) that the LPAs share many of our concerns.

1.1.8 On 16th September 2022, Sunnica Ltd provided a written response to the matters raised in our August 2022 report (Appendix 2). It acknowledged certain errors and limitations. We are not aware that the Planning Inspectorate have hitherto been provided with a copy of this document. Amongst other things, it includes reference to update surveys (including Phase 2 botanical surveys) that "*will be reported in a technical note which will be shared with all stakeholders through submission to PINS during the Examination for Deadline 1*." (see Appendix 2, page 1 bottom of page).

1.1.9 We are not aware that this technical note was submitted at Deadline 1 and having not had sight of it are naturally unable to take account here of any remedial work that it includes to correct data errors or oversights in the applicant's submission material on ecology.

1.1.10 In light of the above, STNS's representations on ecology/biodiversity at this stage seek to assist the examination process by focusing on matters which are:

a) Still in dispute as a matter of fact or interpretive analysis;

b) Not being led fully or otherwise dealt with by other interested parties – for example on most (but not all) matters concerning protected species, SNTS are broadly content to defer to the statutory authority and/or other IPs such as RSPB at this stage.

c) Relevant to the determination process and the application of national or local policy and relevant legal obligations.

[1] PINS were copied in on this correspondence – ref e-mail from Amdrew Munro to Sunnica Ltd dated 1st September 2022. We are not aware that PINS were copied in on Sunnica's response.

2 PARTICULARISATION OF CONCERNS

2.1 Categories of concern

2.1.1 Bioscan's and STNTs ongoing concerns about the treatment of biodiversity resources in the applicant's submission material can be grouped into the following headings:

- The scope, coverage and methodology of the desk and field surveys of habitat and flora undertaken by the applicant and the consequent accuracy and representativeness of the assessment baseline;
- Omissions or limitations with regard to the consideration of protected species;
- An apparent misuse of the Rochdale Envelope approach and the implications of this for the robustness of the impact assessments provided;
- The practical realism and deliverability of substantial elements of the proposed habitat creation;
- The cumulative impact of all of the above on the robustness of the applicant's calculations of biodiversity loss/gain and the extent to which they can be relied upon in decision making

2.1.2 We expand on each of the above in turn below.

2.2 Particularisation of concerns

i) *The scope, coverage and methodology of the desk and field surveys of habitat and flora undertaken by the applicant and the consequent accuracy and representativeness of the assessment baseline*.

2.2.1 As set out in our report at Appendix 1, we have undertaken independent checks of the accuracy of much of the baseline habitat survey work presented in Chapter 8 of the submitted Environmental Statement [APP-040] and in the accompanying appendices and drawings. This has enabled independent review of the robustness and veracity of the impact assessment statements arising, including the claims that the project will, overall, deliver significant net gain in biodiversity as compared with the present (baseline) situation.

2.2.2 It will be seen from the documentation at Appendix 1 and Appendix 2 that this process exposed a number of errors, many of which seem to be at least tacitly acknowledged by Sunnica Ltd in the context of their confirmation that further surveys (what it calls 'update' surveys) are required. The Examining Authority is invited to read Sunnica Ltd's response at Appendix 2 and note the various concessions made in the light of the points made in the Bioscan report at Appendix 1.

2.2.3 The effect of these errors is to undermine the reliability and robustness of both the impact assessments and the Biodiversity Net Gain calculations presented by the applicant. It is striking that in no example or location have we found the baseline value of a habitat or other ecological resource to have been *overestimated* – in all examples where we have identified error or omission, such error has had the effect of *underestimating* the value of the baseline position.

2.2.4 We still await the applicant's further information from the update surveys (including Phase 2 botanical surveys) that it has advised "*will be reported in a technical note which will be shared with all stakeholders through submission to PINS during the Examination for Deadline 1*." (see Appendix 1, page 1 bottom of page). We propose to make further comments at that stage on the extent to which these further surveys, and amendments to the baseline arising from them, address our concerns about the reliability of the baseline for impact assessment.

ii) *Omissions or limitations with regard to the consideration of protected species*

2.2.5 Bioscan's review of the submission information indicated that there were also some omissions on the matter of the presence or absence of specially protected and 'Priority' species within the application site, albeit the review could not be comprehensive as much of the information was redacted and public access was not possible to large areas of the site.

2.2.6 The identified omissions were similarly brought to the attention of Sunnica Ltd via our report of August 2022. In their response of 16th September 2022, Sunnica Ltd responded by way of a Scott Schedule-type table with responses to each identified query or omission (Appendix 1). We provide a further update to this table, with our further responses, below:

Table A: Position as regards adequacy of protected species information and impact assessments

Issue identified in Bioscan review August 2022 (Appendix 1)	Sunnica Response 16 Sept (Appendix 2)	Bioscan further response
Great crested newt		
Bioscan note that there is a licence return record from the southern part of Chippenham Fen, indicating the presence of great crested newt at that site in 2014 [National grid reference: TL 650 690] (2.2.10). In view of the fact that the location of this record is from a contiguous wetland complex that extends to within 250m of proposed construction areas, Bioscan suggest there may at the very least need to be revision to the applicant's assessments of risk of impact to this species in this part of the project area (Sunnica West Site B) (Appendix 1, 2.2.11)	The location for the record is at least 514 m from the Order Limits, 572 m from the Developable area and 584 m from the nearest PV solar panel (see Figure 1 in Appendix). Whilst some of this distance is part of the wetland complex and SSSI, the latter half is across arable field fields. It is unknown whether this is a reliable record and it has been our understanding from the Natural England site manager, that great crested newt is unknown from Chippenham Fen, in light of previous monitoring of amphibian species. Irrespective of this, great crested newt was not recorded within the Sunnica West Site B (APP-082 6.1 Environmental statement Appendix 8F - Great Crested Newt Survey Report) and along with standard mitigation measures to be secured through the CEMP (APP-123	The failure to pick up and document this record appears to be acknowledged. The comments about land-uses in the intervening area do not appear to be correct, albeit there has been recent cultivation in the last few weeks, including within the SSSI designated buffer area: a matter that has been raised with Natural England and on which a response is still awaited. Bioscan accept that suitable mitigation for the species, if present at

Issue identified in Bioscan review August 2022 (Appendix 1)	Sunnica Response 16 Sept (Appendix 2)	Bioscan further response
	Environmental Statement - Appendix 16C - Framework Construction Environmental Management Plan) and avoidance of known great crested newt habitats within the Order Limits, even if present at low densities, impacts to great crested newt can be appropriately avoided.	Chippenham Fen, would be achievable, but the omission of this record calls into question how comprehensive the baseline is for other areas.
Hobby		
Hobby was heard calling in Sunnica East Site B on 13th July 2022. It is noted that this Schedule 1 species, which appears likely on the strength of this record to nest in field boundary pines south of Worlington is not mentioned in App-085 (ES Appendix 8I: Report of survey for breeding birds, but its presence within the order limits in a breeding capacity is acknowledged and assessed in ES Chapter 8. It is unclear if our record on this date is consistent or inconsistent with the baseline conditions for this species reported in the ES and related submission material. … (Appendix 1, 2.6.1)	Hobby was recorded as breeding on Sunnica East Site B (Appendix 8I - Report on Surveys for Breeding Birds). Bioscan's observations are therefore consistent with the Applicant's baseline assessment (APP-085 6.2 Environmental Statement - Appendix 8I - Report on Surveys for Breeding Birds).	As the applicant acknowledges presence of hobby in this area, no further comment to make.
Stone-curlew		
Stone curlew *Burhinus oedicnemus* was also present in Sunnica East B on 13th July 2022, using fields which are identified for solar rays. Due to the (understandable) redactions in EA Appendix 6.6: Offsetting Habitat Provision for Stone Curlew Specification APP-258. It is unclear whether our record on this date is consistent	Stone-curlew was recorded as breeding on Sunnica East Site B (Appendix 8I - Report on Surveys for Breeding Birds). Bioscan's observations are therefore consistent with the Applicant's baseline assessment (APP-085 6.2 Environmental Statement - Appendix 8I - Report on Surveys for Breeding Birds)..	As the applicant acknowledges presence of stone curlew in this area, no further comment to make.

Issue identified in Bioscan review August 2022 (Appendix 1)	Sunnica Response 16 Sept (Appendix 2)	Bioscan further response
with the baseline conditions for this species reported in the ES and related submission material. …		
Farmland birds		
Attention is drawn in 3.3.2 and a footnote on p. 16 of Appendix 1 to: a. the need to give full and balanced consideration to those declining species of open arable farmland known to be present b. the apparent absence of an assessment of the cumulative impacts on local and regional populations of these species from the multiple solar projects in Cambridgeshire and Suffolk acting in combination which has the potential to drastically reduce the available habitat for these species. c. limitation of the biodiversity net gain metric in that it does not take into account the use animals make of a habitat, in this case, of farmland birds; an arable field which regularly supports breeding lapwing and stone curlew is afforded the same de minimus score as an arable field supporting neither species.	a. The Scheme has embedded sufficient 'undeveloped' land for the creation of biodiverse grassland to offset the loss of arable farmland and avoid significant effects either alone or in-combination with other schemes (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation). As part of the Scheme, this grassland will be better managed than they currently are and support richer invertebrate assemblages and more permanent nesting habitat that will increase density and productivity of species such as skylark. Other farmland species such as corn bunting and linnet, rely on well managed margins and hedgerows for breeding and an over-wintering seed resource, all of which will be enhanced by the Scheme (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation. See sub-section Creation of replacement grassland habitats of APP-108 6.2 Environmental statement – Appendix 10I - Landscape and Ecology Management Plan (LEMP) and paragraphs 1.7.12 et seq. outlining how grassland will be managed for breeding farmland birds. b. A thorough a review was undertaken of plans and projects which in combination with the Scheme might have an impact on important ecological features. The former is presented in Table 8-14 in APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation. No plans or projects identified in Table 8-14 are considered in combination to impact important ecological features identified in this assessment including farmland birds (APP-040 6.1 Environmental	Recent published research (see Appendix 2) has confirmed that the Priority (NERC Act Section 41 species) skylark is typically displaced as a breeding species from fields where solar arrays are installed. This empirical evidence runs wholly contrary to the applicant's claims that significant impact on this species, as part of the farmland bird assemblage, would be avoided and that net gains would be delivered. In reality, the displacement of this declining species from the application site could result in impacts significant at local or even county/regional population level. The quantum of 'undeveloped' land referred to here, to be converted to permanent grassland, is insufficient to accommodate the displaced territories, and therefore cannot mitigate or compensate for the net loss of population on the application site. No consideration has been given to the ability of surrounding farmland to accommodate the

Issue identified in Bioscan review August 2022 (Appendix 1)	Sunnica Response 16 Sept (Appendix 2)	Bioscan further response
	Statement - Chapter 8 - Ecology and Nature Conservation). c. Notwithstanding the use of the BNG metric, the Applicant has taken account of the baseline data in relation to protected and other species in developing our enhancement proposals, e.g. well-managed grasslands with an increase in habitat for farmland birds (as described in (b) above); and that as such the Applicant will be providing a gain for such species (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation) as well as achieving a calculated BNG by applying metric 3.1 in line with the requirements of Natural England, and we note this approach is supported by the Environment Act.	displaced population or to the significance of the overall likely net loss in population. This is before one considers the scope for in-combination effects with other losses locally to land-use change. This is a failure of adequate assessment for impacts on a declining species that is capable f being a material consideration in development decisions.
Bats		
It is at best unclear whether the assessments of impact on bats account fully for the magnitude of tree loss likely to be occasioned by the project. There appears to be a degree of incongruity between the conclusions of the tree constraints study, in terms of the number of trees identified for removal, the assumptions used as the basis for the assessment of impacts on bats in the ES Chapter 8 and Appendix 8J, and the amount of latitude sought by the applicant in respect of construction working areas, especially those around road crossings along the cable routes. Given the acknowledged presence of barbastelle in the locality, the importance of trees to this species and its habitual use of roost features considered low suitability for other species, this introduces a degree of uncertainty that the Examining authority might wish to be	The Applicant is currently working on a vegetation removal plan along with an Arboricultural Impact Assessment (AIA) and this will be brought forward at detailed design and will inform the Detailed LEMP pursuant to the LEMP (APP-108 6.2 Environmental statement – Appendix 10I - Landscape and Ecology Management Plan). The working assumption is that this will avoid trees with bat roost suitability or confirmed roosts. There should be no need for substantial tree removal, including in the cable corridor (predicted as a maximum of 0.46 ha in the Biodiversity Net Gain calculations) (APP-259 6.7 Environmental Statement - Biodiversity Net Gain Assessment) or any loss of ancient/veteran trees. Barbastelle forage throughout Suffolk and Cambridgeshire and will roost in suitable woodland trees and occasionally buildings. Proposed mitigation measures encompass the needs of barbastelle as well as other bat species (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation and APP-108 6.2	The uncertainty as to the scope and magnitude of impacts on bats and whether its full extent is covered by the EIA submitted by the applicant is not alleviated by this response. It appears the applicant's approach is that if bat roosts are found, even if of rare species, it can be dealt with. In the absence of further information (particularly in the context of the latitude sought by the applicant on matters of detail) it is difficult to see how the Examining Authority can be reassured that the scope for significant impact from this source has been duly assessed and found to be within acceptable levels. We would suggest there is insufficient information being provided by the applicant for Natural England to be able to issue

Issue identified in Bioscan review August 2022 (Appendix 1)	Sunnica Response 16 Sept (Appendix 2)	Bioscan further response
addressed by further information.	Environmental statement – Appendix 10I - Landscape and Ecology Management Plan (LEMP)). Where necessary, updated surveys prior to commencement will be undertaken to confirm the position presented in the ES (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation).	a Letter of No Impediment as regards potential impacts on this group of protected species.
Brown hare		
Appendix 1, para 3.3.1: Although brown hare (which we noted frequently on 13th July 2022) is 'assumed' to be present within the order limits in the ES, there is no assessment of the potential impact on the priority (NERCA [NERC] Act S41) species, which could be at risk of a certain (potentially significant) quantum of displacement effects from the change in habitat structure associated with the scheme. We consider this to be an omission.	Brown hare is common in all habitats in Suffolk (Bullion, 2009) and Cambridgeshire except for the fens where they are less common (Hows et al. 2016). Whilst brown hare will be displaced from the Scheme during construction, it will re-establish itself and, given that brown hare is most common in grassland habitats and at woodland edges, favouring a mosaic of arable fields, grasses and hedgerows, it will benefit from the landscape provided by the proposed Scheme. This achieves a better balance for this species between arable and grassland than exists at present (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation) and includes gaps at the base of security fencing to maintain movements of small-medium sized mammals between the Scheme and the wider landscape. To put this into context, a change to winter-sown cereals has led to a reduction in higher quality food in early summer in Suffolk, leading to food shortages and a lower leveret survival rate (Harris, 2008). Large numbers of hares are still regularly shot in Suffolk as part of organised meetings (Bullion, 2009), an activity which will not occur on the Scheme. Brown hare is assessed as being of local importance and will not be significantly impacted by the Scheme.	We dispute this assessment which, rather in the same manner as the approach taken to skylark (see above) assumes that brown hare 'will find somewhere else'. The Examining Authority is asked to note our submissions on deterioration or suppression of habitat quality due to shade (see below at 2.2.13-2.2.21) and to consider the comments made about 'benefits' to this species from the scheme in light of the evidence and imagery there.
Hedgehog and harvest mouse		
Appendix 1, para 3.3.1	The hedgerow habitat and associated margins used by hedgehog will largely be	See comment under 'brown hare' above.

Issue identified in Bioscan review August 2022 (Appendix 1)	Sunnica Response 16 Sept (Appendix 2)	Bioscan further response
The same [see Brown hare above] applies to hedgehog, which is also a priority species. No consideration whatsoever is given to the priority species harvest mouse. The latter two species are however likely to be at less risk of negative effects.	retained within the Order limits (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation). Coupled with the increase in grassland and the absence of insecticides and mollusicides, this should result in an increase in hedgehog population. Grassland management on the site will include habitat suitable for harvest mouse, again, the expectation being an increase in the population of this species. Hedgehog and harvest mouse are assessed as being of local importance and will not be significantly impacted by the Scheme.	

iii) An apparent misuse of the Rochdale Envelope approach and the implications of this for the robustness of the impact assessments provided

2.2.7 The Examining Authority's attention is drawn to section 3.2.13 of our August 2022 report (Appendix 1) and the comments made about whether the flexibility being sought by the applicant to allow for different designs and configurations of arrays to be deployed has been adequately covered in its application of the 'Rochdale Envelope' approach.

2.2.8 In response to this concern, the applicant has stated (Appendix 2, page 7) that:

"*Bioscan's assertion regarding the extent to which the Rochdale Envelope approach has been rigorously applied by the Applicant (section 3.2.13) is not correct. Whilst the Applicant is seeking flexibility in the design, the maximum parameters are set out in APP-035 6.1 Environmental Statement - Chapter 3 - Scheme Description of the Environmental Statement and APP-264 7.3- Design and Access Statement. These have been the worst-case scenario assessed in the ES. Should the DCO be consented, then these will be the parameters against which the Scheme will be built*."

2.2.9 We would remark that there appears to be incongruity between the development parameters set out at APP-035 6.1 Environmental Statement - Chapter 3 and the assumptions upon which the ecological impact assessments are based, which assume (for example) regular spacing between rows and very low or no impacts from shading (on which see below at 2.2.13-2.2.21).

2.2.10 Rather than labour the points we made in our report at Appendix 1 about the scope for higher impacting designs to be implemented that have not been adequately assessed, we would invite the Examining Authority to satisfy itself through the course of the examination that the full scope of likely significant effects from the design

flexibility sought by the applicant has been adequately covered in the impact assessments for all disciplines, not just ecology.

iv) The practical realism and deliverability of substantial elements of the proposed habitat creation;

2.2.11 The applicant's response to our concerns on this point, in its reply of 16th September 2022 (Appendix 2), is rather brief, and less than reassuring as a consequence. It states:

"*The Applicant recognises the challenges associated with the habitat creation that is planned. Forward planning has commenced in terms of sourcing seed mixes, soil amelioration and grassland management. An important element in assuring targets are met is a robust monitoring and surveillance programme over the life of the Scheme including implementation of contingency and remedial measures (APP-108 6.2 Environmental Statement - Appendix 10I - Landscape and Ecology Management Plan). This will be overseen by the Sunnica Ecology Advisory Group and it will be important to use the feedback and Group to:*

- guide implementation of remedial measures;
- use the monitoring to improve the enhancement measures; and
- learn from other similar projects
- to achieve the biodiversity enhancement predicted."

2.2.12 In the first instance, we question the absence of detail or evidence behind this statement. Such detail or evidence could provide reassurance that 'forward planning' has determined that there will in fact be adequate resources available for the proposed habitat creation, at the time it is needed. For example, the magnitude of seeding required to deliver the proposed habitat enhancements and creation for this scheme is enormous – far beyond any habitat creation project that Bioscan are aware of and this brings into question whether there are sufficient outlets capable of providing such volume of seed. The applicant elects not to provide any evidence that might provide a degree of confidence on this matter. We invite the Examining Authority to seek to satisfy itself on this point before putting any credence or weight on the habitat creation claims.

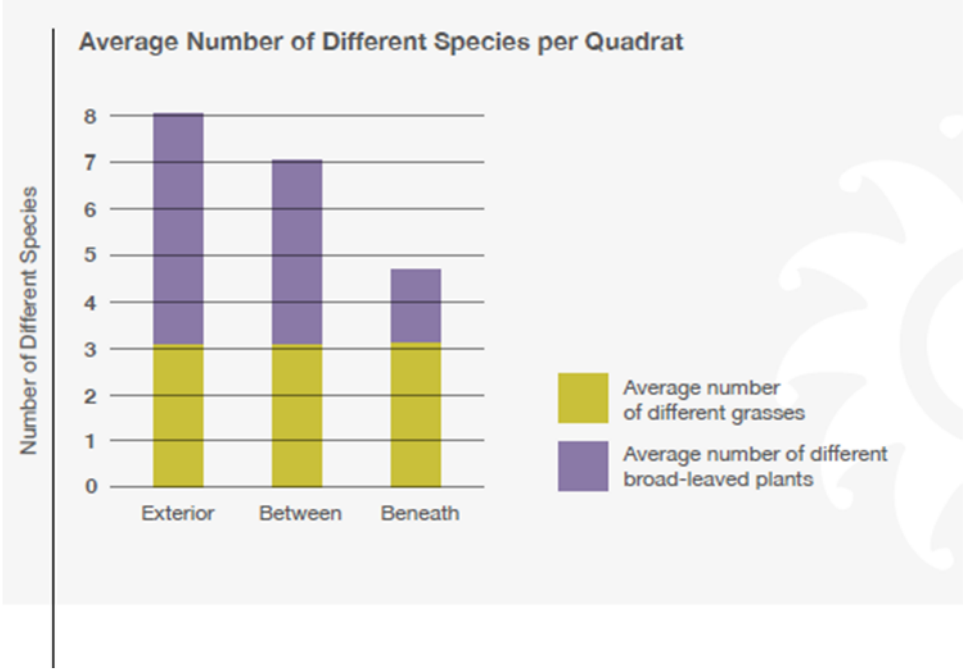
2.2.13 In any event, the 'elephant in the room' with this element of the applicant's claims is the impact of shading on both the nature and quality of retained habitats, and of new ones created from seeding and other forms of conversion from arable land. Even with traditional panel spacing and single plane of incline designs[2], shading is a significant suppressant of habitat quality. We provide further supporting evidence for this concern below.

[2] See comments at Appendix 1 about the scope for more shading designs to be employed under the terms of the flexibility sought by the applicant.

2.2.14 Grasslands, whether existing retained grasslands or new ones created from former arable land, are communities maintained by high light levels and certain forms of grazing and/or cutting management. Despite this, there is little or no allowance made in the applicant's assessments and its BNG calculations for the effect of shade cast by PV panels. Instead, it is assumed that it will be avoided by panel height and spacing. The applicant provides no empirical evidence in support of its assertion that shading impacts will be avoided and in fact the weight of available evidence points to the contrary.

2.2.15 Whilst there remains only limited research on the issue of shading effects from PV arrays, the general thrust from the studies that have been done consistently points towards, at best, significantly suppressed herb diversity beneath panels due to shade. In many cases, shade can lead to wholesale loss of grassland habitat to bare ground and ruderal 'weedy' communities beneath panels, as evidenced in the photographic examples we present below.

2.2.16 That such suppression is commonplace is reflected in a 2019 report by Clarkson and Woods (Appendix 3), reporting on monitoring of a number of solar sites in 2019. This found overall species diversity to be consistently suppressed beneath panels (see extracted graph below) and also found a higher proportion of undesirable (and shade-tolerant) species such as stinging nettle and bramble beneath panels. This report also comments on the difficulty in establishing grassland on bare ground in areas shaded by panels, noting that this is a particular issue for ex-arable sites.



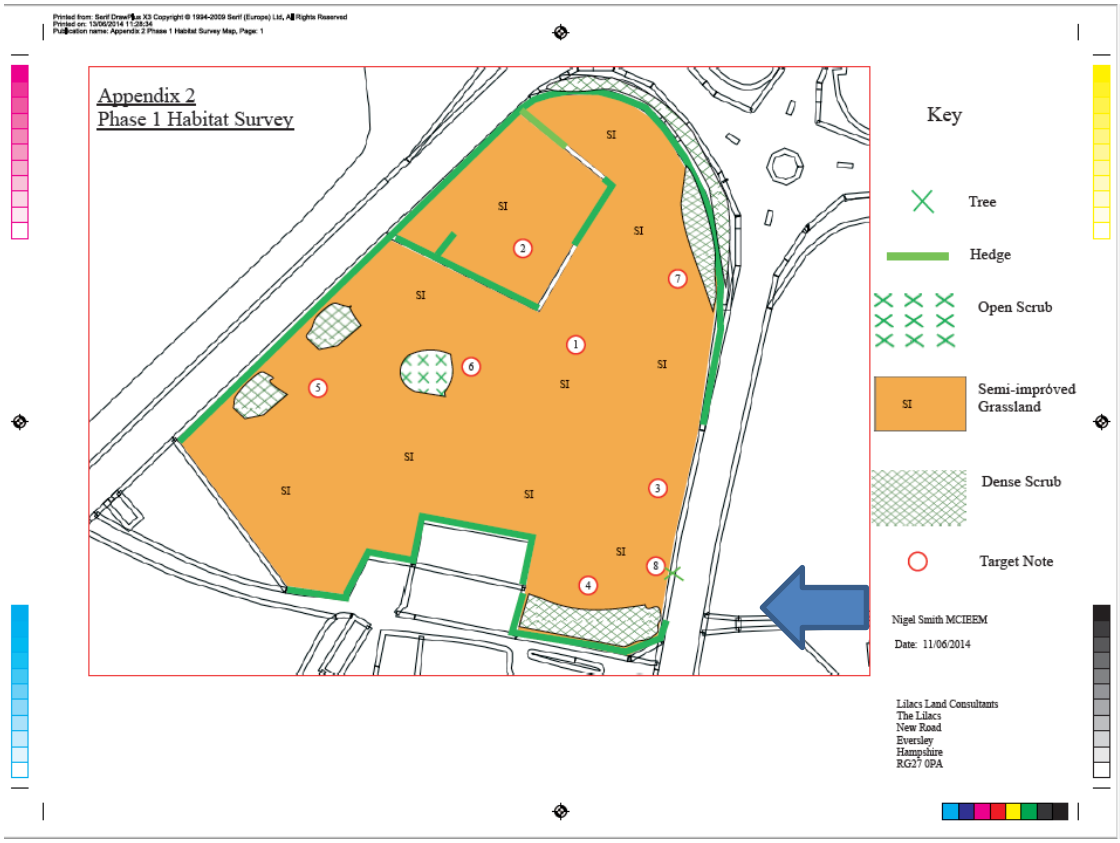
Graph taken from Clarkson & Woods (2019) showing consistently lower plant diversity beneath PV panels, particularly amongst broad-leaved species (herbs).

2.2.17 This is no more than consistent with Bioscan's empirical experience of the reality of solar farm sites. By way of just one example, the two photographs below were taken on 2nd October 2022 at a solar facility in Oxfordshire[3].

Photographs of solar site between Wallingford and Cholsey, Oxon, >5 years after construction. The land was formerly semi-improved grassland as per the Phase 1 map and Streetview image below.

[3] South Oxfordshire District Council refs: P14/S2846/FUL, P14/S3003/SCR and P15/S1117/DIS.

2.2.18 As can be seen from the extract from the submitted Phase 1 Habitat Survey report[4] for this solar project below and the Google Streetview screengrab from May 2011 overleaf), the previous land-use at this site was semi-improved grassland, not dissimilar to the type that the applicant claims will be created over much of the application site.



Phase 1 habitat map from Lilacs Land Consultants (2014) Phase 1 Habitat Surveys For the installation of Solar Panels at Chosley. The position and general direction of view of the two photos above is marked with an arrow.

[4] Lilacs Land Consultants (2014) *Phase 1 Habitat Surveys For the installation of Solar Panels at Chosley* (on South Oxfordshire District Council planning portal under reference P14/S2846/FUL)

Google Streetview image of the above site prior to PV installation, dated May 2011.

2.2.19 The ecological mitigation and enhancement proposals for this Oxfordshire project included a commitment to "*enhance the long-term value of the site for badgers, reptiles, breeding birds and other wildlife, <u>including via long-term maintenance of meadow grassland below the solar panels</u> and provision of a rough grassland/ scrub mosaic in the wayleave areas and buffer strips providing valuable habitat for reptiles and other species* (emphasis added)"[5]

2.2.20 This solar facility has now been completed for >5 years, so grassland recovery post-construction and some evidence of the claimed enhancements would be expected to be in evidence. However, and as the above photos taken in October 2022 show, the reality is rather different. The photos above show plant communities beneath the PV panels (and indeed in areas disturbed by construction) that are not 'meadow grassland', but closer to ruderal vegetation on disturbed soils.

2.2.21 This is the likely reality in respect of the outcome of the application scheme. Even if other concerns were to be overcome – for example if the proposed solar arrays were (contrary to expectations) to impose no hindrance on appropriate grazing and cutting management - outcomes more or less consistent with the graph and photos above would still be expected. The Examining Authority is asked to note that this has very significant implications for the veracity of the applicant's BNG calculations (as discussed below) and related matters of policy compliance.

[5] Hankinson Duckett Associates (April 2015) *Conditions 9&10 Ecological Mitigation Strategy* (on South Oxfordshire District Council planning portal under reference P15/S1117/DIS)

v) The cumulative impact of all of the above on the robustness of the calculations of biodiversity loss/gain and the extent to which they can be relied upon in decision making

2.2.22 As set out in our report of August 2022, the effect of correcting the applicant's Biodiversity Net Gain calculations to address the various omissions and errors the applicant has made in its habitat classifications and condition assessments, and tempering the exaggerated uplift to future habitat quality and condition to take due consideration of shading effects, effectively nullifies the +83.51% net gain in habitat units that is claimed.

2.2.23 Without certainty that all input errors have been addressed, we contend that the Examining Authority is not in a position to accept that any positive net gain figure is in fact achievable and, furthermore, is not in a sufficient position of comfort that ***net loss*** of biodiversity will not in fact be the consequence of the scheme. This is without taking account of the effects on protected and otherwise notable species – matters which the biodiversity metric system leaves out of account.

2.2.24 We say that the thrust of empirical evidence on the types and quality of habitat actually capable of being delivered under solar arrays fully supports our view that the applicant's biodiversity net gain calculations, and the claims of enhancement and net gain arising from them, cannot be relied upon. The cultivated land that would be lost is, due to the particular soil and geographic factors applying to the application site, well above the default low value assumed by the metric for arable land as a habitat and furthermore supports rare and specialist fauna and flora. It is striking that this point is accepted by the applicant in its subjective assessments, (for example in the identification of certain arable fields as of 'county importance') but then wholly disregarded in its application of the BNG metric. In place of these locally distinctive habitats, the applicant proposes to deliver what the thrust of empirical evidence indicates will in reality be poor quality grasslands, suppressed by shade and the relics of the construction-phase, such as soil compaction and disturbance. Yet it claims these as enhancements. There can be no confidence that the outcome of the land-use changes occasioned by the project will not be an overall result of degraded habitat quality over vast areas, and an attendant displacement of characteristic species such as skylark, stone curlew and rare arable plants. We contend that these impacts have in large measure been disregarded by the applicant and consequently their BNG calculations are incomplete and flawed, and their mitigation and compensation proposals are inadequate in magnitude. As there is no evidence that net loss of biodiversity would be avoided, we contend that the proposals clearly contravene national and local policy.

3 SUMMARY AND CONCLUSIONS

3.1 In order to assist the examination, we have sought to narrow the issues of dispute on ecology by giving the applicant advance sight of our report at Appendix 1 of this written representation and inviting comment and response on the issues it raises.

3.2 Having received from the applicant the reply at Appendix 2, our position has not changed. We maintain that the applicant's submissions on ecology, as encompassed within ES Chapter 8 and the suite of supporting documents, a) fail to present a sufficiently accurate representation of the baseline ecological interest present within the proposed order limits, and b) are not therefore sufficiently reliable for robust decision-making.

3.3 We attempted to demonstrate in our report of August 2022 that correction of the errors we have identified calls into question the overall compliance of the scheme with national policy to avoid net biodiversity loss. The applicant has not provided a substantive response on this point. The ExA is advised that without remedy of such deficiencies, extreme caution should be applied in using the information in the Environmental Statement to inform decision making on biodiversity matters.

3.4 Similarly, the mitigation and compensation proposals offered in the applicant's submission material, being founded on an incomplete understanding and/or representation of the baseline position and an, at best, highly optimistic view of the delivery challenges they will face, cannot in their present form be relied upon by decision makers as a safeguard to avoid the project ultimately giving rise to significant net loss of biodiversity.

3.5 The applicant advised, in its response of 16th September 2022, that further survey work was in hand, implying that it would pick up the identified errors and omissions in the baseline information, and that the results would be reported to the examination at Deadline 1. We are not aware of any submission to this effect being made at Deadline 1.

3.6 The overall conclusion to be reached at this stage of the examination is therefore that it is still not possible to determine whether net harm to biodiversity would be avoided by the proposed scheme and that the Examining Authority are therefore not in possession of sufficient information to determine whether relevant policies and the duties of the NERC Act 2006 placed on the Secretary of State could be met if the scheme were to be approved.

APPENDIX 1

PROPOSED SUNNICA ENERGY FARM

REVIEW OF SUBMITTED ECOLOGICAL INFORMATION

AUGUST 2022

E2132R1

COMMISSIONED BY

Say No to Sunnica

PROPOSED SUNNICA ENERGY FARM

Review of submitted ecological information

August 2022

Bioscan Report No.
E2132R1

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CONTENTS

Appendices

1 INTRODUCTION AND SCOPE OF THIS REPORT

1.1 Background

1.1.1 Bioscan (UK) Ltd was appointed by the campaign group 'Say No to Sunnica' to review the robustness of the ecological information submitted to the Planning Inspectorate (Infrastructure Planning Commission) in support of Sunnica Ltd's application for a Development Consent Order (DCO). Consent is being sought for a large-scale solar installation covering land straddling the Cambridgeshire and Suffolk borders north of Newmarket.

1.1.2 The project would involve the construction of ground-mounted solar photovoltaic (PV) panel arrays and one or more battery storage systems involving in excess of a thousand hectares of what is currently rural (and predominantly arable) farmland. The applicants do not seek consent for a prescriptive scheme but for a flexible DCO which would allow best available technologies to be exploited during construction for the generation, storage, import and export of electrical capacity (in excess of 50MW and with a maximum capacity of 500MW). The scheme also includes a proposed extension to the Burwell National Grid Substation and associated infrastructure including several kilometres of cable connections, access tracks, construction compounds and offices.

1.1.3 NPS EN-1 paragraph 5.3.7 states that: "*As a general principle, and subject to the specific policies below, development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives … where significant harm cannot be avoided, then appropriate compensation measures should be sought*".

1.1.4 On the issue of harm to biodiversity, the applicant claims that "*The embedded mitigation in the Scheme includes areas of habitat creation and enhancement throughout the Sites to provide benefit to the local wildlife. A Biodiversity Net Gain Assessment … concludes that the Scheme will lead to a biodiversity net gain of 83% habitat units, 16% hedgerow units and 1% river units*." [APP-256 6.4 Environmental Statement - Non-Technical Summary para 7.4.14].

1.1.5 A particular focus of Bioscan's review was to assess the accuracy of this quantitative measure of the balance of loss versus gain in biodiversity terms. However, we have also considered the applicant's claims that significant residual negative impacts on a range of locally characteristic and important biodiversity assets will be avoided.

1.2 Methodology

1.2.1 Our review initially focused on independent checks of the accuracy of the baseline habitat survey work, as presented in Chapter 8 of the submitted Environmental Statement [APP-040] and the accompanying appendices and drawings. We then reviewed the robustness and veracity of the impact assessment statements, including the claims that the project will, overall, deliver significant net gain in biodiversity as compared with the present (baseline) situation.

1.2.2 The review of desk-based sources included cross checking the submitted environmental information against open access data such as on-line aerial photography, current and historic map data, the relevant adopted and/or emerging local plans for the area, the NBN Atlas and the on-line 'MAGIC' database managed by Natural England[1] as well as information held in Bioscan's archive (including knowledge gained from previous commissions in the locality). This process allowed it to be determined whether the submission material encompassed due and appropriate reference to all readily available and relevant data on statutory and non-statutory designations, important species and habitats, agri-environment schemes and European protected species licences, as consistent with best practice.

1.2.3 We undertook a field visit for ground truthing and spot-checking purposes on 13th July 2022. It is understood that access has previously been denied to SNTS and therefore access permissions for land within the scheme were not sought: the land areas within the project were instead examined as far as able from highways land and public rights of way. The field visit was by no means comprehensive: its focus was to assess, by means of targeted spot-checks, the general accuracy of the habitat descriptions and classifications presented in the ES, including in particular the habitat mapping at Figure 8-3 of the ES [APP-187] and the accompanying descriptions and evaluations as set out at appendices 8B and 8C of the ES [APP-078 and APP-079 respectively].

1.2.4 As a consequence of being restricted to PRoWs and public land, comparatively few field units within the project site were directly visited, although a larger number were viewed from afar (assisted where relevant with binoculars). The information from Bioscan's walkover that is presented in this report cannot therefore be regarded as a comprehensive review and it is not suitable for appropriation by the applicant or others as a means to address the identified shortfalls in the submission material. Rather, the fact that errors and omissions have been identified within the applicant's submission material should be noted by the Examining Authority in considering whether to request additional information from the applicant during the course of the examination. To assist in the Examining Authority's deliberations on this, we pass comment on the significance of such errors and omissions for decision making within this report and are ready to supply further supporting evidence to the examination.

1.2.5 Initial review indicated that there were some omissions on the matter of the presence or absence of 'Priority' species and habitats within the application site. This included omissions as to the extent of arable land recognised as of elevated value and on the accuracy of classifications applied to other habitats such as grasslands. 'Priority' species and habitats are of particular relevance to the determination process in that they are capable of being a material consideration in planning determination. This follows the statutory duty incumbent on public authorities (including Local Planning Authorities and government departments) by section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 – that duty being to have regard to the purpose of conserving biodiversity including restoring or

[1] MAGIC (Multi-Agency Geographic Information for the Countryside) website. Sourced from: <http://magic.defra.gov.uk/MagicMap.aspx>

enhancing a population or habitat in particular of Priority Species (further to the lists drawn up under section 41), and to take such steps which the Secretary of State considers reasonably practicable to further the conservation of the living organisms and types of habitat included in those lists. Consequently, these matters were a particular focus of the field visit.

1.2.6 As far as possible within the limitations of PRoW-based access and time constraints, searches for field sign evidence of (or potential for) protected or rare species were also undertaken on the field visit, with attention also paid to the presence or likely presence of any 'Species of Principal Importance in England' ('Priority species') under the Section 41 list of the Natural Environment and Rural Communities (NERC) Act 2006[2,3] or species of otherwise elevated conservation status. Locations identified for compensatory habitat creation were also examined for factors such as soil type and condition in order to inform an independent review of the practical achievability of the applicant's proposals for these areas.

1.3 Structure of this report

1.3.1 The remaining sections of this report particularise and then discuss the implications of the omissions and errors that Bioscan have noted within the applicant's submission material.

1.3.2 The remainder of the report is structured as follows;

Section 2 identifies the errors and omissions found in each of the desk survey, baseline habitat surveys (and habitat mapping and classification) and baseline fauna surveys;

Section 3 examines and discusses the veracity of the case made by the applicant that a) improvements to habitat will be delivered as part of the development and that b) compensatory provision for impacted species such as stone curlew and a number of scarce arable plants will be effective;

Section 4 concludes by summarising the cumulative effect of the errors and omissions on the veracity of the impact statements, and by extension the reliability of the submission material for decision making.

[2] Natural Environment and Rural Communities Act, 2006. Chapter 16. HMSO, London.

[3] Section 41 list accessed from: http://webarchive.nationalarchives.gov.uk/20140711133551/http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx

2 BASELINE POSITION - OMISSIONS AND ERRORS AND THEIR SIGNIFICANCE

2.1 Preamble

2.1.1 It is incumbent on any developer carefully and thoroughly to ascertain the base level of species and habitats of flora and fauna (living organisms and types of habitats in the words of the NERC Act 2006) on and around a prospective development site in order that the impact of the proposed development can be properly determined at a formative stage. This is so that the design process can be reactive in seeking to avoid harm to biodiversity in the first instance and (in situations where harm is deemed to be unavoidable) decisions can be made on what type, location and magnitude of mitigation and compensation can be incorporated into the design of the scheme from the outset and whether it is likely to be sufficiently effective to render such unavoidable effects acceptable. This requires that appropriate effort be expended by development proponents to firstly collate pre-existing data on affected resources and secondly to carry out suitably thorough field surveys to obtain as full an understanding as possible of the biodiversity resources likely to be affected.

2.2 Omissions in the collation of pre-existing data

2.2.1 While most of the expected repositories for pre-existing data on the site and its environs appear to have been approached in the course of producing Chapter 8 of the ES, we have noted important omissions from the desk survey process., as follows:

Priority habitats

2.2.2 Although MAGIC was evidently consulted, the fact that a significant number of fields in Sunnica East Site B are (or have recently been) in environmental stewardship schemes does not appear to be referenced in any of the Sunnica ecological submission material, despite being clear on MAGIC. The location of these fields, in a compass south-west to south-east of Worlington, is indicated at Figure 1 below. Further information on these land management agreements will have been readily available to the applicant's ecological consultants via the landowners that have agreed to be part of the project. This information is relevant and important as it provides empirical data on the recent land-use history of these areas, and how their current condition informs assessments of what is achievable in the locality on land with a recent history of intensive agriculture. It is unclear why this valuable avenue of desk survey was not pursued by the applicant's ecologists, given its importance in understanding the baseline value of the land in its present form and its potential future value. In the context that much weight is placed on claims that habitat improvements on such farmland will arise as a consequence of the project, we regard this as a significant omission from the desk-study phase.

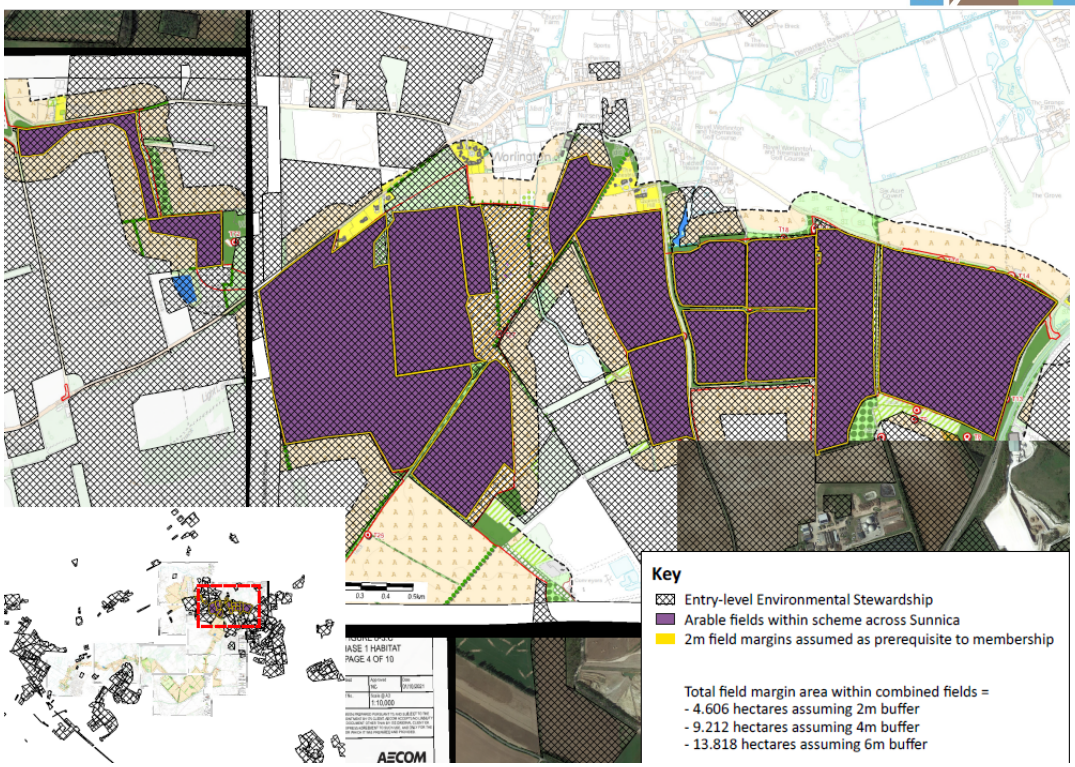

Figure 1: Fields around Worlington in agri-environment schemes

2.2.3 This omission also undermines the accuracy of the baseline information in any event, in particular the habitat mapping and classification. As indicated on Figure 1 above, the existence of a minimum 2m of uncultivated or cultivated but unsown field margins can be assumed for these fields. In fact, several of these fields were noted on Bioscan's field visit on 13th July 2022 to have margins that are broader than this, and apparently managed in accordance with one or more higher level options under the relevant agreements.

2.2.4 Arable field margins of this type are a 'Habitat of Principal Importance', further to NERC Act Section 41, otherwise known as 'Priority' habitats. Consequently, they should have been identified and mapped separately, and their 'Priority' status acknowledged. This has not been done and consequently this higher distinctiveness habitat has been omitted from the assessment of baseline conditions and impacts, and (furthermore) from the applicant's BNG calculations.

2.2.5 This omission is particularly glaring given the acknowledged presence in the immediate local area (including within the project site) of scarce and rare arable plants and plant assemblages. Irregularly cultivated or annually cultivated (but unsown) arable field margins of the type omitted are particularly likely to be important stations for such species in the locality. Indeed, it has been confirmed that stations for the scarce arable plant sand catchfly have been recorded in fields south-west of Worlington that are dismissed as low-grade arable land by the applicant in its ES.

2.2.6 The precise and total area of such habitats omitted from the ecological baseline and impact assessment cannot be independently quantified as MAGIC no longer provides access to detail on the relevant agreements and the current open-access aerial

photography is not sufficiently up to date. As indicated on Figure 1 however, we believe it is likely to be between circa 4.606 and 13.818 hectares.

2.2.7 This is not an insignificant land area. It will, amongst other things, materially raise the baseline habitat score in the applicant's BNG calculations and correspondingly reduce the claimed net gain output. This is discussed and tested further in section 2.2 below.

2.2.8 Whilst we consider this oversight to be a significant deficiency of the desk survey work, it was then subsequently compounded during the field-based Phase 1 habitat mapping, as discussed in section 2.2 below. One would normally have expected Phase 1 field survey to have 'captured' the existence of these field margins, even if missed at desk survey stage. The fact that it did not do so is a further point of deficiency that does not indicate a high calibre Phase 1 survey. We suspect that the failure to detect these habitats is possibly because a significant proportion of the Phase 1 surveys appear to have taken place at a suboptimal time of year.

Protected species

2.2.9 The desk-based search for great crested newt records is discussed at Table 8-7 of the ES (page 8-65). It is not expressly stated whether this included a search of the licence-return data exhibited on MAGIC, but Bioscan note that there is a licence return record from the southern part of Chippenham Fen, indicating the presence of great crested newt at that site in 2014 (see screen grab at Figure 2 below – the pale red dot shows the location of the record).

Figure 2: Omitted great crested newt licence return record

2.2.10 As the ES states at Table 8-7 that *"no GCN have been recorded within Chippenham Fen (NE site manager per comms.)"* [sic], it is unclear whether it is the record that is erroneous, or the recollection of the NE site manager. In any event, the record was plain on MAGIC and yet it was omitted from consideration.

2.2.11 In view of the fact that the location of this record is from a contiguous wetland complex that extends to within 250m of proposed construction areas, we suggest

there may at the very least need to be revision to the applicant's assessments of risk of impact to this species in this part of the project area (Sunnica West Site B).

2.3 Omissions in field surveys of habitats and flora

2.3.1 Having discussed certain omissions from the desk survey process, we now consider the Phase 1 and Phase 2 habitat and botanical surveys conducted by the applicant, and their results.

2.3.2 The applicant acknowledges the presence of both arable plant and grassland assemblages of elevated importance within the project sites, and the ES identifies a number of particular field units as of interest - specifically within ES Appendix 8C – Terrestrial Habitats and Flora [APP-079] (and as mapped on Figures 2.1-2.9 of that document). However, we note that the approach taken by the applicant to field surveys to document the baseline resource of these locally distinctive, important and pre-existing biodiversity assets, carries with it an inherently high scope for omission.

2.3.3 In the first instance, this is because decisions as to which areas to subject to further Phase 2 surveys (those set out at APP-079) appear to have been based almost exclusively on the results of the desk and Phase 1 surveys which, as we have stated, are insufficiently thorough. The applicant's claims that "*The margins of all arable fields within the Order limits were searched for species of scarce arable flora*" [APP-079 para 4.2.2] does not conform with the evidence from the Phase 1 survey reporting and target notes that suggests the Phase 1 was rather more cursory and/or conducted at the wrong time of year. In fact the applicant appears to have failed to notice the existence of field margin strips in stewardship land south-west and south-east of Worlington, not just during its desk surveys, but also during its field surveys.

2.3.4 As a further illustration of failures within the Phase 1 survey, Bioscan was able, even within the scope of the time-restricted and access-limited field surveys undertaken on 13th July 2022, to note and document the following errors and omissions in the Phase 1 habitat classification and mapping. The list is presented at Table 1 below, with the locations in question indicated by large magenta numbers on the reproductions of Figures 8.3A-I at Appendix 1 of this report:

Table 1: Errors in Phase 1 classification/mapping readily detected via survey from public rights of way on 13th July 2022

Location (see Appendix 1)	Position as stated/conveyed in ES	Position found by Bioscan in July 2022
1	Mapped as 'species-poor semi-improved grassland'. (target noted T16 but no survey sheet	Found to be equivalent to nearby areas mapped as semi-improved acid grassland, with characteristic species including common bent *Agrostis capillaris*, sheep's

Location (see Appendix 1)	Position as stated/conveyed in ES	Position found by Bioscan in July 2022
	is provided for this target note in ES Appendix 8C – Terrestrial Habitats and Flora [APP-079]).	fescue *Festuca ovina*, viper's bugloss *Echium vulgare*, lady's bedstraw *Galium verum* and silvery hair grass *Aira caryophyllea*.
2 (multiple)	Verges of minor roads ubiquitously shown on the applicant's Phase 1 maps as either 'improved' or 'species—poor semi-improved' grassland.	In these locations, the plant community present more often than not includes species indicative of higher quality neutral-calcareous grassland, such as lady's bedstraw, wild parsnip *Pastinaca sativa*, knapweed *Centaurea nigra*, greater knapweed *Centaurea scabiosa* and in one location the uncommon knapweed broomrape *Orobanche elatior*. A large proportion of these grasslands will qualify as higher distinctiveness habitat than assumed by the applicant. The extent of loss of such habitats to the default 'open trench' cable installation (and associated haul roads and working areas within the 30m wayleave) is not clear from the ES and appears to have been inadequately assessed.
3	Mapped as arable on Figure 8-3.B of ES.	An example of a field with a broad uncultivated margin, here transitional to semi-improved grassland in places. This field is in environmental stewardship so the presence of field margins should have been expected and picked up by the applicant in their desk survey – see section 2.1 of this report.
4	Mapped as species-poor semi-improved grassland on Figure 8-3.B.	Locally species-rich acid and neutral-calcareous grassland along Badlingham Lane CWS, including characteristic breckland species such as *Phleum phleoides*. It is not species poor semi-improved grassland.
5	Mapped as arable on Figure 8-3.B.	Actually semi-improved acid grassland

Location (see Appendix 1)	Position as stated/conveyed in ES	Position found by Bioscan in July 2022
6	Mapped as arable on Figure 8-3.E	Actually species-poor semi-improved grassland (though outside proposed order limits).
7	Mapped as arable	Actually an area of permanent marshy grassland/cattle grazed pasture (an extension to the area mapped as semi-improved grassland to the west and north). This area is proposed for solar arrays apparently on the assumption that it is arable.
8	Mapped as arable	Actually an area of semi-improved grassland and scrub (though outside proposed order limits)
9	Mapped as species-poor semi-improved grassland	More correctly defined as semi-improved grassland or other neutral grassland, with a suite of indicators at low density including pyramidal orchid *Anacamptis pyramidalis*, and, locally, *Juncus subnodulosus.*
10	Mapped as arable (but not taken forward for Phase 2 surveys)	Arable on lime-rich clay soils with an arable plant assemblage score of 11 (after Table 3-2 of APP-079 ES Appendix 8C Terrestrial Habitats and Flora Report) qualifying it as of 'District' importance (species noted as present: *Bromus secalinus, Sherardia arvensis, Lamium amplexicaule, Vicia tetrasperma* – also non-qualifying calcicole species *Ononis spinosa* and *Erigeron acer* in field margins)

2.3.5 Some of these errors are so basic (e.g. error 8, mapping semi-improved permanent grassland as arable) as to indicate that the Phase 1 effort was cursory and incomplete, at least in parts of the project area. A proportion of the other errors may be due to factors such as timing or surveyor experience. We note the Phase 1 survey is described as being 'commenced in November 2018' (ES Table 8-1 page 8-8) and this suboptimal timing for vegetation surveys (particularly of arable plants) may be one reason for poor standards in at least parts of the project area.

2.3.6 The outcome is in any event that a more restricted shortlist of areas for further Phase 2 study were taken forward than we believe was merited by the actual (and indeed to be expected) baseline conditions. In particular, and as example 10 in Table 1 shows, locations capable of supporting arable or grassland flora of relevance and importance to the assessment (or indeed known to support scarce species) were not picked up, were not then subject to further work as part of the Phase 2 effort and were consequently dismissed as low value.

2.3.7 The Phase 2 surveys undertaken within the project area were of a much better standard, but they were very restricted in scope and omitted large parts of the project sites, as is plain from Figures 2.1-2.9 of APP-079. The omitted areas include cultivated fields such as example 10 in Table 1 above where Bioscan readily found notable arable plants in July 2022 and a number of road verges where species-diversity was noted by Bioscan to be significantly elevated above that indicated in the ES, as per example 2 in Table 1 above.

2.3.8 Consequently, we believe that despite the elevated value of the locality for arable plants being well known, and indeed acknowledged by the applicant, the true status of the baseline resource is significantly under-represented in the ES. In particular we believe it highly likely that there are additional fields within the scheme, beyond those recognised in the ES and the additions we have highlighted, that will be of equivalent value to those identified in the ES as of District importance. It is possible that some have been omitted that are equivalent to those identified by the applicant as of County level (or even higher) importance.

2.3.9 In conclusion, errors were embedded in the habitat survey and assessment process from an early stage and as a consequence we do not have confidence that the baseline resource, particularly in terms of scarce arable plant assemblages has been adequately documented in the ES. Moreover, these errors have been carried through to, and consequently infect, the assessment of impacts and of biodiversity loss/gain.

2.4 Limitations of the Biodiversity Metric 3.0/3.1 in dealing with important arable plant assemblages

2.4.1 The implications of the errors and omissions discussed above for the robustness of the ES and for the decision-making process are significant on their own terms, and for the accuracy of subjective value judgments that seek to dismiss the ecological importance of the arable land within the application site. However, we believe that in this case they have been magnified through the prism of the Biodiversity Metric system, which has been used uncritically by the applicant to generate what we believe is a numerical biodiversity gain figure that is highly misleading.

2.4.2 The reason the applicant's decision to apply Metric 3.0 (or indeed 3.1) without qualification has the effect of masking the true value and importance of the arable plant resources within the proposed order limits, is because both metric systems classify all arable land as of 'low distinctiveness' and apply a default 'poor condition' score to it.

2.4.3 Given that the applicant accepts that there are field units with arable plant assemblages of higher (District and County) importance than others within the project area, by reference to the established scoring systems developed by Plantlife, we would expect them to agree with ourselves and many other practicing ecologists that the homogenisation of value scores for all arable land in Metric 3.0/3.1 is a flawed approach that flies in the face of common ecological sense. Yet we have not seen any qualifying comment given to this issue by the applicant in the ES or elsewhere.

2.4.4 We consider that it is incontrovertible that higher value arable fields merit a higher scoring in metric calculations than the default applied in metric 3.0/3.1. Yet the applicant has chosen to apply and rely upon the default in all cases. In other words, while the applicant accepts that the baseline value of the arable land across the project sites is not uniformly poor, that is nevertheless how it has chosen to treat the arable land component in its biodiversity net gain assessment.

2.4.5 We would invite both the Examining Authority and the applicant to recognise that this is a deficiency of the applicant's assessment (and indeed of Metric 3.0 and 3.1) and something that demands a more nuanced consideration.

2.4.6 If the inevitable logic of this is duly accepted, it follows that the applicant's claimed BNG output figure of 83.51% for habitat units is substantially inflated above the true picture. We repeat that it is disappointing that we observe no evidence of this limitation with the metric system being discussed or accepted by the applicant or their ecological consultants in the form of qualifying or calibrating comments. Instead, the 83.51% figure is used without qualification, particularly (and without context) in the most public-facing elements of the ES, such as the non-technical summary.

2.4.7 This is a matter of direct relevance to decision making. Amongst other things it requires that lesser weight be placed on the claims of BNG than the applicant seeks to invite. The question that follows on is 'how much lesser weight'?.

2.4.8 Despite the limitations of our brief, and the constraints of limited access, we attempt below and in section 3 to assist the examination in understanding the general magnitude of correction that would need to be applied to the applicant's net gain figures (and the claims based upon them) before they could be safely used to inform decision-making on overall biodiversity impacts.

2.5 Necessary adjustments/corrections to the applicant's Metric 3.0 inputs and their effect on baseline habitat scores

2.5.1 The Examining Authority will be aware of our attempts since 9th May 2022 to obtain from the applicant the full workings behind their claimed net gain figures. On 13th July, (and coincidentally whilst we were on-site), the applicant did finally release its full Metric 3.0 calculations. We attach a full read-out of these calculations, as received, at Appendix 2.

2.5.2 Attention is drawn to the extent of the total application site area (78%) that is classified and scored uniformly as 'cereal crops' of the lowest possible distinctiveness and condition multiplier (Tab A-1 'Site Habitat Baseline' Ref/row 18). Reading across, it can be seen that the baseline figure this generates ('total habitat units' column) is 1744.22. In other words, the applicant's metric inputs are based on an assumption that 78% of the application site is arable land of the lowest quality and condition.

2.5.3 That this is not the position on the ground is actually revealed by the applicant's own submissions and evidence which acknowledge that there is actually significant variation in the value of the arable land resource across the project area.

2.5.4 To ensure the metric calculations better reflect this acknowledged factual position, at Appendix 3 we attach an adjusted version of the applicant's metric in which arable fields recognised of Local, District or County value by the applicant, on account of their plant assemblages, are given a higher score. This requires that the Metric 3.0 default condition score of 1 (poor condition) for arable land is overridden in each case where field units are acknowledged by the applicant in APP-079 to be of higher value. **We emphasise here that these adjustments merely reflect the applicant's evaluations as to of the presence of arable land of elevated habitat value.**

2.5.5 The approach we took to making these adjustments was as follows: for fields with arable plant assemblages assessed by the applicant to be of 'County' importance, we have applied a condition multiplier of 3 (equivalent to 'good' condition arable land) to the calculations (see Row/Ref 27 in tab A-1 in Appendix 3). For those assessed to be of 'District' importance, the multiplier used is 2.5 (equivalent to 'fairly good' condition) (Row/Ref 26 in tab A-1 in Appendix 3). For those assessed to be of 'Local' importance, we have applied a condition multiplier of 2 (equivalent to 'moderate' condition) (Row/Ref 25 in tab A-1 in Appendix 3). All other fields we have left as the default 'poor' condition (multiplier=1). We made no other changes to the applicant's figures.

2.5.6 As can be seen at Appendix 3, the effect of this adjustment is a significant (23%) increase in the 'Ecological Baseline' score (column Q of the table) which increases from 3242.04 units to 4214.57 units (see cell Q259 at Tab A-1 at Appendix 3). This is solely due to the increase in the baseline value of the arable land component from 1744.22 habitat units to 2716.75.

2.5.7 The applicant's own data and assessments thus provide a clear evidential basis for corrections to the BNG calculations to ensure a more representative baseline habitat score is factored in. Based on a corrected baseline habitat score of 4214.57, the applicant's net gain figure for habitat units drops by **over half** (the adjusted BNG output score drops from 83.51% to 41.16%) (See 'Headline Results' tab of Appendix 3).

2.5.8 **We re-emphasise that the applicant's own submitted data and evidence support the halving of their claimed biodiversity net gain score from 83.51% to 41.16%. The correction is solely for arable field units that the applicant itself accepts are of higher value than the background position. As the applicant acknowledges in the**

ES that the arable fields across the project sites are not of uniformly poor quality, and that some are up to county level importance, we question why it has not sought to reflect this variation in its BNG assessment, or otherwise flag this issue as a limitation of its assessment.

2.5.9 Against the backdrop of the above, we further ask the Examining Authority to note that we have confirmed other arable fields within the proposed order limits to merit District or higher value (e.g. location 10 at Table 1 above). In fact, we fully anticipate, on the basis of our own field visit, the site's geographic location on the edge of Breckland and in a generally high value area for arable plants, that a more comprehensive and thorough Phase 2 effort would have determined that a number of additional arable field units should be elevated to Local, District or County importance on account of their assemblage of uncommon, scarce or rare arable plants. Naturally, this would further elevate the baseline habitat score in the BNG calculation and further reduce the output score.

2.5.10 Over and above the misclassification of arable land, further adjustments are clearly merited to account for other habitat mapping errors and omissions, as noted in Table 1 above. We can advise that correcting for the limited sample of such errors listed in Table 1 has the effect of further elevating the baseline habitat unit score to around 4300 units, and consequently further tempering the BNG output to around +40% (Appendix 4).

2.5.11 In summary, we believe that a more comprehensive Phase 2 habitat survey effort (or a better standard of Phase 1 survey) would have documented a significantly higher baseline habitat valuation and in turn resulted in a significantly different and much lower biodiversity net gain output than is advanced by the applicant. We stress that such corrections and adjustments are only a part of the problems we have noted with the applicant's BNG assessment. In particular, the errors and omissions in habitat classification that infect the applicant's baseline, and have the effect of suppressing the actual value of the land within the proposed order limits, are further compounded by insufficient regard to the practical reality and achievability of the proposed future habitats. This matter is returned to in section 3 of this report.

2.5.12 **In summary, it is a matter of some concern that omissions and limitations in the ES baseline studies are being relied upon as a basis for claims that the project will deliver significant net biodiversity gain.**

2.6 Field surveys - fauna

2.6.1 Due to the constraints of time and access our ability to independently critique the strength of the applicant's field surveys for fauna has been very limited and we do not deal with this matter in much detail. However, we note here the following matters of relevance.

- Hobby *Falco subbuteo* was heard calling in Sunnica East Site B on 13th July 2022. It is noted that this Schedule 1 species, which appears likely on the strength of

this record to nest in field boundary pines south of Worlington, is not mentioned in APP-085 (ES Appendix 8I: Report on surveys for breeding birds), but its presence within the proposed order limits in a breeding capacity is acknowledged and assessed in ES Chapter 8. It is unclear whether our record on this date is consistent or inconsistent with the baseline conditions for this species reported in the ES and related submission material. The applicant will no doubt confirm this to the examination in due course.

- Stone curlew *Burhinus oedicnemus* was also present in Sunnica East Site B on 13th July 2022, using fields which are identified for solar arrays. Due to the (understandable) redactions in ES Appendix 6.6: Offsetting Habitat Provision for Stone Curlew Specification APP-258. it is unclear whether our record on this date is consistent or inconsistent with the baseline conditions for this species reported in the ES and related submission material. The applicant will no doubt confirm this to the examination in due course.

3 FUTURE POSITION - HABITAT CREATION AND ENHANCEMENT CLAIMS AND THEIR VERACITY

3.1 Introduction

3.1.1 In this section we give critical consideration to the claims made by the applicant that the project will deliver significant enhancements to local habitat resources. This is based principally on assumptions about uplift in habitat quality from the conversion of 'poor condition' active arable land into permanent/semi-permanent grasslands.

3.1.2 This large-scale land-use change is instrumental in the applicant's claims that the project will deliver significant net gain in biodiversity, including the output figure it has derived from use of Biodiversity Metric 3.0. In the previous section we discussed how the applicant's assumptions and metric input figures concerning the baseline value of the project area needed to be viewed critically, and substantially adjusted to account for errors and omissions in the baseline data, and we illustrated the 'reality-check' effect this had on the Metric 3.0 output figure.

3.1.3 In this section we consider whether any further corrections or 'reality-check' adjustments are appropriate in respect of the assumptions made about the future position with the wind farm development, accounting for the practical challenges facing the proposed land-use changes and whether they are deliverable in the manner suggested.

3.2 Habitat creation under solar arrays

Failure to properly account for effect of shading on habitat condition

3.2.1 A central assumption in the applicant's impact assessments is that grasslands that are sown or allowed to develop under and around the solar arrays will be of higher intrinsic quality than the arable land they replace. In fact, this 'trade up' from what is dismissed as uniformly poor condition cropland to neutral grassland accounts for 89% of the claimed biodiversity net gain figure.

3.2.2 For much of the arable land in the UK, with a history of intensive agriculture since the second World War, an assumption that conversion to permanent or semi-permanent grassland will represent a step up in habitat quality is a relatively safe premise. However, in this particular locality there are a number of factors that require more qualified and nuanced consideration be applied to this assumption than appears to have been given in the ES.

3.2.3 In the first instance there is the elevated baseline value of much of the arable land in the project area, as discussed in section 2. This is in large part a function of geography and geology/soils and, as already highlighted, is recognised by the applicant themselves by their identification of some arable fields as of 'County' or 'District' importance due to assemblages of scarce and rare arable plants[4]. Where these fields

[4] To say nothing of rare and declining farmland birds which are currently given no weighting in Metric-based calculations – thus an arable field regularly supporting breeding lapwing and stone curlew is afforded the same *de minimis* score as an arable field supporting neither species.

are impacted, there is no suggestion in the application material that the replacement grassland habitats will be of equivalent (County/District/Local) importance. Consequently, the transformation from arable to neutral grassland of moderate or fairly poor quality/condition in these field units actually represents net losses[5]. This is not reflected in the applicant's metric scores.

3.2.4 As it is far from certain that the sum total of arable field unts with elevated value has been adequately documented in the baseline surveys (as explored in section 2), it follows that the proportion of the project area where this hidden 'trading down' (to a lower value habitat) is a factor, is similarly unclear.

3.2.5 Beyond this, the 'trade-up' of arable to 'other neutral grassland' assumes that a certain quality of grassland is achievable, including under the shade of the PV units. We note that the applicant has resisted the temptation to claim that in fields with solar arrays, high quality semi-natural calcareous or acid grasslands will be able to be delivered within realistic timescales (albeit there appears some confusion between the ecology and landscape submissions on this issue). We also agree that factors such as soil type would mean the development (via seeding or otherwise) of 'other neutral grassland' of fairly poor to moderate condition in these fields over the timescales indicated is a reasonable assumption, but only *in the absence of the solar arrays*. However, and critically, this fails to take sufficient account of the effect of the solar arrays – particularly in terms of shading and, fatally in our view, it does not take a precautionary and worst-case approach consistent with the Rochdale Envelope[6] method of assessment.

3.2.6 Our view is that even with traditional single-incline panel arrangements and spacing, a realistic worst case is that 'other neutral grassland' of 'moderate' quality is unlikely to be attainable over perhaps 70-80% of the field units housing solar arrays. Whilst such habitats might develop or be created in the spaces between arrays, and on peripheral land (where not otherwise used for tracks and other infrastructure), only a lower quality habitat is likely to be achievable under the panels.

3.2.7 There has been little in the way of properly controlled empirical research on this issue, but the limited suite of studies that have been carried out are consistent in reporting a lower quality and/or diversity of grassland habitat beneath PV arrays. For example, Clarkson and Woods, reporting on monitoring of a number of solar sites in 2019[7], found overall species diversity to be suppressed beneath panels (see Figure 3 below) and also a higher proportion of undesirable species such as stinging nettle and bramble beneath panels. This report also commented on the difficulty in

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5 There are also concerns that these losses will be irreversible due to uncertainties over whether the seed bank of specialist arable and Breckland plants associated with disturbance will be able to survive the extended period of stasis associated with grassland cover during the operational life of the proposed wind farm. It is noted that the applicant proposes a number of cultivated strips to act as reservoirs for such species, but these represent a tiny fragment of the area that they currently have the potential to survive within as a metapopulation.

6 https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/

7 Clarkson & Woods (2019) Solarview: Ecological Monitoring of Solar Sites – Overview of 2019 Surveys

establishing grassland on bare ground in areas shaded by panels, noting that this was a particular issue for ex-arable sites.

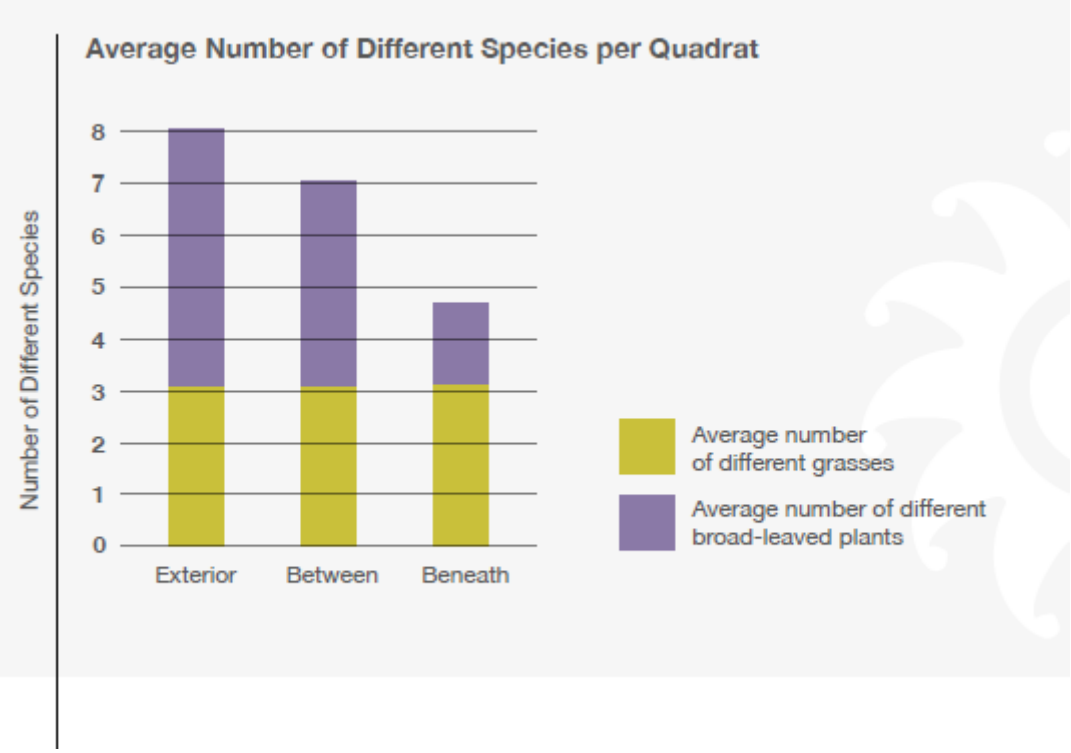

Figure 3: Graph taken from Clarkson & Woods (2019) showing consistently lower plant diversity beneath PV panels, particularly amongst broad-leaved species (herbs).

3.2.8 Even with grazing, outcomes consistent with this will be expected under the solar arrays within the project area and in that context, we consider that the claim that other neutral grassland habitats of above 'poor' condition can be created in these areas is misleading.

3.2.9 As discussed in the previous section, these more tempered and realistic outcomes are not reflected in the applicant's metric inputs and outputs. Thus, the claims of significant biodiversity net gain from future enhancement require to be considered critically.

3.2.10 We argue that the applicant's biodiversity net gain metric output figure warrants further downward adjustment to account for this. To illustrate the impact that such an adjustment has, Appendix 5 presents a further adjusted version of the applicant's figures to account for 75% of the grassland in fields that will house solar arrays achieving no better than 'other neutral grassland, poor condition'. It will be noted that with this further adjustment, the output figure falls to a net gain of +13.08%. This figure is only marginally above the 10% net gain target set out as a statutory requirement, including for NSIPs, under the Environment Act 2021 and which will become law upon the enactment of secondary legislation that is believed to be imminent.

Misuse of Rochdale Envelope approach

3.2.11 In addition to the above commentary on the implications of shading for achievable habitat condition in the context of traditional solar installations on farmland, we are also concerned that the flexibility being sought by the applicant to allow for different designs and configurations of arrays to be deployed, opens up the possibility for designs that involve larger panels and less spacing to be used. Figure 4 below is a CGI from the Cleve Hill development recently granted a DCO in Kent. Rather than traditional standard panel sizes arrayed on a single plane of incline (of the type submitted by the applicant as 'illustrative' [APP-137]), it shows substantially larger panels with fewer spaces between, casting a much denser and more expansive shade than traditional single-incline arrangements.

Figure 4: Screengrab from developer's photomontage of consented Cleve Hill solar farm showing significantly greater shading with an alternative array design[8]

3.2.12 Such designs, were they to be deployed in the Sunnica scheme through the flexibility the applicant seeks within the DCO, could prevent the development of grassland of any substantive quality beneath – in fact large areas would likely generate little more than a sparsely vegetated habitat with a restricted suite of species tolerant of both shade and residual fertility, such as bramble and nettle. These would unarguably be 'low distinctiveness' habitats of 'poor condition'.

[8] Taken from [redacted]

3.2.13 We believe this calls into question the extent to which the Rochdale Envelope approach has been rigorously applied by the applicant, at least in assessing ecological impacts. We consider that an approach consistent with the Rochdale Envelope methodology would assume that only shade-tolerant grassland or ephemeral habitats of low distinctiveness and condition would be able to develop within the indicated footprint of the solar arrays over perhaps 75-80% of the areas identified for solar arrays on the parameter plans [APP-135 and APP-136].

3.2.14 Due consideration of this worst-case would have the effect of further adjusting the BNG outputs to a more conservative figure. Indeed, even allowing for margins of error, adjustment of the BNG outputs via application of the above 75% figure would bring the BNG output to below 0% meaning that the project would deliver net loss of biodiversity. This would call into question the project's overall compliance with national and local biodiversity policy.

3.2.15 Because of the significance of this issue, we believe that **without additional compensatory habitat creation, the project should not be awarded the flexibility to use larger, more densely spaced and therefore more impacting solar PV designs** that would completely compromise the delivery of the claimed enhancements. To do so opens up the possibility that the project will deliver net biodiversity loss 'by the back door'.

3.3 Assessments of impacts on fauna

3.3.1 Although brown hare (which we noted frequently on 13th July 2022) is 'assumed' to be present within the order limits in the ES, there is no assessment of the potential impact on this priority (NERCA Act S41) species, which could be at risk of a certain (potentially significant) quantum of displacement effects from the change in habitat structure associated with the scheme. We consider this to be an omission. The same applies to hedgehog, which is also a priority species. No consideration whatsoever is given to the priority species harvest mouse. The latter two species are however likely to be at less risk of negative effects.

3.3.2 The ES states that "The EcIA has considered impacts to farmland birds, including Skylark *Alauda arvensis*, Corn Bunting *Emberiza calandra*, Yellowhammer *Emberiza citrinella* and Linnet *Linaria cannabina*." (Table 8-3 Chapter 8). However only skylark is given anything close to detailed consideration, and no quantitative impact is provided in relation to the likely number of territories that will be temporarily or permanently displaced. No equivalent impact assessment at all is provided for yellow wagtail, corn bunting and other declining species of open arable farmland known to be present, despite the clear scope for the introduction of solar arrays to lead to the displacement of these decidedly 'open country' species. We believe this is an omission, and that it is particularly glaring in the context that the need for the ES to duly and properly document potential impacts on farmland bird assemblages was flagged by PINS and others during the scoping stage. There also appears to be no assessment of the cumulative impacts on local and regional populations of these species from the multiple solar projects in Cambridgeshire and Suffolk acting in-

combination. The combined effect of these significant changes has the potential to drastically reduce the available habitat for these species.

3.3.3 It is at best unclear whether the assessments of impact on bats account fully for the magnitude of tree loss likely to be occasioned by the project. There appears a degree of incongruity between the conclusions of the tree constraints study, in terms of the number of trees identified for removal, the assumptions used as the basis for the assessment of impacts on bats in the ES Chapter 8 and Appendix 8J, and the amount of latitude sought by the applicant in respect of construction working areas, especially those around road crossings along the cable routes. Given the acknowledged presence of barbastelle in the locality, the importance of trees to this species and its habitual use of roost features considered of low suitability for other species, this introduces a degree of uncertainty that the Examining Authority might wish to be addressed by further information.

4 KEY MATTERS FOR EXAMINATION PROCESS

4.1.1 Bioscan's brief was to review the information on ecological effects submitted to the Examination by Sunnica Ltd and assess its robustness, including in terms of the methodologies followed, results obtained, and in terms of the claims presented in the ES about the type, magnitude and significance of impacts on biodiversity.

4.1.2 Notwithstanding constraints related to timescales, resourcing, obtaining information from the applicant and most particularly, very limited independent access to land within the project area, we have noted and documented a number of significant deficiencies in the ES material that we believe are relevant and important matters for the examination and the determination process.

4.1.3 We have demonstrated how, as a consequence of these deficiencies, the applicant's claims of +83.51% net biodiversity gain as a consequence of the development are, on any reading, a significant distortion and exaggeration of likely outcomes. Being now in receipt of the full set of the applicant's Metric 3.0 input figures, and having visited a sample proportion of the land within the project area, we have been able to identify a number of omissions, errors and misconceptions in the baseline habitat survey work and in the assumptions about future conditions, that undermine the applicant's figures.

4.1.4 Correcting these factors as far as we are able, we believe a net gain figure only marginally above 10% is much more representative of the likely reality, even were all the applicant's stated commitments to a) be followed through and b) achieve the target success levels claimed for them. It should be emphasised that we expect this figure could fall further were every suspected error in the ES submission not to be satisfactorily addressed[9].

4.1.5 We are further concerned about the scope for the project as currently designed to ultimately deliver net loss of biodiversity 'by the back door' due to deviation from the assessment parameters via the flexibility being sought to increase generation capacity and adopt new technologies. We do not consider that the clear scope for such new technologies to deliver a substantially worse outcome for biodiversity, has been adequately considered in the ES. The applicant claims to have taken a Rochdale Envelope approach to the assessment of impacts and effects, but we consider that the parameters they have adopted are demonstrably short of the realistic worst case, at least as far as the assessment of impacts from habitat loss/gain is concerned.

4.1.6 We also question the likely practicality and efficacy of some of the compensatory measures, including for highly sensitive and protected species such as stone curlew and for the arable plants for which the locality is demonstrably important. On stone curlew, the submission material is light on detail about the practical delivery of grazing and other management of the field units identified for compensatory stone

[9] For example, it would take only one additional medium-sized to large field unit within the proposed order limits to be confirmed as meriting county importance for its arable plant assemblage, to place the overall net gain figure short of the 10% required for all developments pursuant to the Environment Act 2021. Given the deficiencies of the Phase 1 and Phase 2 surveys, this appears far from being a remote possibility.

curlew plots/habitat and given the apparent high fertility of the soils in certain fields, we call into question whether there is sufficient certainty before the Examination that these measures will be successful. This is a matter that engages, via the Functionally Linked Land concept, with the compliance of the scheme pursuant to the Conservation of Habitats and Species Regulations 2017. Other practical challenges that get no meaningful consideration at all include availability and supply of the specified grassland seed mixtures at sufficient tonnages and timescales to cover the hundreds of hectares identified for them. We raise similar questions about the proposed use of chalk to admix with soils and deliver calcareous grassland. It is far from clear to us that the full suite of environmental impacts of extraction, import and re-working of chalk and seed materials have been fully considered as part of the project.

4.1.7 Overall, we believe the applicant's submissions on ecology, as encompassed within ES Chapter 8 and the suite of supporting documents, a) fail to present a sufficiently accurate representation of the baseline ecological interest present within the proposed order limits, and b) are not therefore sufficiently reliable for robust decision-making.

4.1.8 We have attempted to demonstrate that correction of the errors we have identified calls into question the overall compliance of the scheme with national policy and the ExA is advised that without remedy of such deficiencies, caution should be applied in using the ES to inform decision making on biodiversity matters.

4.1.9 The mitigation and compensation proposals offered in the applicant's submission material, being founded on an incomplete understanding and/or representation of the baseline position and an, at best, optimistic view of the delivery challenges they will face, cannot in their present form be relied upon by decision makers as a safeguard to avoid the project ultimately giving rise to significant net loss of biodiversity.

4.1.10 The overall conclusion to be reached is that it is not possible to ascertain whether net harm to biodiversity would be avoided by the proposed Scheme and that the duties of the NERC Act 2006 placed on the Secretary of State would thereby be met in the event of approving the Scheme.

APPENDIX 1

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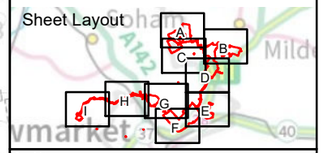
LEGEND

The Order Limits

100m scheme buffer

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

Sheet Layout



Purpose of Issue
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Client
SUNNICA LTD

Project Title
sunnica energy farm

Drawing Title
FIGURE 8-3.
PHASE 1 HABITAT
PAGE 1 OF 10

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LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Broad leaved plantation woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Scattered scrub
- Improved grassland
- Poor semi improved grassland
- Marsh/marshy grassland
- Tall ruderal
- Running water
- Arable
- Ephemeral/short perennial
- Bare ground
- Private/Garden
- Building
- Hard surface
- Intact hedge
- Defunct hedge
- Hedge and trees
- Tree
- Target note

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

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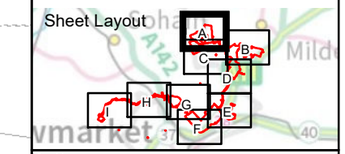

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FIGURE 8-3.A
PHASE 1 HABITAT
PAGE 2 OF 10

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LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Broad leaved plantation woodland
- Coniferous plantation woodland
- Coniferous parkland
- Mixed semi-natural woodland
- Broad-leaved felled woodland
- Dense scrub
- Unimproved acid grassland
- Semi-improved acid grassland
- Semi-improved neutral grassland
- Improved grassland
- Poor semi improved grassland
- Marsh/marshy grassland
- Tall ruderal
- Running water
- Standing water
- Quarry
- Arable
- Bare ground
- Private/Garden
- Building
- Hard surface
- Tree line
- Intact hedge
- Defunct hedge
- Hedge and trees
- Fence
- Tree
- Target note

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

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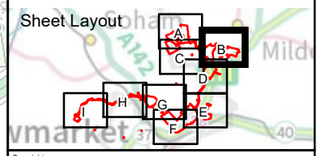

Purpose of Issue
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Client
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FIGURE 8-3.B
PHASE 1 HABITAT
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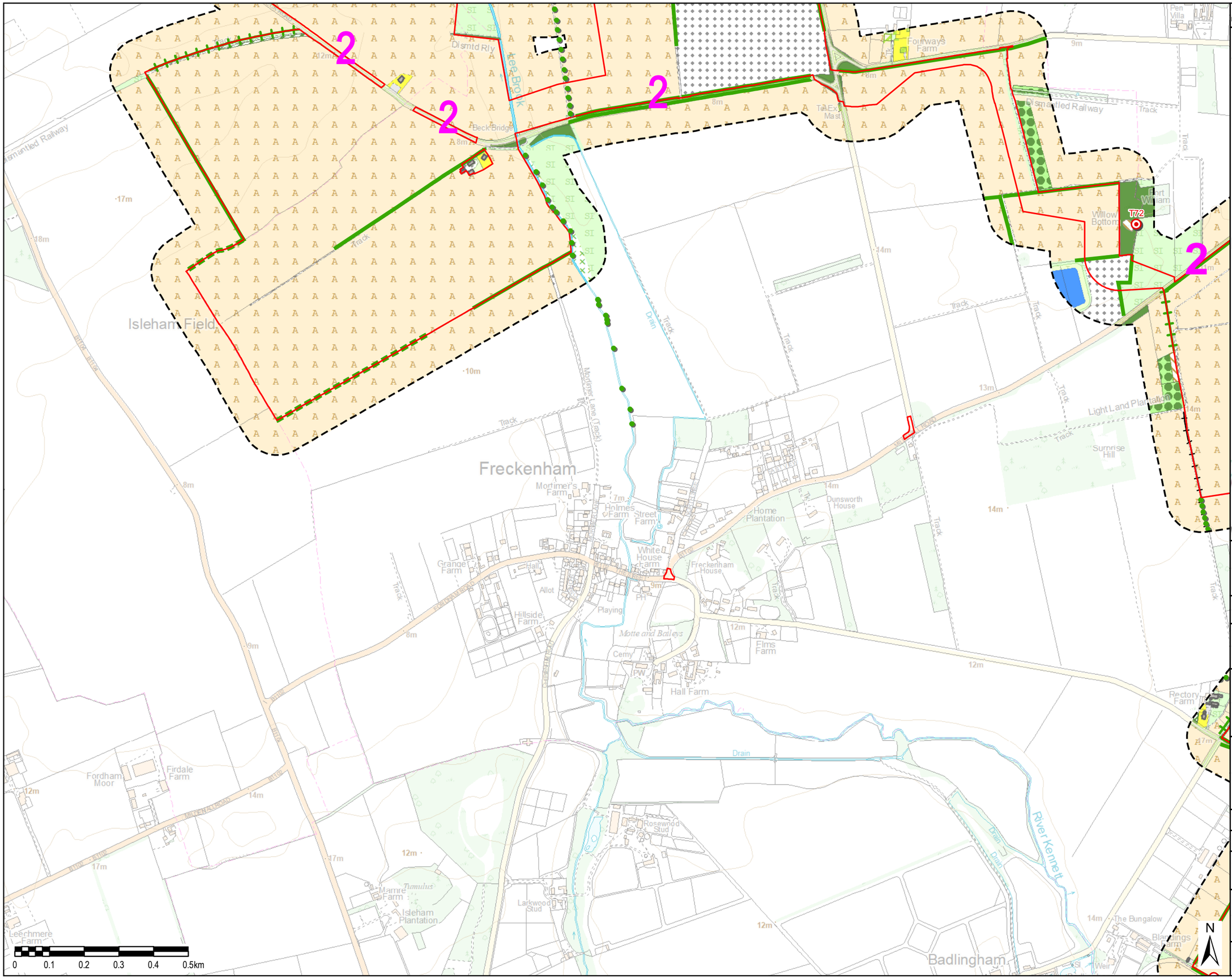

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LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Broad leaved plantation woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Dense scrub
- Scattered scrub
- Improved grassland
- Poor semi improved grassland
- Tall ruderal
- Running water
- Standing water
- Arable
- Bare ground
- Private/Garden
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- Hard surface
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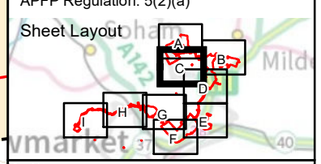

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FIGURE 8-3.C
PHASE 1 HABITAT
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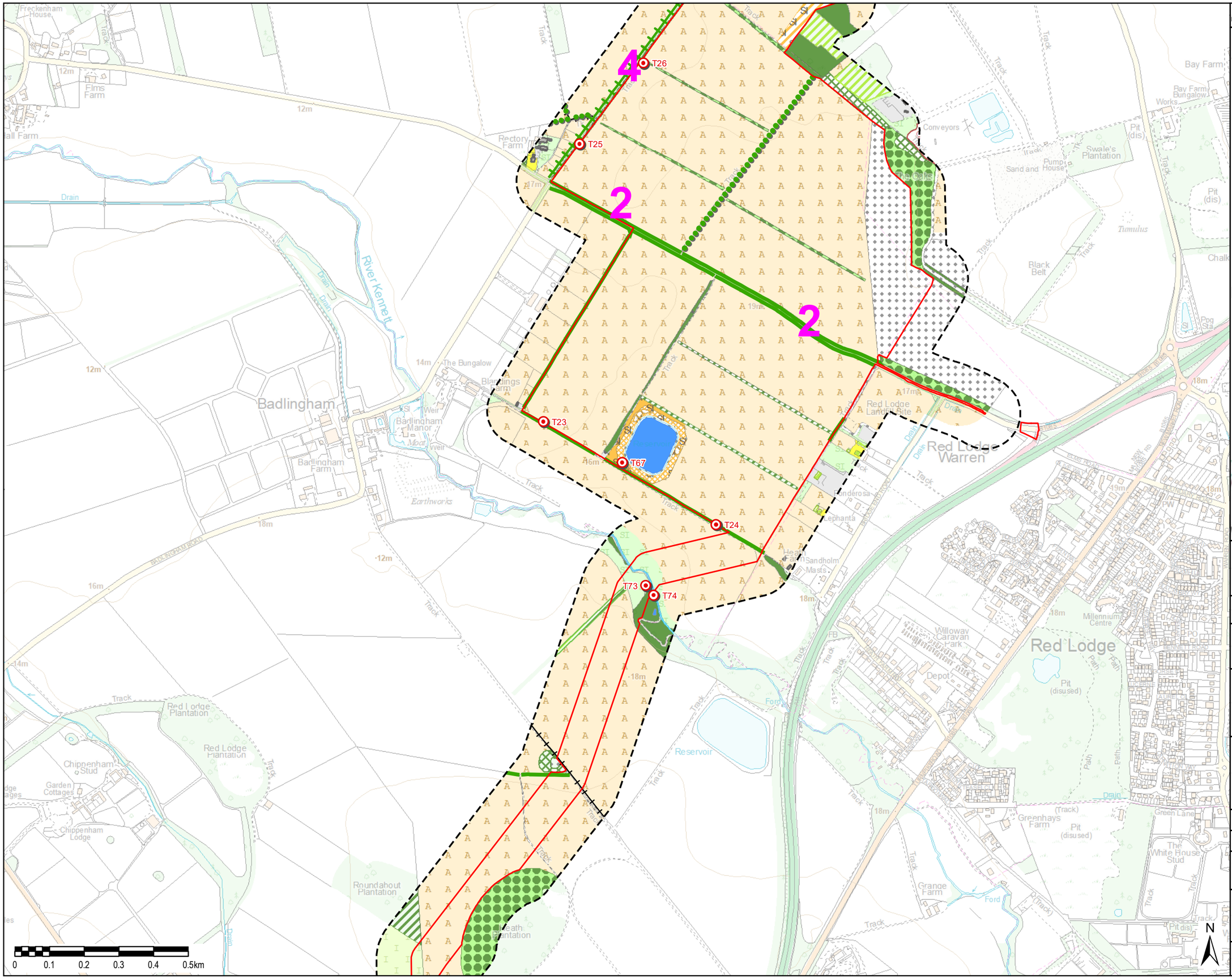

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LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Broad leaved plantation woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Mixed plantation woodland
- Dense scrub
- Semi-improved acid grassland
- Semi-improved neutral grassland
- Semi-improved calcareous grassland
- Improved grassland
- Poor semi improved grassland
- Tall ruderal
- Running water
- Standing water
- Quarry
- Arable
- Bare ground
- Private/Garden
- Building
- Hard surface
- Tree line
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- Hedge and trees
- Fence
- Target note

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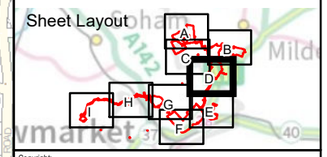

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FIGURE 8-3.D
PHASE 1 HABITAT
PAGE 5 OF 10

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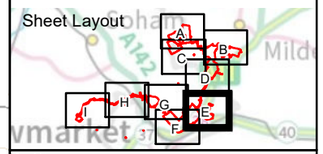
LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Broad leaved plantation woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Mixed plantation woodland
- Scattered scrub
- SI Semi-improved neutral grassland
- Improved grassland
- SI Poor semi improved grassland
- Tall ruderal
- Running water
- Standing water
- A Arable
- Ephemeral/short perennial
- Bare ground
- Building
- Hard surface
- Intact hedge
- Defunct hedge
- Hedge and trees
- Dry ditch
- Tree
- Target note

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

Sheet Layout



Purpose of Issue
FOR DCO SUBMISSION

Client
SUNNICA LTD

Project Title
sunnica energy farm

Drawing Title
FIGURE 8-3.E
PHASE 1 HABITAT
PAGE 6 OF 10

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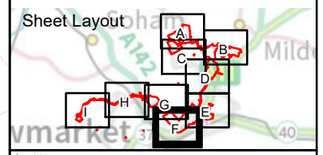
LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Dense scrub
- Scattered scrub
- Improved grassland
- Poor semi improved grassland
- Tall ruderal
- Running water
- Arable
- Bare ground
- Building
- Hard surface
- Tree line
- Intact hedge
- Defunct hedge
- Fence
- Tree
- Target note

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

Sheet Layout



Purpose of Issue
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Client
SUNNICA LTD

Project Title
sunnica energy farm

Drawing Title
FIGURE 8-3.F
PHASE 1 HABITAT
PAGE 7 OF 10

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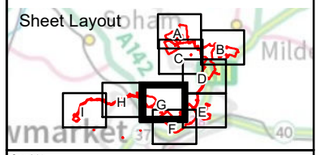
LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Broad leaved plantation woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Dense scrub
- Scattered scrub
- Improved grassland
- Semi Improved grassland
- Poor semi improved grassland
- Marsh/marshy grassland
- Running water
- Standing water
- Arable
- Bare ground
- Building
- Hard surface
- Tree line
- Intact hedge
- Hedge and trees
- Fence
- Tree
- Target note

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

Sheet Layout



Purpose of Issue
FOR DCO SUBMISSION

Client
SUNNICA LTD

Project Title
sunnica energy farm

Drawing Title
FIGURE 8-3.G
PHASE 1 HABITAT
PAGE 8 OF 10

Drawn	Checked	Approved	Date
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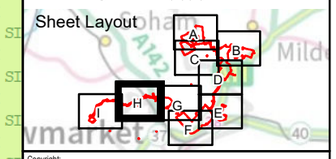
LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Broad leaved plantation woodland
- Coniferous parkland
- Mixed semi-natural woodland
- Dense scrub
- Scattered scrub
- Semi-improved acid grassland
- Improved grassland
- Semi Improved grassland
- Poor semi improved grassland
- Marsh/marshy grassland
- Running water
- Standing water
- Artificial spoil
- Arable
- Bare ground
- Private/Garden
- Building
- Hard surface
- Species rich hedge and trees
- Intact hedge
- Hedge and trees
- Ditch
- Fence
- Tree
- Target note

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

Sheet Layout



Purpose of Issue
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Client
SUNNICA LTD

Project Title
sunnica energy farm

Drawing Title
FIGURE 8-3.H
PHASE 1 HABITAT
PAGE 9 OF 10

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0 0.1 0.2 0.3 0.4 0.5km

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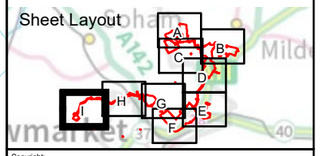
LEGEND

- The Order Limits
- 100m scheme buffer
- Broad leaved semi-natural woodland
- Broad leaved plantation woodland
- Dense scrub
- Scattered scrub
- Improved grassland
- Poor semi improved grassland
- Marsh/marshy grassland
- Tall ruderal
- Running water
- Arable
- Bare ground
- Private/Garden
- Building
- Hard surface
- Scrub scattered
- Tree line
- Species rich hedge and trees
- Intact hedge
- Defunct hedge
- Hedge and trees
- Ditch
- Dry ditch
- Tree
- Target note

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

Sheet Layout



Purpose of Issue
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Client
SUNNICA LTD

Project Title
sunnica energy farm

Drawing Title
FIGURE 8-3.I
PHASE 1 HABITAT
PAGE 10 OF 10

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0 0.1 0.2 0.3 0.4 0.5km

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APPENDIX 2

Appendix 2

Headline Results

Return to results menu

On-site baseline	*Habitat units*	3242.04
	Hedgerow units	120.69
	River units	5.77
On-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	5949.41
	Hedgerow units	141.05
	River units	5.83
On-site net % change (Including habitat retention, creation & enhancement)	*Habitat units*	83.51%
	Hedgerow units	16.87%
	River units	1.00%
Off-site baseline	*Habitat units*	0.00
	Hedgerow units	0.00
	River units	0.00
Off-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	0.00
	Hedgerow units	0.00
	River units	0.00
Total net unit change (including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	2707.37
	Hedgerow units	20.36
	River units	0.06
Total on-site net % change plus off-site surplus (including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	83.51%
	Hedgerow units	16.87%
	River units	1.00%

Appendix 2
App 2- Baseline

Condense / Show Columns | Condense / Show Rows | Main Menu | Instructions

	Habitats and areas			Distinctiveness		Condition		Strategic significance			Suggested action to address habitat losses	Ecological baseline	Retention category biodiversity value					Bespoke compensation agreed for unacceptable losses	Comments	
Ref	Broad habitat	Habitat type	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic Significance multiplier		Total habitat units	Area retained	Area enhanced	Baseline units retained	Baseline units enhanced	Area lost	Units lost		Assessor comments	Reviewer comments
1	Woodland and forest	Other woodland; broadleaved	6.33	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	55.70	6.33		55.70	0.00	0.00	0.00			
2	Woodland and forest	Other coniferous woodland	5.74	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	22.96	5.74		22.96	0.00	0.00	0.00			
3	Woodland and forest	Lowland mixed deciduous woodland	12.42	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	163.94	12.42		163.94	0.00	0.00	0.00			
4	Heathland and shrub	Mixed scrub	4.91	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	43.21	4.91		43.21	0.00	0.00	0.00			
5	Woodland and forest	Other woodland; mixed	16.85	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	148.28	16.85		148.28	0.00	0.00	0.00			
6	Grassland	Lowland dry acid grassland	12.4	V.High	8	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Bespoke compensation likely to be required	306.24	11.6		306.24	0.00	Unacceptable Loss	Alternative Compensation	Yes		
7	Grassland	Other lowland acid grassland	0.78	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	6.86	0.78		6.86	0.00	0.00	0.00			
8																					
9																					
10	Sparsely vegetated land	Coastal sand dunes	0.48	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	6.34	0.48		6.34	0.00	0.00	0.00			
11	Grassland	Lowland calcareous grassland	1.03	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	13.60	1.03		13.60	0.00	0.00	0.00			
12	Grassland	Modified grassland	87.53	Low	2	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same distinctiveness or better habitat required	385.13	13.89		61.12	0.00	73.64	324.02			
13	Grassland	Other neutral grassland	0.65	Medium	4	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	8.58	0.45		5.94	0.00	0.20	2.64		Neutral grassland -other neutral grassland / fen marsh and swamp -other swamps	
14	Grassland	Other neutral grassland	0.06	Medium	4	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	0.79	0.06		0.79	0.00	0.00	0.00			
15	Grassland	Other neutral grassland	2.49	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	21.91	1.68		14.78	0.00	0.81	7.13			
16	Grassland	Other neutral grassland	0.81	Medium	4	Poor	1	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	3.56	0.81		3.56	0.00	0.00	0.00			
17	Sparsely vegetated land	Ruderal/Ephemeral	8.07	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	32.28	0		0.00	0.00	8.07	32.28			
18	Cropland	Cereal crops	872.11	Low	2	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	1744.22	74.35		148.70	0.00	797.76	1595.52			
19	Wetland	Reedbeds	0.07	High	6	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same habitat required	0.84	0.07		0.84	0.00	0.00	0.00			
20	Lakes	Ponds (Non- Priority Habitat)	1.63	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	14.34	1.63		14.34	0.00	0.00	0.00			
21	Urban	Vacant/derelict land/ bareground	57.24	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	228.96	2.16		8.64	0.00	55.08	220.32			
22	Urban	Developed land; sealed surface	12.77	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00	12.77		0.00	0.00	0.00	0.00			
23	Cropland	Cereal crops other	3.06	Low	2	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	6.12	0		0.00	0.00	3.06	6.12			
24	Grassland	Other neutral grassland	3.2	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	28.16	3.2		28.16	0.00	0.00	0.00			
			1110.63									3242.04	171.21	0.00	1054.01	0.00	938.62	2188.02			

Appendix 2
App 2- Creation

Condense / Show Columns | Condense / Show Rows | Main Menu | Instructions

Post development/ post intervention habitats

Broad Habitat	Proposed habitat	Area (hectares)	Distinctiveness		Condition		Strategic significance			Temporal multiplier						Difficulty multipliers				Habitat units delivered	Comments	
			Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic position multiplier	Standard time to target condition/years	Habitat created in advance/years	Delay in starting habitat creation/years	Standard or adjusted time to target condition	Final time to target condition/years	Final time to target multiplier	Standard difficulty of creation	Applied difficulty multiplier	Final difficulty of creation	Difficulty multiplier applied		Assessor comments	Reviewer comments
Grassland	Other neutral grassland	441.94	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	3			Standard time to target condition applied	3	0.899	Low	Standard difficulty applied	Low	1	2382.85	5% of total removed for hardstanding	
Grassland	Other neutral grassland	236.62	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5			Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	1584.08	eco1, eco2 and eco3 retained. 5% of total removed for hardstanding	
Woodland and forest	Other woodland; broadleaved	50.3	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	15			Standard time to target condition applied	15	0.586	Low	Standard difficulty applied	Low	1	259.39		
Urban	Developed land; sealed surface	37.6	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Grassland	Floodplain Wetland Mosaic (CFGM)	26.5	High	6	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	20			Standard time to target condition applied	20	0.490	High	Standard difficulty applied	High	0.33	77.19		
Grassland	Other lowland acid grassland	30.9	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	10			Standard time to target condition applied	10	0.700	Low	Standard difficulty applied	Low	1	173.11		
Grassland	Other lowland acid grassland	81.6	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5			Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	409.71		
Urban	Developed land; sealed surface	8.22	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Urban	Developed land; sealed surface	23.26	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Grassland	Other neutral grassland	1.68	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	3			Standard time to target condition applied	3	0.899	Low	Standard difficulty applied	Low	1	9.06	Added neutral grassland to balance differences in units	
	Total area	958.62																	Total Units	4995.40		

APPENDIX 3

Appendix 3

Headline Results

Return to results menu

On-site baseline	*Habitat units*	4214.57
	Hedgerow units	120.69
	River units	5.77
On-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	5949.41
	Hedgerow units	141.05
	River units	5.83
On-site net % change (Including habitat retention, creation & enhancement)	*Habitat units*	41.16%
	Hedgerow units	16.87%
	River units	1.00%
Off-site baseline	*Habitat units*	0.00
	Hedgerow units	0.00
	River units	0.00
Off-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	0.00
	Hedgerow units	0.00
	River units	0.00
Total net unit change (including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	1734.84
	Hedgerow units	20.36
	River units	0.06
Total on-site net % change plus off-site surplus (including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	41.16%
	Hedgerow units	16.87%
	River units	1.00%
Trading rules Satisfied?		Yes

Appendix 3

A-1 Site Habitat Baseline

Condense / Show Columns | Condense / Show Rows

Main Menu | Instructions

	Habitats and areas			Distinctiveness		Condition		Strategic significance				Ecological baseline
Ref	Broad habitat	Habitat type	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic Significance multiplier	Suggested action to address habitat losses	Total habitat units
1	Woodland and forest	Other woodland; broadleaved	6.33	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	55.70
2	Woodland and forest	Other coniferous woodland	5.74	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	22.96
3	Woodland and forest	Lowland mixed deciduous woodland	12.42	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	163.94
4	Heathland and shrub	Mixed scrub	4.91	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	43.21
5	Woodland and forest	Other woodland; mixed	16.85	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	148.28
6	Grassland	Lowland dry acid grassland	12.4	V.High	8	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Bespoke compensation likely to be required	306.24
7	Grassland	Other lowland acid grassland	0.78	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	6.86
8												
9												
10	Sparsely vegetated land	Coastal sand dunes	0.48	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	6.34
11	Grassland	Lowland calcareous grassland	1.03	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	13.60
12	Grassland	Modified grassland	87.53	Low	2	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same distinctiveness or better habitat required	385.13
13	Grassland	Other neutral grassland	0.65	Medium	4	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	8.58
14	Grassland	Other neutral grassland	0.06	Medium	4	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	0.79
15	Grassland	Other neutral grassland	2.49	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	21.91
16	Grassland	Other neutral grassland	0.81	Medium	4	Poor	1	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	3.56
17	Sparsely vegetated land	Ruderal/Ephemeral	8.07	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	32.28
18	Cropland	Cereal crops	480.2385	Low	2	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	960.48
19	Wetland	Reedbeds	0.07	High	6	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same habitat required	0.84
20	Lakes	Ponds (Non- Priority Habitat)	1.63	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	14.34
21	Urban	Vacant/derelict land/ bareground	57.24	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	228.96
22	Urban	Developed land; sealed surface	12.77	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00
23	Cropland	Cereal crops other	3.06	Low	2	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	6.12
24	Grassland	Other neutral grassland	3.2	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	28.16
25	Cropland	Cereal crops	239.49	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	957.96
26	Cropland	Cereal crops	115.973	Low	2	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	579.87
27	Cropland	Cereal crops	36.4085	Low	2	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	218.45
			1110.83									4214.57

	Retention category biodiversity value						Bespoke compensation agreed for unacceptable losses	Comments	
	Area retained	Area enhanced	Baseline units retained	Baseline units enhanced	Area lost	Units lost		Assessor comments	Reviewer comments
1	6.33		55.70	0.00	0.00	0.00			
2	5.74		22.96	0.00	0.00	0.00			
3	12.42		163.94	0.00	0.00	0.00			
4	4.91		43.21	0.00	0.00	0.00			
5	16.85		148.28	0.00	0.00	0.00			
6	11.6		306.24	0.00	Unacceptable Loss	Alternative Compensation	Yes		
7	0.78		6.86	0.00	0.00	0.00			
8									
9									
10	0.48		6.34	0.00	0.00	0.00			
11	1.03		13.60	0.00	0.00	0.00			
12	13.89		61.12	0.00	73.64	324.02			
13	0.45		5.94	0.00	0.20	2.64		Neutral grassland -other neutral grassland / fen marsh and swamp -other swamps	
14	0.06		0.79	0.00	0.00	0.00			
15	1.68		14.78	0.00	0.81	7.13			
16	0.81		3.56	0.00	0.00	0.00			
17	0		0.00	0.00	8.07	32.28			
18	74.35		148.70	0.00	405.89	811.78			
19	0.07		0.84	0.00	0.00	0.00			
20	1.63		14.34	0.00	0.00	0.00			
21	2.16		8.64	0.00	55.08	220.32			
22	12.77		0.00	0.00	0.00	0.00			
23	0		0.00	0.00	3.06	6.12			
24	3.2		28.16	0.00	0.00	0.00			
25	0		0.00	0.00	239.49	957.96			
26	0		0.00	0.00	115.97	579.87			
27	0		0.00	0.00	36.41	218.45			
	171.21	0.00	1054.01	0.00	938.62	3160.56			

Appendix 3

A-2 Site Habitat Creation

Condense / Show Columns | Condense / Show Rows | Main Menu | Instructions

Post development/ post intervention habitats

Broad Habitat	Proposed habitat	Area (hectares)	Distinctiveness		Condition		Strategic significance			Temporal multiplier					Difficulty multipliers				Habitat units delivered	Comments	
			Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic position multiplier	Standard time to target condition/years	Habitat created in advance/years	Delay in starting habitat creation/years	Standard or adjusted time to target condition	Final time to target condition/years	Final time to target multiplier	Standard difficulty of creation	Applied difficulty multiplier	Final difficulty of creation	Difficulty multiplier applied		Assessor comments	Reviewer comments
Grassland	Other neutral grassland	441.94	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	3			Standard time to target condition applied	3	0.899	Low	Standard difficulty applied	Low	1	2382.85	5% of total removed for hardstanding	
Grassland	Other neutral grassland	236.62	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5			Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	1584.08	eco1, eco2 and eco3 retained. 5% of total removed for hardstanding	
Woodland and forest	Other woodland; broadleaved	50.3	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	15			Standard time to target condition applied	15	0.586	Low	Standard difficulty applied	Low	1	259.39		
Urban	Developed land; sealed surface	37.6	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Grassland	Floodplain Wetland Mosaic (CFGM)	26.5	High	6	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	20			Standard time to target condition applied	20	0.490	High	Standard difficulty applied	High	0.33	77.19		
Grassland	Other lowland acid grassland	30.9	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	10			Standard time to target condition applied	10	0.700	Low	Standard difficulty applied	Low	1	173.11		
Grassland	Other lowland acid grassland	81.6	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5			Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	409.71		
Urban	Developed land; sealed surface	8.22	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Urban	Developed land; sealed surface	23.26	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Grassland	Other neutral grassland	1.68	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	3			Standard time to target condition applied	3	0.899	Low	Standard difficulty applied	Low	1	9.06	Added neutral grassland to balance differences in units	
	Total area	938.62																	Total Units	4888.40		

APPENDIX 4

Appendix 4

Headline Results

Return to results menu

On-site baseline	*Habitat units*	4306.48
	Hedgerow units	120.69
	River units	5.77
On-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	6053.41
	Hedgerow units	141.05
	River units	5.83
On-site net % change (Including habitat retention, creation & enhancement)	*Habitat units*	40.57%
	Hedgerow units	16.87%
	River units	1.00%
Off-site baseline	*Habitat units*	0.00
	Hedgerow units	0.00
	River units	0.00
Off-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	0.00
	Hedgerow units	0.00
	River units	0.00
Total net unit change (including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	1746.94
	Hedgerow units	20.36
	River units	0.06
Total on-site net % change plus off-site surplus (including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	40.57%
	Hedgerow units	16.87%
	River units	1.00%
Trading rules Satisfied?		Yes

Appendix 4

A-1 Site Habitat Baseline

Condense / Show Columns | Condense / Show Rows

Main Menu | Instructions

	Habitats and areas			Distinctiveness		Condition		Strategic significance			Suggested action to address habitat losses	Ecological baseline	Retention category biodiversity value					Bespoke compensation agreed for unacceptable losses	Comments	
Ref	Broad habitat	Habitat type	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic Significance multiplier		Total habitat units	Area retained	Area enhanced	Baseline units retained	Baseline units enhanced	Area lost	Units lost		Assessor comments	Reviewer comments
1	Woodland and forest	Other woodland; broadleaved	6.33	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	55.70	6.33		55.70	0.00	0.00	0.00			
2	Woodland and forest	Other coniferous woodland	5.74	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	22.96	5.74		22.96	0.00	0.00	0.00			
3	Woodland and forest	Lowland mixed deciduous woodland	12.42	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	163.94	12.42		163.94	0.00	0.00	0.00			
4	Heathland and shrub	Mixed scrub	4.91	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	43.21	4.91		43.21	0.00	0.00	0.00			
5	Woodland and forest	Other woodland; mixed	16.85	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	148.28	16.85		148.28	0.00	0.00	0.00			
6	Grassland	Lowland dry acid grassland	12.4	V.High	8	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Bespoke compensation likely to be required	306.24	11.6		306.24	0.00	Unacceptable Loss	Alternative Compensation	Yes		
7	Grassland	Other lowland acid grassland	0.78	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	6.86	0.78		6.86	0.00	0.00	0.00			
8																					
9																					
10	Sparsely vegetated land	Coastal sand dunes	0.48	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	6.34	0.48		6.34	0.00	0.00	0.00			
11	Grassland	Lowland calcareous grassland	1.03	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	13.60	1.03		13.60	0.00	0.00	0.00			
12	Grassland	Modified grassland	72.601	Low	2	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same distinctiveness or better habitat required	319.44	13.89		61.12	0.00	58.71	258.33			
13	Grassland	Other neutral grassland	0.65	Medium	4	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	8.58	0.45		5.94	0.00	0.20	2.64		Neutral grassland -other neutral grassland / fen marsh and swamp -other swamps	
14	Grassland	Other neutral grassland	0.06	Medium	4	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	0.79	0.06		0.79	0.00	0.00	0.00			
15	Grassland	Other neutral grassland	2.49	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	21.91	1.68		14.78	0.00	0.81	7.13			
16	Grassland	Other neutral grassland	0.81	Medium	4	Poor	1	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	3.56	0.81		3.56	0.00	0.00	0.00			
17	Sparsely vegetated land	Ruderal/Ephemeral	8.07	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	32.28	0		0.00	0.00	8.07	32.28			
18	Cropland	Cereal crops	470.8075	Low	2	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	941.62	74.35		148.70	0.00	396.46	792.92			
19	Wetland	Reedbeds	0.07	High	6	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same habitat required	0.84	0.07		0.84	0.00	0.00	0.00			
20	Lakes	Ponds (Non- Priority Habitat)	1.63	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	14.34	1.63		14.34	0.00	0.00	0.00			
21	Urban	Vacant/derelict land/ bareground	57.24	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	228.96	2.16		8.64	0.00	55.08	220.32			
22	Urban	Developed land; sealed surface	12.77	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00	12.77		0.00	0.00	0.00	0.00			
23	Cropland	Cereal crops other	3.06	Low	2	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	6.12	0		0.00	0.00	3.06	6.12			
24	Grassland	Other neutral grassland	3.2	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	28.16	3.2		28.16	0.00	0.00	0.00			
25	Cropland	Cereal crops	239.49	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	957.96	0		0.00	0.00	239.49	957.96			
26	Cropland	Cereal crops	115.973	Low	2	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	579.87	0		0.00	0.00	115.97	579.87			
27	Cropland	Cereal crops	36.4085	Low	2	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	218.45	0		0.00	0.00	36.41	218.45			
28	Grassland	Other neutral grassland	4.825	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required	38.60	0		0.00	0.00	4.83	38.60		Correction - mapped by applicant as arable but in fact semi-improved permanent pasture	
29	Grassland	Other neutral grassland	14.929	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required	119.43	13		104.00	0.00	1.93	15.43		Correction - road verges mapped by applicant as lpSI but in reality closer to ONG moderate condition	
30	Cropland	Arable field margins cultivated annually	4.606	Medium	4	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required	18.42	0		0.00	0.00	4.61	18.42		Correction - margins of fields in agri-environment schemes (minimum figure)	
			1110.63									4306.48	184.21	0.00	1156.01	0.00	925.62	3148.46			

Appendix 4
A-2 Site Habitat Creation

Condense / Show Columns | Condense / Show Rows | Main Menu | Instructions

Check Areas - Area of development footprint and habitat creation exceeds the area of habitats lost

Post development/ post intervention habitats																							
			Distinctiveness		Condition		Strategic significance			Temporal multiplier					Difficulty multipliers						Comments	
Broad Habitat	Proposed habitat	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic position multiplier	Standard time to target condition/years	Habitat created in advance/years	Delay in starting habitat creation/years	Standard or adjusted time to target condition	Final time to target condition/years	Final time to target multiplier	Standard difficulty of creation	Applied difficulty multiplier	Final difficulty of creation	Difficulty multiplier applied	Habitat units delivered	Assessor comments	Reviewer comments
Grassland	Other neutral grassland	441.94	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	3			Standard time to target condition applied	3	0.899	Low	Standard difficulty applied	Low	1	2382.85	5% of total removed for hardstanding	
Grassland	Other neutral grassland	236.62	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5			Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	1584.08	eco1, eco2 and eco3 retained. 5% of total removed for hardstanding	
Woodland and forest	Other woodland; broadleaved	50.3	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	15			Standard time to target condition applied	15	0.586	Low	Standard difficulty applied	Low	1	259.39		
Urban	Developed land; sealed surface	37.6	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Grassland	Floodplain Wetland Mosaic (CFGM)	26.5	High	6	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	20			Standard time to target condition applied	20	0.490	High	Standard difficulty applied	High	0.33	77.19		
Grassland	Other lowland acid grassland	30.9	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	10			Standard time to target condition applied	10	0.700	Low	Standard difficulty applied	Low	1	173.11		
Grassland	Other lowland acid grassland	81.6	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5			Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	409.71		
Urban	Developed land; sealed surface	8.22	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Urban	Developed land; sealed surface	23.26	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Grassland	Other neutral grassland	1.68	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	3			Standard time to target condition applied	3	0.899	Low	Standard difficulty applied	Low	1	9.06	Added neutral grassland to balance differences in units	
	Total area	938.62																	Total Units	4995.40		

APPENDIX 5

Appendix 5

Headline Results

Return to results menu

On-site baseline	*Habitat units*	4306.48
	Hedgerow units	120.69
	River units	5.77
On-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	4869.89
	Hedgerow units	141.05
	River units	5.83
On-site net % change (Including habitat retention, creation & enhancement)	*Habitat units*	13.08%
	Hedgerow units	16.87%
	River units	1.00%
Off-site baseline	*Habitat units*	0.00
	Hedgerow units	0.00
	River units	0.00
Off-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	0.00
	Hedgerow units	0.00
	River units	0.00
Total net unit change (including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	563.41
	Hedgerow units	20.36
	River units	0.06
Total on-site net % change plus off-site surplus (including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	13.08%
	Hedgerow units	16.87%
	River units	1.00%
Trading rules Satisfied?		Yes

Appendix 5

A-1 Site Habitat Baseline

Condense / Show Columns | Condense / Show Rows

Main Menu | Instructions

	Habitats and areas			Distinctiveness		Condition		Strategic significance			Suggested action to address habitat losses	Ecological baseline	Retention category biodiversity value					Bespoke compensation agreed for unacceptable losses	Comments	
Ref	Broad habitat	Habitat type	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic Significance multiplier		Total habitat units	Area retained	Area enhanced	Baseline units retained	Baseline units enhanced	Area lost	Units lost		Assessor comments	Reviewer comments
1	Woodland and forest	Other woodland; broadleaved	6.33	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	55.70	6.33		55.70	0.00	0.00	0.00			
2	Woodland and forest	Other coniferous woodland	5.74	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	22.96	5.74		22.96	0.00	0.00	0.00			
3	Woodland and forest	Lowland mixed deciduous woodland	12.42	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	163.94	12.42		163.94	0.00	0.00	0.00			
4	Heathland and shrub	Mixed scrub	4.91	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	43.21	4.91		43.21	0.00	0.00	0.00			
5	Woodland and forest	Other woodland; mixed	16.85	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	148.28	16.85		148.28	0.00	0.00	0.00			
6	Grassland	Lowland dry acid grassland	12.4	V.High	8	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Bespoke compensation likely to be required	306.24	11.6		306.24	0.00	Unacceptable Loss	Alternative Compensation	Yes		
7	Grassland	Other lowland acid grassland	0.78	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	6.86	0.78		6.86	0.00	0.00	0.00			
8																					
9																					
10	Sparsely vegetated land	Coastal sand dunes	0.48	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	6.34	0.48		6.34	0.00	0.00	0.00			
11	Grassland	Lowland calcareous grassland	1.03	High	6	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same habitat required	13.60	1.03		13.60	0.00	0.00	0.00			
12	Grassland	Modified grassland	72.601	Low	2	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same distinctiveness or better habitat required	319.44	13.89		61.12	0.00	58.71	258.33			
13	Grassland	Other neutral grassland	0.65	Medium	4	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	8.58	0.45		5.94	0.00	0.20	2.64		Neutral grassland -other neutral grassland / fen marsh and swamp -other swamps	
14	Grassland	Other neutral grassland	0.06	Medium	4	Good	3	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	0.79	0.06		0.79	0.00	0.00	0.00			
15	Grassland	Other neutral grassland	2.49	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	21.91	1.68		14.78	0.00	0.81	7.13			
16	Grassland	Other neutral grassland	0.81	Medium	4	Poor	1	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	3.56	0.81		3.56	0.00	0.00	0.00			
17	Sparsely vegetated land	Ruderal/Ephemeral	8.07	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	32.28	0		0.00	0.00	8.07	32.28			
18	Cropland	Cereal crops	470.8075	Low	2	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	941.62	74.35		148.70	0.00	396.46	792.92			
19	Wetland	Reedbeds	0.07	High	6	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same habitat required	0.84	0.07		0.84	0.00	0.00	0.00			
20	Lakes	Ponds (Non- Priority Habitat)	1.63	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	14.34	1.63		14.34	0.00	0.00	0.00			
21	Urban	Vacant/derelict land/ bareground	57.24	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	228.96	2.16		8.64	0.00	55.08	220.32			
22	Urban	Developed land; sealed surface	12.77	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00	12.77		0.00	0.00	0.00	0.00			
23	Cropland	Cereal crops other	3.06	Low	2	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	6.12	0		0.00	0.00	3.06	6.12			
24	Grassland	Other neutral grassland	3.2	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	Same broad habitat or a higher distinctiveness habitat required	28.16	3.2		28.16	0.00	0.00	0.00			
25	Cropland	Cereal crops	239.49	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	957.96	0		0.00	0.00	239.49	957.96			
26	Cropland	Cereal crops	115.973	Low	2	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	579.87	0		0.00	0.00	115.97	579.87			
27	Cropland	Cereal crops	36.4085	Low	2	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required	218.45	0		0.00	0.00	36.41	218.45			
28	Grassland	Other neutral grassland	4.825	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required	38.60	0		0.00	0.00	4.83	38.60		Correction - mapped by applicant as arable but in fact semi-improved permanent pasture	
29	Grassland	Other neutral grassland	14.929	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required	119.43	0		0.00	0.00	14.93	119.43		Correction - road verges mapped by applicant as lpSI but in reality closer to ONG moderate condition	
30	Cropland	Arable field margins cultivated annually	4.606	Medium	4	N/A - Agricultural	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required	18.42	0		0.00	0.00	4.61	18.42		Correction - margins of fields in agri-environment schemes (minimum figure)	
			1110.63									4306.48	171.21	0.00	1054.01	0.00	938.62	3252.46			

Appendix 5
A-2 Site Habitat Creation

Condense / Show Columns | Condense / Show Rows | Main Menu | Instructions

Post development/ post intervention habitats

Broad Habitat	Proposed habitat	Area (hectares)	Distinctiveness		Condition		Strategic significance			Temporal multiplier						Difficulty multipliers				Habitat units delivered	Comments	
			Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic position multiplier	Standard time to target condition/years	Habitat created in advance/years	Delay in starting habitat creation/years	Standard or adjusted time to target condition	Final time to target condition/years	Final time to target multiplier	Standard difficulty of creation	Applied difficulty multiplier	Final difficulty of creation	Difficulty multiplier applied		Assessor comments	Reviewer comments
Grassland	Other neutral grassland	110.485	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	3			Standard time to target condition applied	3	0.899	Low	Standard difficulty applied	Low	1	595.71	5% of total removed for hardstanding	
Grassland	Other neutral grassland	59.155	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5			Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	396.02	eco1, eco2 and eco3 retained. 5% of total removed for hardstanding	
Woodland and forest	Other woodland; broadleaved	50.3	Medium	4	Moderate	2	Location ecologically desirable but not in local strategy	Medium strategic significance	1.1	15			Standard time to target condition applied	15	0.586	Low	Standard difficulty applied	Low	1	259.39		
Urban	Developed land; sealed surface	37.6	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Grassland	Floodplain Wetland Mosaic (CFGM)	26.5	High	6	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	20			Standard time to target condition applied	20	0.490	High	Standard difficulty applied	High	0.33	77.19		
Grassland	Other lowland acid grassland	30.9	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	10			Standard time to target condition applied	10	0.700	Low	Standard difficulty applied	Low	1	173.11		
Grassland	Other lowland acid grassland	81.6	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5			Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	409.71		
Urban	Developed land; sealed surface	8.22	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Urban	Developed land; sealed surface	23.26	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0			Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00		
Grassland	Other neutral grassland	1.68	Medium	4	Fairly Poor	1.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	3			Standard time to target condition applied	3	0.899	Low	Standard difficulty applied	Low	1	9.06	Added neutral grassland to balance differences in units	
Grassland	Other neutral grassland	508.92	Medium	4	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	2			Standard time to target condition applied	2	0.931	Low	Standard difficulty applied	Low	1	1895.68		
	Total area	938.68																	Total Units	3818.68		

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APPENDIX 2

RE: Application by Sunnica Ltd for an Order Granting Development Consent for Sunnica Energy Farm
Ecological Impact Assessment

The Applicant welcomes the review carried out by Bioscan and commissioned by Say No to Sunnica of the ecological information included as part of the DCO submission.

Our response is structured around the five matters to which Bioscan draws attention:

- field surveys of habitat and flora
- protected species
- calculation of biodiversity net gain
- misuse of the Rochdale Envelope approach
- viability of proposed habitat creation

Field surveys of habitat and flora

The production of a baseline for habitats and flora for the Scheme began with an extended Phase 1 Habitat survey in autumn 2018. As would be normal for a Phase 1 Habitat survey, this has been informed by the red line boundary and changes to it, aerial photography, data from the local environmental records centres and MAGIC including any agri-environment schemes noted on MAGIC. With respect to the latter, e.g. stewardship schemes, MAGIC does not provide any detail concerning habitats or species nor are the data necessarily comprehensive or up to date. As this is not standard practice, we do not normally make reference to this aspect of MAGIC in our reporting.

The Applicant's ecological impact assessment provides a comprehensive appraisal of the ecological features within the Scheme and its zone of influence, following recognised methods to ensure an appropriate level of coverage. Its adequacy has been recognised by Natural England and the Environment Agency. Our ES can be considered adequate and robust on the basis of the data we have submitted.

We recognise that we are working in a changing environment and parts of the Phase 1 Habitat survey have been kept up to date since 2018 and yet further surveys had been planned for 2022 some time ago to ensure the data are up to date. We have used and continue to use aerial photography to assist in this process. It is useful to have received the information in Table 1 of Bioscan's report (pages 7-9) and we will integrate the locations identified into ongoing habitat surveys.

The Phase 1 Habitat survey along with the significant knowledge of the Site built up from undertaking a range of surveys is used to inform the decisions as to which habitats and areas require more detailed survey, i.e. Phase 2 Habitat classification.

Changes to habitats within the site picked up in the Phase 1 Habitat survey have identified locations that need Phase 2 Habitat survey and, again, surveys had been planned for 2022 some time ago.

The results of these update surveys will be reported in a technical note which will be shared with all stakeholders through submission to PINS during the Examination for Deadline 1.

Protected species

Bioscan comment on certain aspects of protected species. These and the associated responses are summarised in Table A.

Table A. Summary of comments made in Bioscan review on protected species

Issue	Response
Great crested newt	
Bioscan note that there is a licence return record from the southern part of Chippenham Fen, indicating the presence of great crested newt at that site in 2014 [National grid reference: TL 650 690] (2.2.10). In view of the fact that the location of this record is from a contiguous wetland complex that extends to within 250m of proposed construction areas, we suggest there may at the very least need to be revision to the applicant's assessments of risk of impact to this species in this part of the project area (Sunnica West Site B) (2.2.11)	The location for the record is at least 514 m from the Order Limits, 572 m from the Developable area and 584 m from the nearest PV solar panel (see Figure 1 in Appendix). Whilst some of this distance is part of the wetland complex and SSSI, the latter half is across arable field fields. It is unknown whether this is a reliable record and it has been our understanding from the Natural England site manager, that great crested newt is unknown from Chippenham Fen, in light of previous monitoring of amphibian species. Irrespective of this, great crested newt was not recorded within the Sunnica West Site B (APP-082 6.1 Environmental statement Appendix 8F - Great Crested Newt Survey Report) and along with standard mitigation measures to be secured through the CEMP (APP-123 Environmental Statement - Appendix 16C - Framework Construction Environmental Management Plan) and avoidance of known great crested newt habitats within the Order Limits, even if present at low densities, impacts to great crested newt can be appropriately avoided.
Hobby	
Hobby was heard calling in Sunnica East Site B on 13th July 2022. It is noted that this Schedule 1 species, which appears likely on the strength of this record to nest in field boundary pines south of Worlington is not mentioned in App-085 (ES Appendix 8I: Report of survey for breeding birds, but its presence within the order limits in a breeding	**Hobby was recorded as breeding on Sunnica East Site B**(Appendix 8I - Report on Surveys for Breeding Birds). **Bioscan's observations are therefore consistent with the Applicant's baseline assessment**(APP-085 6.2 Environmental Statement - Appendix 8I - Report on Surveys for Breeding Birds).

capacity is acknowledged and assessed in ES Chapter 8. It is unclear if our record on this date is consistent or inconsistent with the baseline conditions for this species reported in the ES and related submission material. … (2.6.1)	
Stone-curlew	
Stone curlew *Burhinus oedicnemus* was also present in Sunnica East B on 13th July 2022, using fields which are identified for solar rays. Due to the (understandable) redactions in EA Appendix 6.6: Offsetting Habitat Provision for Stone Curlew Specification APP-258. It is unclear whether our record on this date is consistent with the baseline conditions for this species reported in the ES and related submission material. …	**Stone-curlew was recorded as breeding on Sunnica East Site B** (Appendix 8I - Report on Surveys for Breeding Birds). **Bioscan's observations are therefore consistent with the Applicant's baseline assessment (**APP-085 6.2 Environmental Statement - Appendix 8I - Report on Surveys for Breeding Birds)..
Farmland birds	
Attention is drawn in 3.3.2 and a footnote on p. 16 to: a. the need to give full and balanced consideration to those declining species of open arable farmland known to be present	a. The Scheme has embedded sufficient 'undeveloped' land for the creation of biodiverse grassland to offset the loss of arable farmland and avoid significant effects either alone or in-combination with other schemes (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation). As **part of the Scheme, this grassland will be better managed than they currently are and** support richer invertebrate assemblages and more permanent nesting habitat that will increase density and productivity of species such as skylark. Other farmland species such as corn bunting and linnet, rely on well managed margins and hedgerows for breeding and an over-wintering seed resource, all of which will be enhanced by the Scheme (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation. See sub-section ***Creation of replacement grassland habitats*** **of** APP-108 6.2 Environmental statement – Appendix 10I - Landscape and Ecology Management Plan (LEMP) **and paragraphs**

b. the apparent absence of an assessment of the cumulative impacts on local and regional populations of these species from the multiple solar projects in Cambridgeshire and Suffolk acting in combination which has the potential to drastically reduce the available habitat for these species. c. limitation of the biodiversity net gain metric in that it does not take into account the use animals make of a habitat, in this case, of farmland birds; an arable field which regularly supports breeding lapwing and stone curlew is afforded the same *de minimus* score as an arable field supporting neither species.	1.7.12 *et seq.* outlining how grassland will be managed for breeding farmland birds. b. A thorough a review was undertaken of plans and projects which in combination with the Scheme might have an impact on important ecological features. The former is presented in Table 8-14 in APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation. No plans or projects identified in Table 8-14 are considered in combination to impact important ecological features identified in this assessment including farmland birds (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation). c. Notwithstanding the use of the BNG metric, the Applicant has taken account of the baseline data in relation to protected and other species in developing our enhancement proposals, e.g. well-managed grasslands with an increase in habitat for farmland birds (as described in (b) above); and that as such the Applicant will be providing a gain for such species (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation) as well as achieving a calculated BNG by applying metric 3.1 in line with the requirements of Natural England, and we note this approach is supported by the Environment Act.
Bats	
It is at best unclear whether the assessments of impact on bats account fully for the magnitude of tree loss likely to be occasioned by the project. There appears to be a degree of incongruity between the conclusions of the tree constraints study, in terms of the number of trees identified for removal, the assumptions used as the basis for the assessment of impacts on bats in the ES Chapter 8 and Appendix 8J, and the amount of latitude sought by the applicant in respect of construction working areas, especially those around road crossings along the cable routes. Given the acknowledged presence of barbastelle in the locality, the	The Applicant is currently working on a vegetation removal plan along with an Arboricultural Impact Assessment (AIA) and this will be brought forward **at detailed design and will inform the Detailed LEMP pursuant to the LEMP (**APP-108 6.2 Environmental statement – Appendix 10I - Landscape and Ecology Management Plan**).** The working assumption is that this will avoid trees with bat roost suitability or confirmed roosts. There should be no need for substantial tree removal, including in the cable corridor (predicted as a maximum of 0.46 ha in the Biodiversity Net Gain calculations) (APP-259 6.7

importance of trees to this species and its habitual use of roost features considered low suitability for other species, this introduces a degree of uncertainty that the Examining authority might wish to be addressed by further information.	Environmental Statement - Biodiversity Net Gain Assessment) or any loss of ancient/veteran trees. Barbastelle forage throughout Suffolk and Cambridgeshire and will roost in suitable woodland trees and occasionally buildings. Proposed mitigation measures encompass the needs of barbastelle as well as other bat species (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation and APP-108 6.2 Environmental statement – Appendix 10I - Landscape and Ecology Management Plan (LEMP)). Where necessary, updated surveys prior to commencement will be undertaken to confirm the position presented in the ES (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation).
Brown hare	
3.3.1 Although brown hare (which we noted frequently on 13th July 2022) is 'assumed' to be present within the order limits in the ES, there is no assessment of the potential impact on the priority (NERCA [NERC] Act S41) species, which could be at risk of a certain (potentially significant) quantum of displacement effects from the change in habitat structure associated with the scheme. We consider this to be an omission.	Brown hare is common in all habitats in Suffolk (Bullion, 2009) and Cambridgeshire except for the fens where they are less common (Hows *et al*. 2016). Whilst brown hare will be displaced from the Scheme during construction, it will re-establish itself and, given that brown hare is most common in grassland habitats and at woodland edges, favouring a mosaic of arable fields, grasses and hedgerows, it will benefit from the landscape provided by the proposed Scheme. This achieves a better balance for this species between arable and grassland than exists at present (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation) and includes gaps at the base of security fencing to maintain movements of small-medium sized mammals between the Scheme and the wider landscape. To put this into context, a change to winter-sown cereals has led to a reduction in higher quality food in early summer in Suffolk, leading to food shortages and a lower leveret survival rate (Harris, 2008). Large numbers of hares are still regularly shot in Suffolk as part of organised

	meetings (Bullion, 2009), an activity which will not occur on the Scheme. Brown hare is assessed as being of local importance and will not be significantly impacted by the Scheme.
Hedgehog and harvest mouse	
3.3.1 The same [see Brown hare above] applies to hedgehog, which is also a priority species. No consideration whatsoever is given to the priority species harvest mouse. The latter two species are however likely to be at less risk of negative effects.	The hedgerow habitat and associated margins used by hedgehog will largely be retained within the Order limits (APP-040 6.1 Environmental Statement - Chapter 8 - Ecology and Nature Conservation). Coupled with the increase in grassland and the absence of insecticides and mollusicides, this should result in an increase in hedgehog population. Grassland management on the site will include habitat suitable for harvest mouse, again, the expectation being an increase in the population of this species. Hedgehog and harvest mouse are assessed as being of local importance and will not be significantly impacted by the Scheme.

Biodiversity net gain

Further to the comments from Bioscan on the Phase 1 and Phase 2 habitat baseline data, we have already planned to:

- update the data following the update and gap filling surveys; and
- use the most up to date metric for the calculation, i.e. metric 3.1 having used the current 3.0 metric at the time of the original calculation.

It is recognised that the habitats score may decrease as a result of the new metric and the revised data. This should be put in the context of an anticipated requirement for future development projects to achieve a BNG score of 10% or above.

The results of these update surveys will be fed into the calculation of BNG using metric 3.1, which will be reported in a technical note which will be shared with all stakeholders through submission to PINS during the Examination by Deadline 1.

Misuse of Rochdale Envelope approach

Bioscan's assertion regarding the extent to which the Rochdale Envelope approach has been rigorously applied by the Applicant (section 3.2.13) is not correct. Whilst the Applicant is seeking flexibility in the design, the maximum parameters are set out in APP-035 6.1 Environmental Statement - Chapter 3 - Scheme Description of the Environmental Statement and APP-264 7.3- Design and Access Statement. These have been the worst-case scenario assessed in the ES. Should the DCO be consented, then these will be the parameters against which the Scheme will be built.

Viability of proposed habitat creation

The Applicant recognises the challenges associated with the habitat creation that is planned. Forward planning has commenced in terms of sourcing seed mixes, soil amelioration and grassland management. An important element in assuring targets are met is a robust monitoring and surveillance programme over the life of the Scheme including implementation of contingency and remedial measures (APP-108 6.2 Environmental Statement - Appendix 10I - Landscape and Ecology Management Plan). This will be overseen by the Sunnica Ecology Advisory Group and it will be important to use the feedback and Group to:

- guide implementation of remedial measures;
- use the monitoring to improve the enhancement measures; and
- learn from other similar projects
- to achieve the biodiversity enhancement predicted.

References

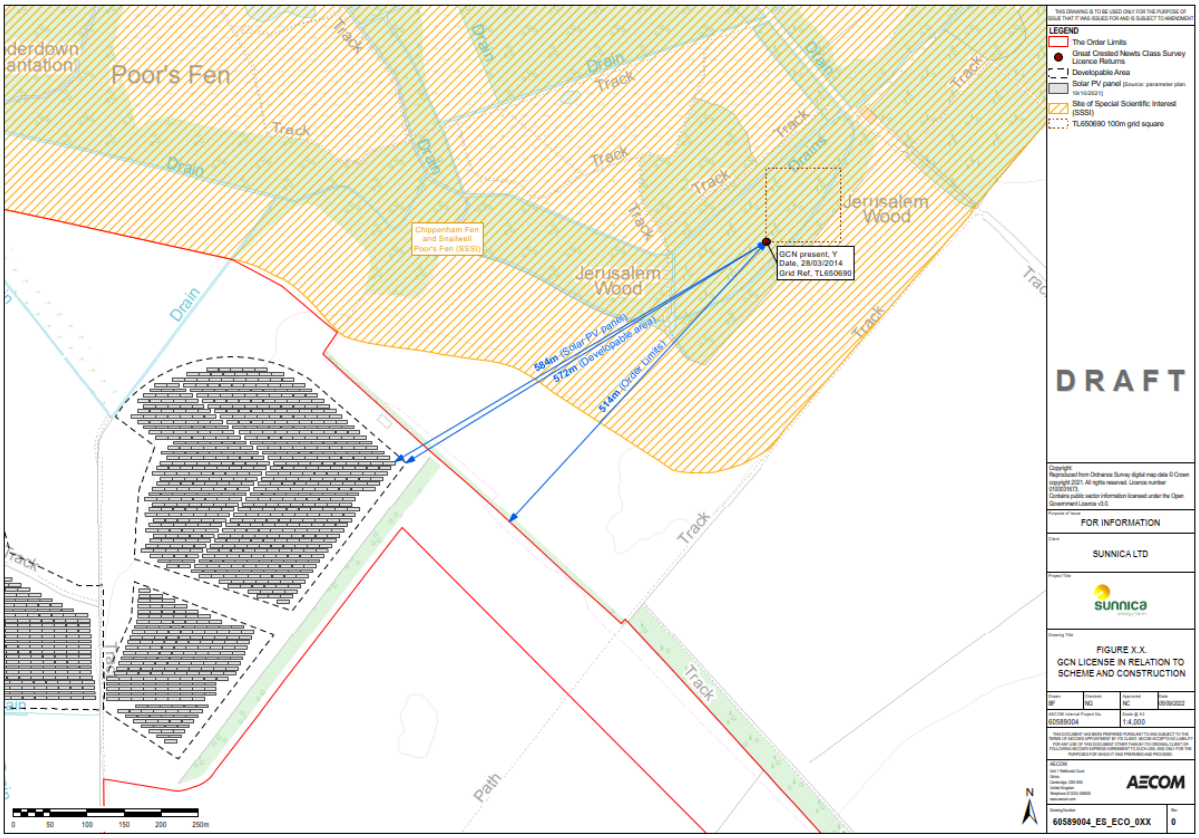
Bullion, S. 2009. The mammal of Suffolk. Suffolk Wildlife Trust and Suffolk Naturalists' Society, Ipswich.

Harris, S. 2008. Hares: The East West divide. Transactions of the Suffolk Naturalists' Society, 44, 9-15.

Hows, M., Pilbeam, P., Conlan, H. and Featherstone, R. (compiled by) 2016. Cambridgeshire Mammal atlas. Cambridgeshire Mammals Group.).

Appendix

Figure 1. Location of great crested newt record (2014) with respect to the Order limit



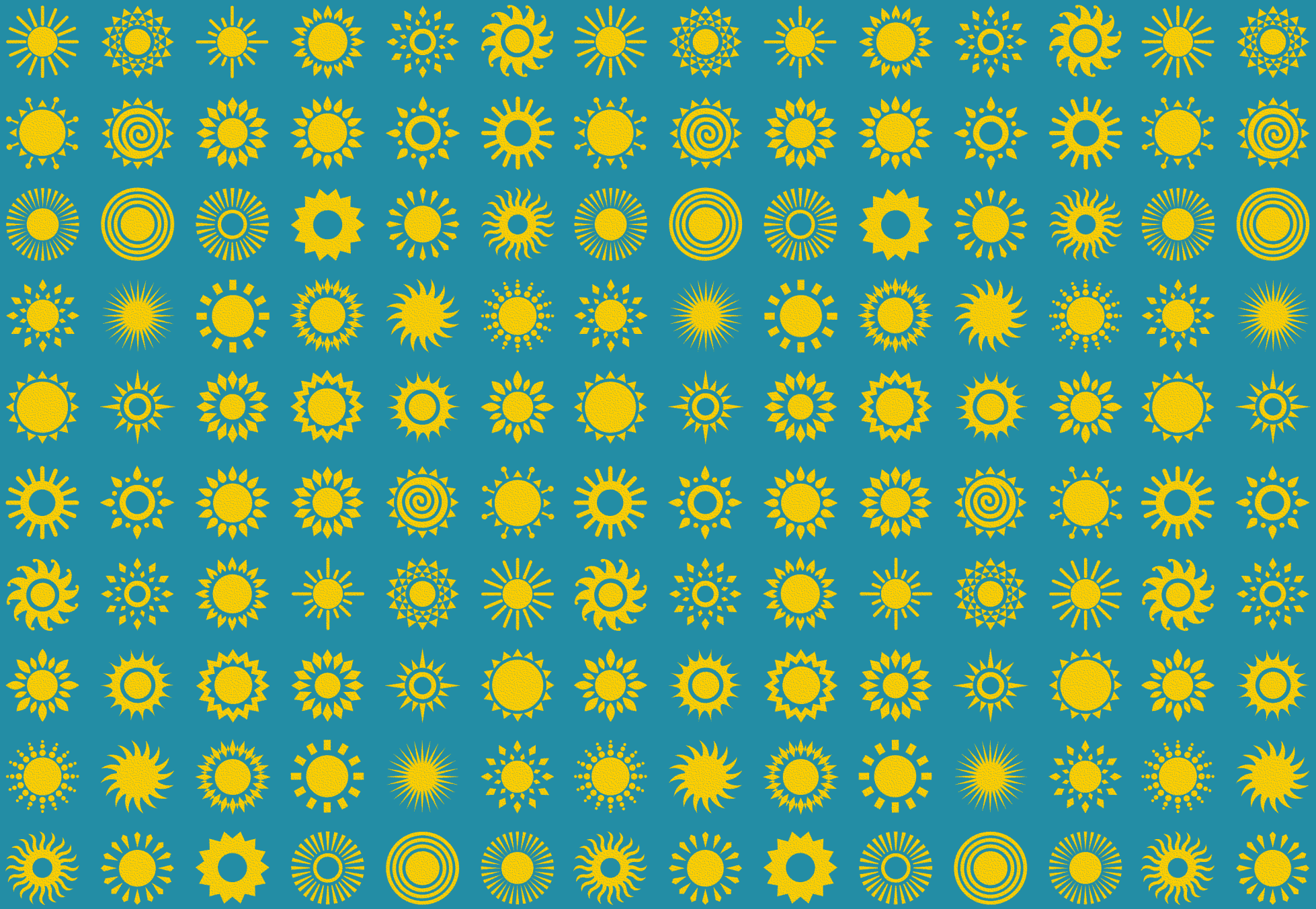
APPENDIX 3

SOLARVIEW

ECOLOGICAL MONITORING OF SOLAR SITES
OVERVIEW OF 2019 SURVEYS

CLARKSON & WOODS
ECOLOGICAL CONSULTANTS

Medium Consultancy of the Year



Welcome to the overview report of all solar sites monitored by Clarkson & Woods in 2019, or the 2019 'Solarview'. The second such report outlining the results of our ecological monitoring.

Clarkson & Woods continue to monitor a large number of ground mounted solar PV sites across the country and our Solarview publication amalgamates this monitoring data in order to look at trends.

The aim of this report is to look at how wildlife is affected by solar farms (and so inform future impact assessments) and explore how successful different forms of management are (and so can inform the development of management plans). We hope that this report will be helpful for site operators, local authorities, ecologists, farmers and the solar trade industry alike.

This report is not intended as an in depth scientific analysis however, the large dataset we have gathered as part of this work provides us with an exceptional opportunity to produce an overview on how solar farms might be influencing the biodiversity on the sites in which they are located. In addition we hope to inform management practices so that they are more effective and cost efficient. We intend to produce further annual reports as additional data is gathered in order to further explore these areas. Of course the main limitation with this study is that the sites we monitor represent only a proportion of those that exist within the UK and a large number of sites go completely unmonitored. The sites that we monitor are the ones which have an ecological management plan in place and so are more likely to have ecologically driven management. Until the dataset can be expanded and ecological monitoring becomes the norm for solar sites, it is impossible to get true averages and fully assess impacts associated with solar sites. For this we rely on solar companies to organise ecological monitoring and Local Planning Authorities (LPAs) to enforce the requirement within the management plans.

All data and photographs used within the report have been gathered during ecological monitoring of solar farms by Clarkson and Woods and has been anonymised, excepting the case studies presented.

If you have any queries regarding this report or have any sites which you would like us to add into our monitoring portfolio and include within next years' Solarview report, please feel free to contact Tom Clarkson or Belinda Howell.

A diverse grassland establishing within a solar farm

SOLARVIEW

Clarkson & Woods have been monitoring large scale ground mounted photovoltaic solar farms (for the purposes of this report, this includes all sites above 3MW) since 2014.

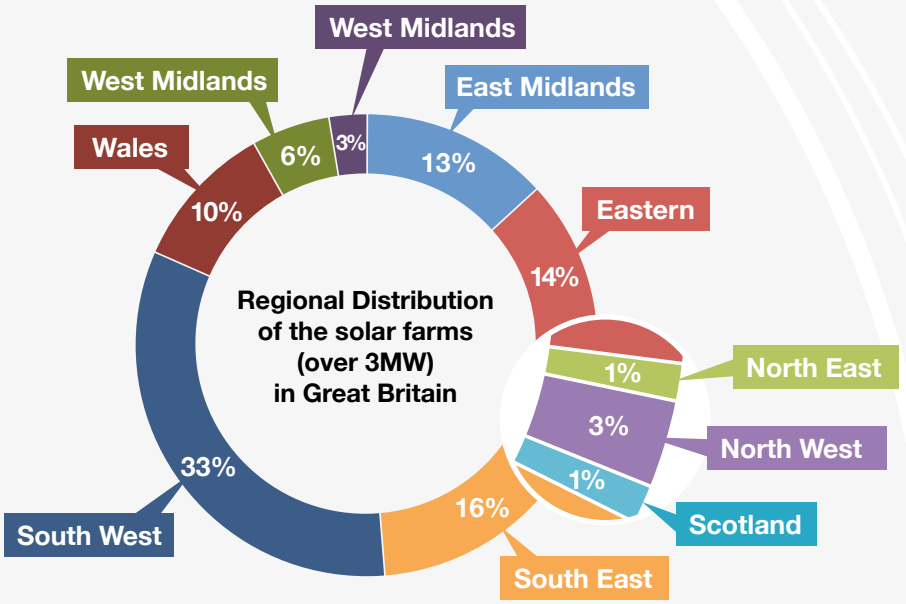
Our portfolio of monitoring sites comprises approximately 10% of all British mainland solar farms[1]. In 2019 we monitored 3% of the GBs sites (30% of our portfolio) as at many sites monitoring is not required on an annual basis, but rather follows an intermittent schedule.

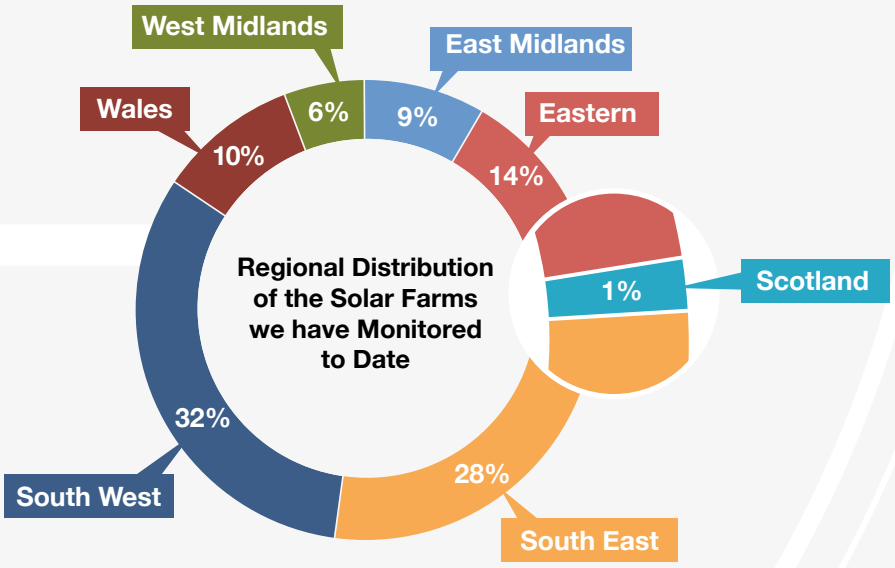
Over the last 6 years we have developed a standardised botanical monitoring protocol which uses quadrat surveys within different areas of the solar farm; this provides us with a comparable dataset. While on site we also conduct a general walkover survey, taking ad-hoc recordings of plants, invertebrates, birds, mammals and anything else of interest. In addition to these surveys, we inspect installed bat and bird boxes. Some sites have more bespoke requirements including breeding bird, dormouse, great crested newt, bat, reptile and fungi surveys.

As the adjacent map shows we monitor sites across England, Wales and into Scotland with approximately 60% of those sites in southern England, reflecting the national distribution of ground mounted PV arrays.

[1] Renewable energy planning database monthly extract – December 2019 https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract last updated 14th January 2020.

33% of operational solar farms are located in the South West and 16% in the South East, as represented in the pie charts below. While proportionately the distribution of sites we have monitored is broadly in line with the industry for the South West, the East, West Midlands, Wales and Scotland, we have monitored a disproportionate number of solar farms in the South East and have yet to monitor any of the farms in the North East, the North West or Yorkshire and Humber.





SOLARVIEW

Grassland Management

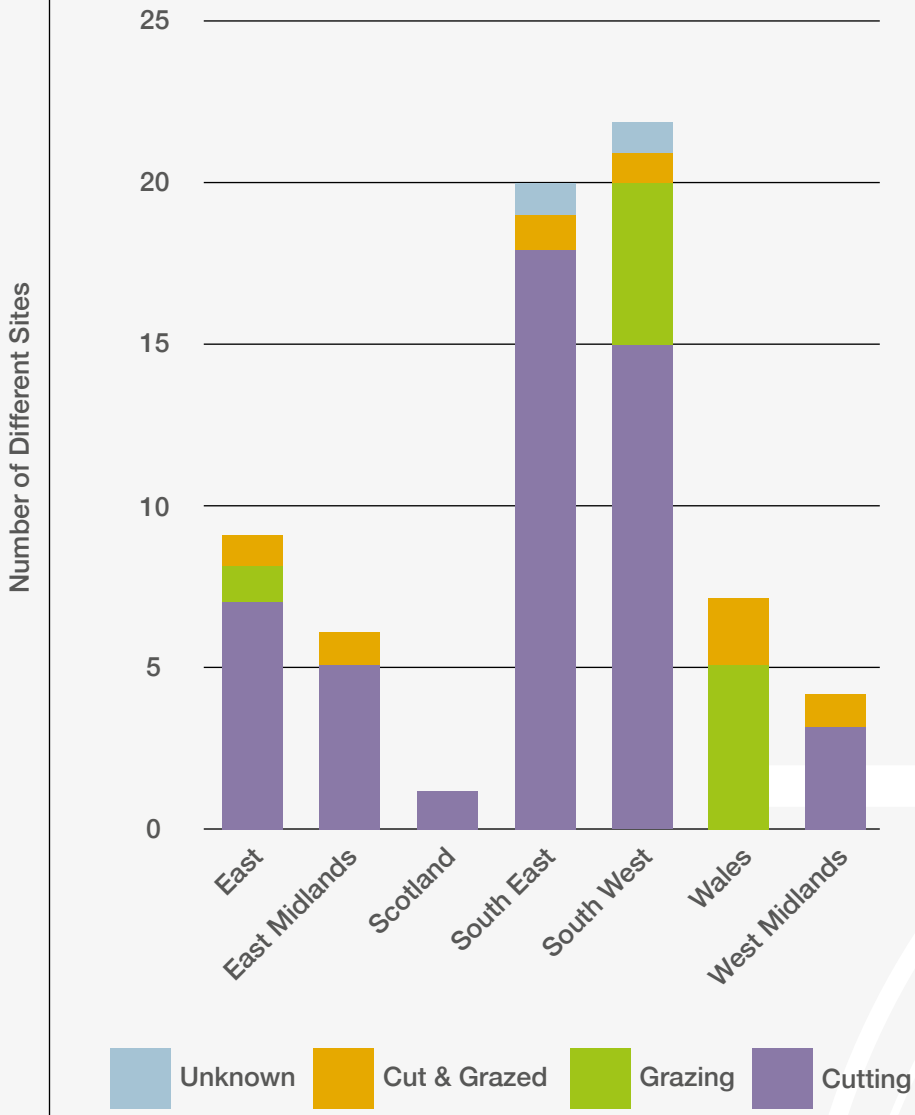
Management of grassland within a solar farm often represents a considerable cost, is the trickiest aspect of management to get right and is the most important in terms of supporting a wide range of other species.

Over the years we have found regional differences in the management of solar farms, as shown in the graph on page 6.

For example, all the sites we monitored in Wales were sheep grazed for at least part of the year; a trend which isn't represented elsewhere. Despite this, a large number of management plans continue to specify sheep grazing as a management tool, which may not be practicable for some sites.

Sheep grazing within a solar farm during the summer months

All Sites Monitored: Management by Region



Overall, 26% of sites monitored are sheep grazed to some extent, and 71% of sites are cut. However, when looking at sites monitored in 2019, 57% were sheep grazed to some extent. This may be due to the smaller sample size. However, we have found that some management companies are looking at moving to sheep grazing now that the grassland sward has become established. We will continue to monitor the approach to management across our portfolio of sites and will report on any changes in management practices within the 2020 Solarview.

It is worth mentioning that most management plans specify the removal of sheep from the solar farm during May-August to allow flowers to set seed and reduce disturbance to ground nesting birds. Whilst it is difficult to assess management for the times of year we are not undertaking ecological monitoring, it appears that the requirement to remove grazing during the key flowering season is not always adhered to.

Many management plans also specify the removal of arisings after cutting as this decreases the nutrients in the soil, helping to diversify the grassland and also preventing a thatch from forming which can stifle plant growth. We have found this practice to be undertaken on only a handful of sites, as it is often considered impractical due to the large amounts of grass clippings which need to be collected and then disposed of. Where we have encountered the removal of arisings they are collected for silage. We have yet to look at the implications of arising removal on botanical diversity as it is such an infrequently encountered management practice, despite the frequency of the recommendation.

The regional differences in management may also reflect the differing farming practices in various parts of the country. For example, farmland which was sheep grazed prior to the solar farm installation are more likely to be sheep grazed after the installation of solar arrays. As shown in the graph below, regardless of previous land use the majority of sites are managed through cutting, although former pasture sites are more likely to be managed through grazing/a combination than the other sites.

All Sites Monitored: Previous Land Use Compared with Current Management

Another commonly encountered management practice is “shade-cutting”, which entails a strip cut directly in front of and behind the panels during the summer to facilitate access and prevent shading. This approach strikes a good compromise between the desire to maximise biodiversity on the site and the need to ensure the efficient operation of the panels. A mosaic of heights is created, the operation of the solar farm is not impeded and the majority of habitat within the site can remain unmanaged for the remainder of the summer.

Arisings from cutting left in-situ

A diverse solar farm with a shade cut 50cm in front of the panels

SOLARVIEW

Botanical Diversity

We have measured 1,481 botanical quadrats within solar farms over the last four years. Within these we have recorded 65 graminoids (grasses, sedges and rushes) as well as 240 broad-leaved species; including orchids, ferns and tree saplings.

In 2019 alone, we recorded 39 different graminoid species and 149 broad-leaved plants.

For the majority of sites we use a standardised methodology; taking five randomly selected 2m x 2m quadrats directly below panels (“beneath” quadrats), five between the strings of panels (“between” quadrats) and five between the edge of the solar farm and the bounding security fence (“exterior” quadrats) which allows us to look at differences across the site.

A successfully seeded solar farm with an abundance of flowering plants

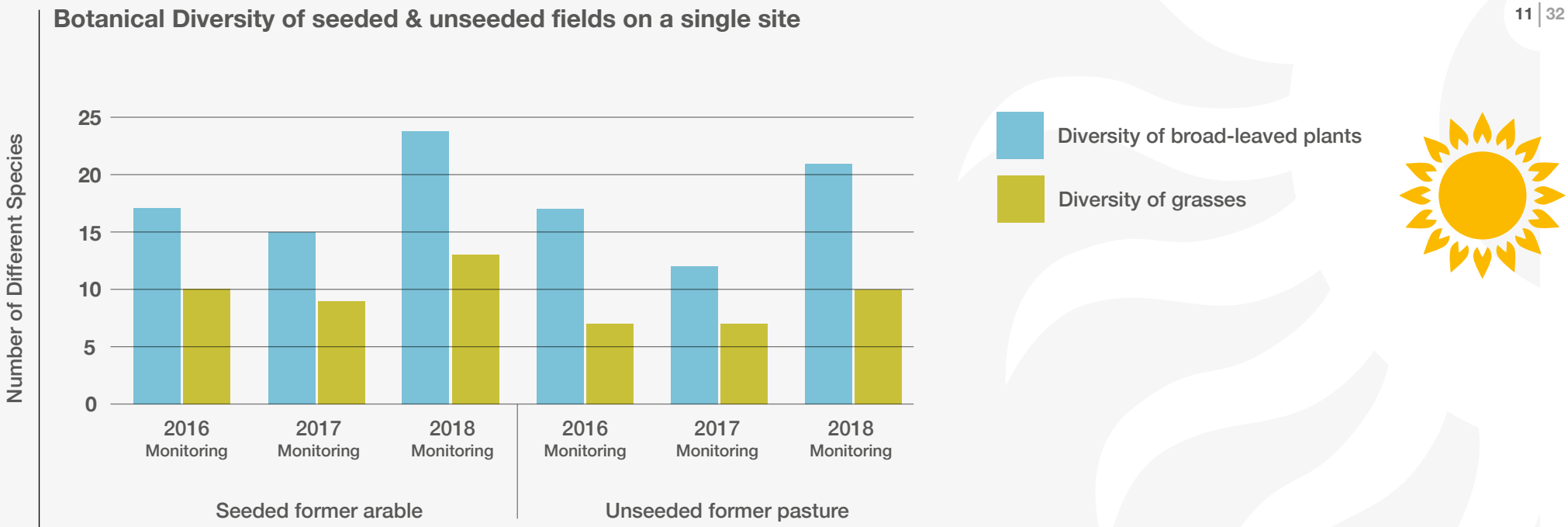
For sites with repeated monitoring requirements this standardised methodology enables us to look at how the site is establishing over time and success (or otherwise) of management.

Our monitoring in 2019 indicates that solar farms created on previously arable land are more diverse than sites created on previously pasture land. The greatest diversity was however recorded on solar farms which previously supported a mixture of both arable and pasture.

We have found that on average previously arable sites (52% of the sample) supported an average diversity of 26 different species including 17 broad-leaved species. It seems likely that this reflects the seeding undertaken at these sites. Pasture sites had a slightly lower diversity (22 different species with an average of 13 broad-leaved species). This may be reflective of the relatively early point in monitoring after seeding.

It is anticipated that diversity within all sites we monitor will continue to expand as agricultural enrichment and disturbance by harrows and plough ceases. Potentially those sites which are not seeded will have a more robust, natural seed bank that may be better suited to the local environmental conditions than those arable sites which feature introduced species.

Botanical Diversity of seeded & unseeded fields on a single site



There is some concern about the introduction of non-locally native genotypes into the natural environment and it is for this reason that we advocate, wherever possible, the use of locally sourced seed. Nevertheless we are aware of seed being used within solar arrays which has been brought in from abroad. The effect this will have upon the natural UK genotypes is unclear although we would note that most invertebrates are unlikely to differentiate between British and European flowers!

On particularly large sites, or those where seeding/management varies across the site, we undertake double the number of quadrats to compare the establishment of each distinct area. This has been particularly useful in relation to a large solar farm in Cornwall which comprises several formerly arable fields which were seeded after construction, as well as several pasture fields which were left unseeded. We have been monitoring this site since 2015 and have been tracking the development of the grassland sward within both the seeded and the unseeded fields separately. The results are outlined within the bar graph on page 11, showing that both field types are relatively diverse, though the seeded formerly arable fields were notably more diverse during every survey.

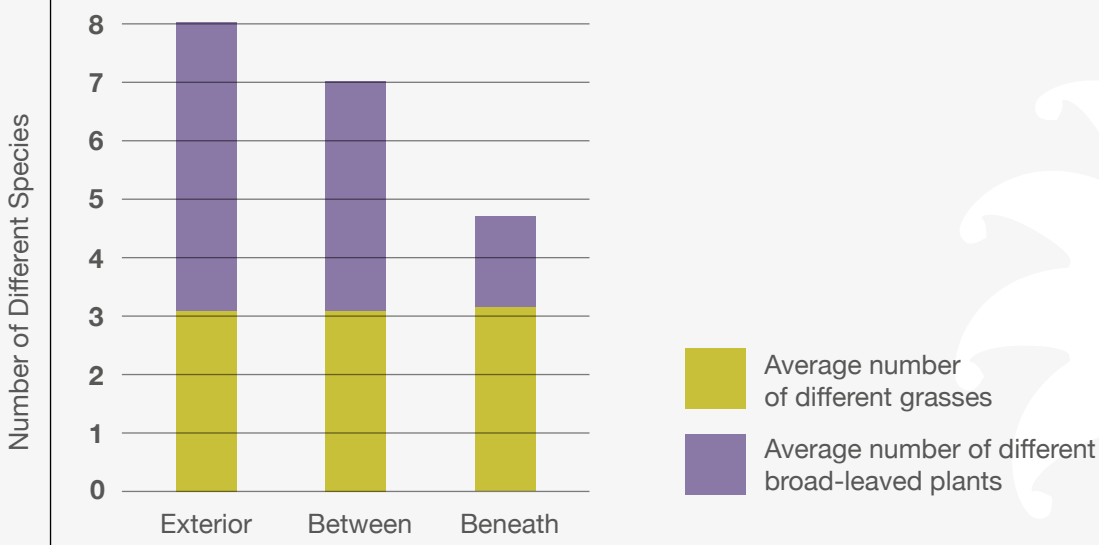
A well seeded margin at the entrance to an otherwise intensively managed solar farm.

Some of the longest established solar farms have been found to have the highest diversity of plant species. 14 graminoid species were recorded at four separate arrays in 2018, all of which had different management practices and different historic land uses. These four sites did not require monitoring in 2019, however monitoring is planned at these sites in 2020 and therefore we look forward to seeing if there is further evidence of diversification of these sites over time. Currently our data shows only a weak correlation between botanical diversity and time since connection of these sites to the grid, but we hope that in the forthcoming years adding additional data will allow us to further examine this theory. Some of the data collected in 2019 supports this theory with 13 graminoid species recorded at one site where we recorded only 8 species in 2018. This represents an increase of approximately 60% in botanical diversity in a single year. This is a dramatic change and whilst we would not anticipate such a trend will be observed at all sites, we do anticipate that diversification will be a feature of solar farms as they mature.

It does appear that different botanical communities are present within different parts of the site. We have compared quadrats taken beneath, between and around the exterior of the solar farms and found that botanical communities within each area differ slightly. For example yellow rattle, rough hawkbit, evening primrose, field scabious, yellow pimpernel and cuckoo flower were all recorded only within the exterior of arrays and not between or beneath the array strings. Conversely, ferns, charlock, garlic mustard and willowherb species were only recorded

A “Beneath” Quadrat, with sheep sheltering undera djacent string

Average Number of Different Species per Quadrat



beneath the strings. Over the 2019 surveys we recorded 135 different plant species in the "exterior" quadrats, 116 different species in the "between" quadrats and only 103 different species "beneath" the panels. This variety of species and the different diversities within a single solar farm creates a mosaic of conditions which can support a wider diversity of species and may thus be of greater importance to wildlife.

When carrying out impact assessments, we are often challenged by claims that grass fails to grow beneath panels, and as anticipated (and as highlighted in the 2018 Solarview), shading does appear to affect the development of grassland vegetation. In 2019 and previous years the quadrats beneath the panels were the least diverse, with an average of 4 different species per quadrat, compared to the those within the array exterior which had an average of 8 different species.

Of the "beneath" quadrats surveyed in 2019, 75% contained some extent of bare ground, while bare ground was only recorded in 39% of the "between" quadrats and 34% of the "exterior" quadrats. This variation appears to be less pronounced on former pasture sites compared to arable sites which likely reflects the difficulty in establishing grassland on bare ground within shaded areas. This suggests there may be merit in considering seeding sites prior to the solar farm installation on previously arable sites. Grassland would be easier and cheaper to establish at this point and potentially might help to reduce the damage caused to soils during construction on bare ground.

The presence of bare ground within arrays is not necessarily a negative characteristic. Bare ground can provide an important habitat for a range of species, particularly invertebrates and ephemeral and annual species such as rare arable weeds which may struggle to grow in areas with established grasses. Out of the 400 botanical quadrats we undertook in 2019, only two were completely bare of vegetation and both were "beneath" quadrats. The two bare quadrats were recorded at different sites and all other "beneath" quadrats at either site had between 5-7 different species and an average of 15% bare ground. On one of these two sites the grassland beneath the panels had diversified considerably from an average of 1.8 different species per quadrat in 2018 to 4.6 in 2019.

Case Study: **Botanical Diversity**

Merston Solar - Solarcentury

A ~7ha former arable site which had previously been perfectly average in terms of botanical diversity (26 different species recorded in 2018). Following the 2018 monitoring the cutting schedule was slightly amended, enabling the sward to develop further. In 2019 we recorded 41 different species (33 different herbs), making it one of our more diverse sites! Characteristic species such as red campion, evening primrose, oxeye daisy and tansy, have been noted throughout, highlighting both the success of seeding by Habitat Aid back in 2016 and the importance of correct management for maintaining biodiversity.

The solar farm and the field margins can vary significantly

SOLARVIEW

Weeds and Undesirable Species

Injurious weeds under the Injurious Weeds Act, 1959 (broad-leaved dock, curled dock, creeping thistle, spear thistle and ragwort) legally require management to prevent spread onto adjacent land. We recorded at least one of these species on 96% of the sites we monitored in 2019.

We have included both common nettle and bramble in this analysis as, although not considered injurious or notifiable weeds, they can create considerable management burdens and dominate in areas.

It is worth noting that although in some cases there is a legal requirement to control injurious weeds to prevent their spread, they provide a valuable nectar source for invertebrates and are even key food plants for particular

Painted Lady butterfly within a solar farm on a creeping thistle (a larval food plant of this species)

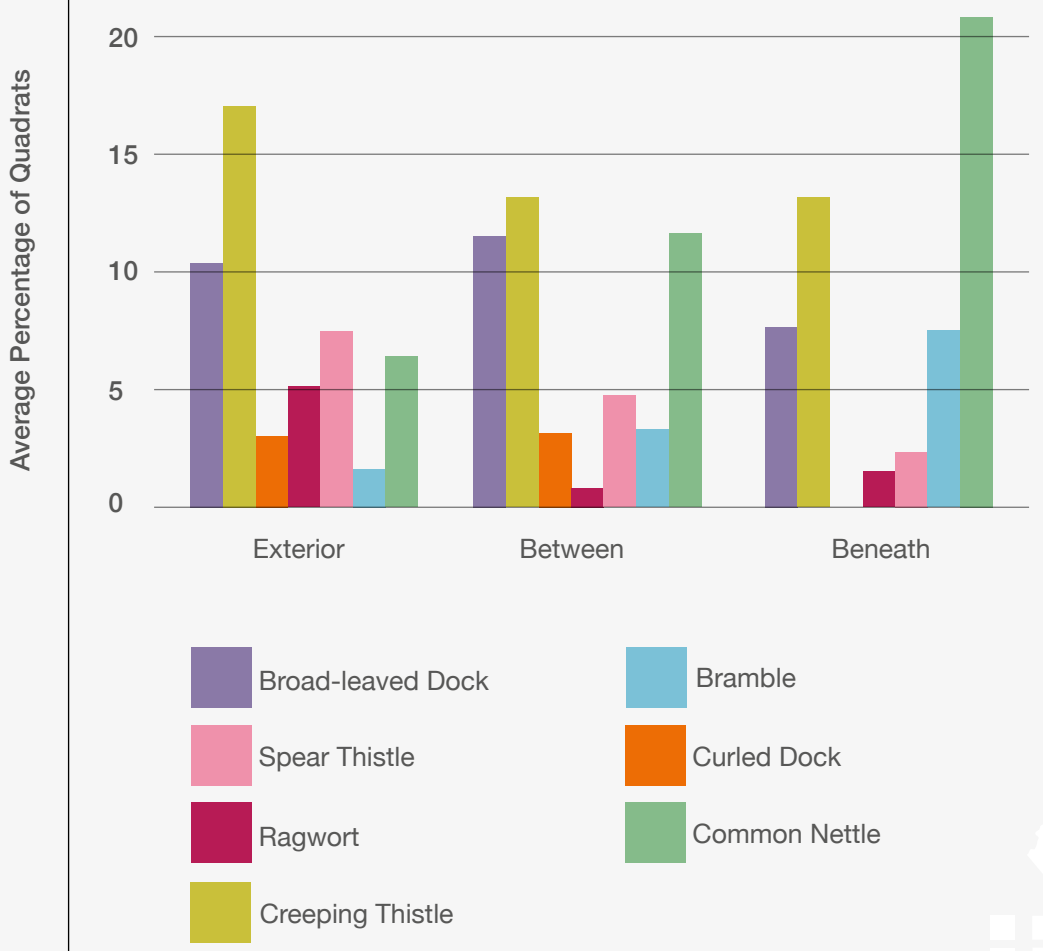
butterflies and moths. For instance the cinnabar moth key food plant is ragwort. Cinnabar moths were recorded on 15% of sites in 2019 and ragwort was recorded on 19% of the sites. Thistles are also primary nectar sources for 10 different species of butterflies and provide a secondary nectar source for a further 26. Nettles are another key food plant for a range of species. Clearly a balance between responsible management of the sites and the biodiversity benefits of species present needs to be struck.

Generally the percentage cover of injurious weeds within solar arrays remains relatively low and is likely to be consistent with those levels recorded in local habitats. As represented within the adjacent bar graph, creeping thistle was the most common and consistently encountered injurious weed.

25% of the “beneath” quadrats taken in 2019 included injurious weeds, while they were recorded in 33% of the “between” quadrats and 43% of the “exterior” quadrats. By contrast the undesirable species (nettle and bramble) were more commonly encountered beneath panels than anywhere else in the solar farms.

14.5% of all quadrats spread over 69% of the sites supported creeping thistle, whereas broad-leaved dock was only recorded in 9.75% of all quadrats but was recorded in over 88% of all the sites. Creeping thistle is a particularly resilient weed which often requires targeted treatment and

Average % Undesirable Weeds by Quadrat Type 2019



can easily dominate where present, whereas broad-leaved dock is more easily controlled, possibly accounting for its lower occurrences despite the increased distribution. It is also worth noting that both species are very common and were likely present on the remainder of the sites but just not recorded within the monitoring survey.

Vigorous shade tolerant common nettles (recorded on 46% of 2019 sites) and bramble (recorded on 3% of sites) can represent a problem when growing under or around the panels, as they can restrict maintenance access, create shading and pose a fire risk. It is assumed that the dominance of common nettles will decline over time due to the gradual reduction of nutrients within the soil, however there is no long term data to confirm this as yet, and is something we are keen to look into.

Bindweed has also been mentioned as a common concern by operators, though we have not yet encountered this species either within our monitoring quadrats or as part of our ad-hoc walkover surveys of sites.

Management of undesirable weeds can be a significant challenge and represents a considerable expense for operators. On some occasions where weed species are prolific, the use of herbicides may be essential to manage the weed problem and ensure that injurious weeds do not spread to adjacent sites (which might represent a breach of the law). Spraying of herbicide under the entirety of the strings has been observed on numerous sites. This kills all broad-leaved plants and subsequently makes the incursions of further problem weeds more likely in the future.

Bramble growing beneath a string – restricting maintenance access

An example of nettle management through topping beneath the panels and collecting of arisings

We have observed herbicides being broadcasted non-selectively across sites which had previously been seeded (at significant expense) with a species-rich seed mix. This resulted in not only the injurious weeds being eradicated, but also all other broad-leaved plants, including wildflowers. Care should be adopted in selecting appropriate treatments for weed species; even the use of selective herbicides such as Grazon will eliminate many of the species deliberately sown. Where impact assessments and biodiversity enhancement strategies have included the creation of species-rich grasslands, management may need to be modified in order to control the extent of injurious weeds without the use of blanket spraying of herbicides. This might include topping of the sward at strategic times of the year, more regular cutting or changes in the grazing intensity. As a last resort, spot spraying or weed wiping may be necessary.

Given the time and expense often put into weed control across sites, we are keen to look at how management practices affect the control or spread of weeds. However, given the large number of variables; providing a detailed assessment of how management affects injurious weeds requires in depth multivariate analysis. As such this is something we are working with Lancaster and York University to look into further. Any comparisons between management strategies are difficult due to the large number of variables; including historic land use, timing of management, whether grazing is removed during key parts of the year, whether a site has been seeded with a diverse seed mix, any herbicide application and the removal or otherwise of arisings etc.

Injurious and undesirable weeds do not require control if they are not spreading to land outside the solar farm and are not causing any maintenance issues. Our botanical surveys have been an extremely useful tool to monitor establishment and spread of weeds and can give an early indication of when management may be required.

2 Injurious Weeds Act (1959 as amended). HMSO, London. https://www.legislation.gov.uk/ukpga/Eliz2/7-8/54/contents

Case Study: **Weeds and Undesirable Species**

Newton Downs – Solarcentury

As is typical of a lot of formerly arable solar farms, the first years' monitoring post construction found high levels of injurious weeds across this site. Following this monitoring survey, efforts to reduce the weeds were made using targeted spraying and topping as well as continued sheep grazing. By the second years' monitoring, injurious weeds which had comprised approximately 15% of the sward in places were now only noted as individuals very occasionally, representing less than 3% throughout. This remarkable decline in injurious weeds was not mirrored by any significant decline in overall botanical diversity, which remained above the average, highlighting the success of management.

SOLARVIEW

Birds On Solar Farms

We recorded 65 different bird species during our monitoring in 2019 alone across just 26 sites. Of these, 12 were BTO Red listed Species of Conservation Concern and 15 were BTO Amber Listed.

The recorded species assemblage, shown in the bar chart on page 22, was typical of farmland habitat with a mean of 12.5 different species per survey. This was highly variable, with some sites having as many as 31 different bird species whilst others had as few as 2. It should be noted that these recordings were from ad-hoc observations only and specific bird surveys have not been conducted, therefore a variety of factors may have skewed the results. Nevertheless we believe that the data is useful to examine general trends.

An extant SUDs pond adjacent a colar site – valuable habitat for a range of species managed by the O&M for the site

A well seeded field margin with establishing tree planting adjacent a solar farm, providing a valuable wildlife enhancement.

Over the last two years of solar monitoring we have recorded 87 different species; 19 Red Listed Species of Conservation Concern and 18 Amber Listed Species of Conservation Concern. The numbers of Red and Amber listed birds recorded within each site was highly variable, with some solar farms supporting as many as 5 Red listed and 7 Amber listed species, whilst on other sites no species of conservation concern were recorded.

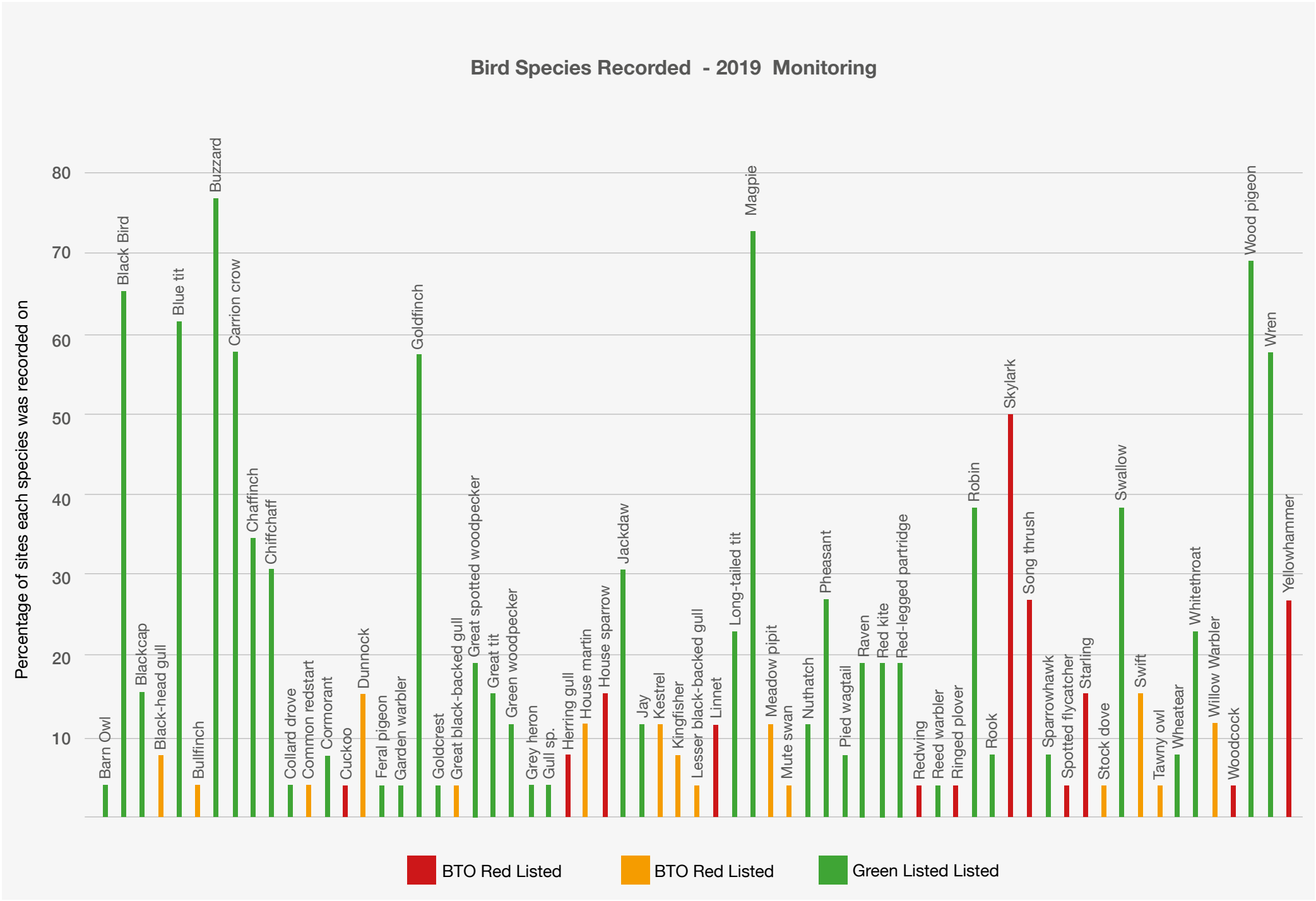
As with the 2018 surveys, the most frequently recorded Bird of Conservation Concern remains skylark, which was recorded on 50% of the sites. Though no nests were found, skylarks were flushed from sites by surveyors walking between the panels, and were noted singing while perched on the panels and foraging within solar farms. Skylarks are ground nesting birds which typically need long sight-lines, therefore it has been wildely assumed that they would be displaced by the construction of a solar farm. Our monitoring shows that skylarks do use solar farms as part of their territory and may use sites for breeding. It is unclear if nesting within solar farms reflects site fidelity (the desire to continue to nest in the same location each year) or evidence that birds do not respond in the manner typically anticipated by ecologists. This would be an interesting area for further research which we hope to pursue.

Skylarks were not the only ground nesting birds recorded using the solar farm interiors, with yellowhammers recorded at 27% of sites. Smaller numbers of wheatear and meadow pipit were also recorded using the sites.

The bar chart shows that a large diversity of birds were recorded during the 2019 monitoring surveys. The most common bird encountered was buzzard (recorded on 77% of all sites). Predatory birds (buzzards, sparrowhawks, kestrels and red kites) were recorded on 92% of all sites monitored in 2019. Ad-hoc notes by surveyors include references to sparrowhawks, buzzards and kestrels foraging within sites, particularly within the field margins where the longer grass offers suitable habitat for small mammals, invertebrates and reptiles.

3 The British Trust for Ornithology (BTO) List of Conservation Concern 4 was updated in 2015; the document reviews the status of birds in the UK, assessing trends in range and population, localised distribution, historical declines, rarity and international importance. The list separated 244 species into red, amber and green levels of conservation concern, with species on the red list being the most venerable or experiencing the greatest decline:

Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. Mark Eaton, Nicholas Aebischer, Andy Brown, Richard Hearn, Leigh Lock, Andy Musgrove, David Noble, David Stroud and Richard Gregory. British Birds 108, page 708–746. Dated December 2015.


Bird Species Recorded - 2019 Monitoring
Percentage of sites each species was recorded on
80
70
60
50
40
30
20
10
Barn Owl
Black Bird
Blackcap
Black-head gull
Blue tit
Bullfinch
Buzzard
Carrion crow
Chaffinch
Chiffchaff
Collard drove
Common redstart
Cormorant
Cuckoo
Dunnock
Feral pigeon
Garden warbler
Goldfinch
Goldcrest
Great black-backed gull
Great spotted woodpecker
Great tit
Green woodpecker
Grey heron
Gull sp.
Herring gull
House martin
House sparrow
Jackdaw
Jay
Kestrel
Kingfisher
Lesser black-backed gull
Linnet
Long-tailed tit
Magpie
Meadow pipit
Mute swan
Nuthatch
Pheasant
Pied wagtail
Raven
Red kite
Red-legged partridge
Redwing
Reed warbler
Ringed plover
Robin
Rook
Skylark
Song thrush
Sparrowhawk
Spotted flycatcher
Starling
Stock dove
Swallow
Swift
Tawny owl
Wheatear
Whitethroat
Willow Warbler
Woodcock
Wood pigeon
Wren
Yellowhammer
BTO Red Listed
BTO Red Listed
Green Listed Listed

SOLARVIEW

Ecological Enhancements

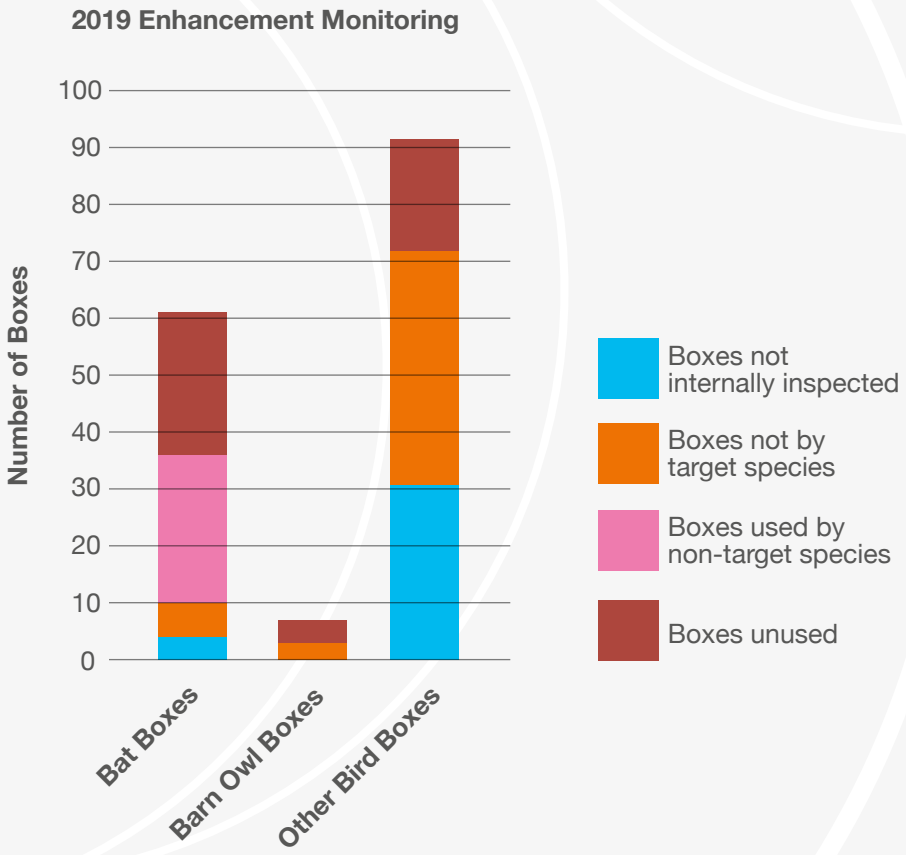
Habitat Boxes

41% of the 119 boxes we internally inspected in 2019 were being used by the target species/taxa. This is a similar success rate to 2018 when out of 400 boxes 40% were used by the target species.

Where bird and bat boxes were recommended within the management plans or ecological reports for the site, these had been installed on 88% of sites prior to the 2019 monitoring visit. The average number of boxes installed within a single site was 5 bat boxes and 5 bird boxes.

A bat box and a barn owl box within a solar farm.

In total we found 67 small song bird nests (26 of which were in bat boxes), 3 barn owl nest sites (including nests with chicks), a corvid nest, and 6 bat roosts in 2019. Bird boxes were most likely to be used, with an occupancy rate of 68% in 2019, of which 70% of nests were associated with tit species. 10% of the bat boxes we inspected in 2019 were used by bats with a further 44% of bat boxes used by nesting birds. Additionally 43% (3 of 7) of barn owl boxes we inspected were used by nesting barn owls. In 2018 when we externally inspected 14 barn owl boxes we found an uptake rate of 28.6%.



Case Study: **Ecological Enhancements**

Berthllwyd – BayWa R.E. Ltd

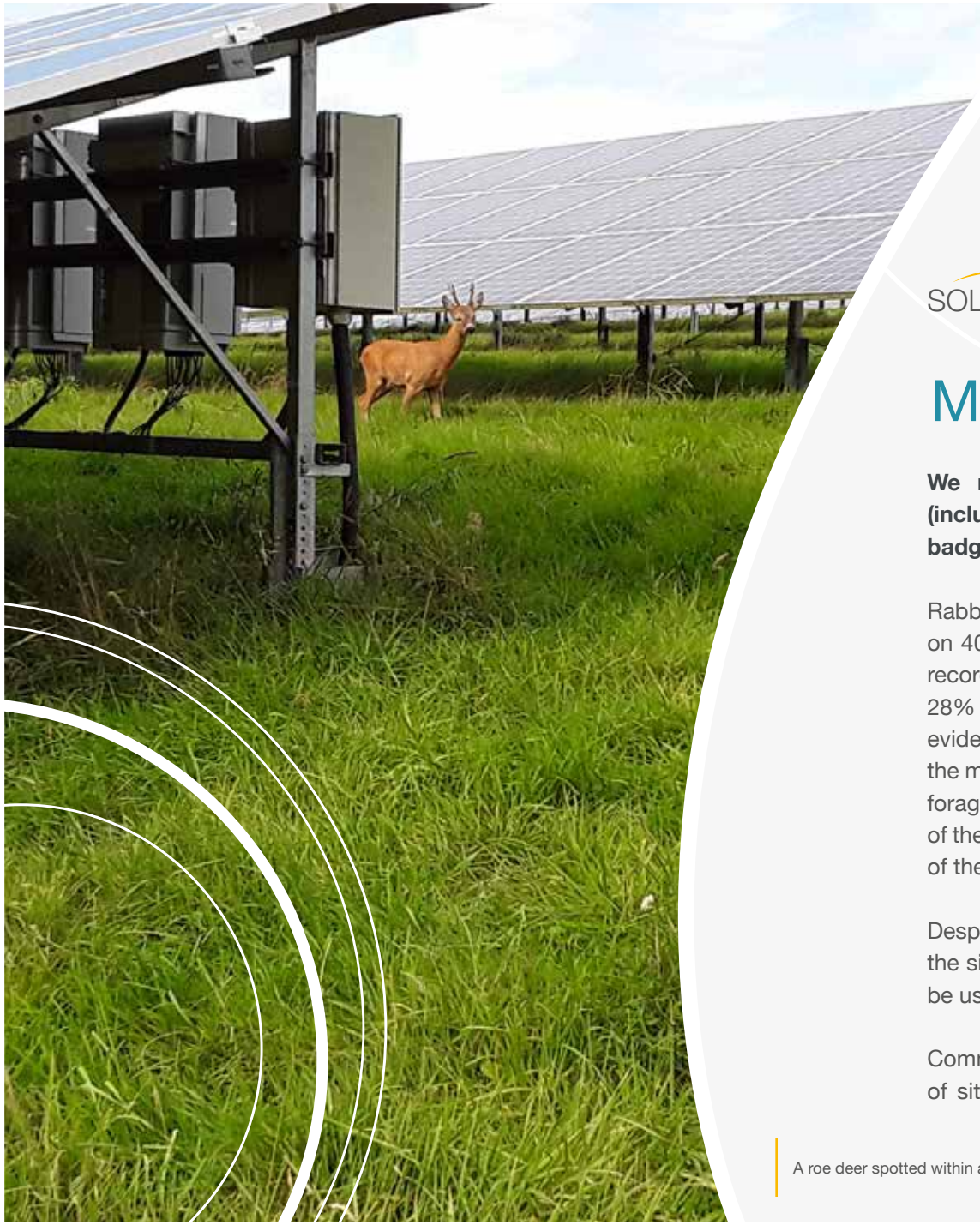
In 2019 four boxes (24% of those installed) were found to be used by roosting bats. The same boxes were also inspected in 2018, when only two boxes were found to be used. The site has a total of 17 bat boxes, all of which were installed in 2017. The boxes comprise Schwegler 1FD, 2F and 1FW boxes, with only the 1FD boxes found to support roosting bats to date. The reason behind the particularly high rate of box uptake is unclear. It might reflect a lack of natural roosting sites within the surrounding area (although the adjacent large mature woodland makes this relatively unlikely), it may reflect the presence of good foraging habitat within the array and thus an increased level of activity by bats within the area, or it may reflect that this solar farm had a number of mature trees offering ideal locations for erecting bat boxes.

While the uptake rate of bat boxes seems low, it is important to note that bat boxes which are confirmed to be used by roosting bats in any one year are considered successful. This is particularly due to the short lifespan of evidence of use (droppings) and the use of multiple roosts by bats. Since our monitoring work began we have found bat boxes have an average occupancy rate of 15% and of all 24 sites where we have monitored bat boxes 46% of them have at least one bat box in use. Given that during the construction of the arrays no losses of bat roosting sites occurred, the installed enhancement measures have been demonstrated to deliver a real gain in biodiversity.

Where we hold the information on the installation dates of the boxes, the success rate (percentage of boxes internally inspected found to be used by target species) of bat and bird boxes can be calculated. Currently we see no particular trend in the percentage of boxes used within a particular site. There does appear to be a small, non-significant increase in uptake over time but currently the data set held is inadequate to draw any meaningful trends.

Habitat enhancements on solar sites extend well beyond bird and bat boxes and include an array of measures such as hedgerow planting, log pile installation and hibernacula creation. The success or otherwise of these features is difficult to measure quantitatively, however they provide valuable features within a landscape.

A hibernacula constructed within the field margin of a solar farm



SOLARVIEW

Mammals

We recorded eight different mammal species using the sites (including bats found in boxes). Species included roe deer as well as badger, brown hare, rabbit, fox, mole, and field vole.

Rabbits were the most commonly observed mammal in 2019, recorded on 40% of sites, while hares (recorded on 53% of the 2018 sites) were recorded on 32% of the 2019 sites. Evidence of foxes was recorded on 28% of sites, and 16% of sites were being actively used by badgers with evidence of foraging being found. New setts have also been recorded at the margins or solar farms which might be indicative of the high quality of foraging opportunities within the array. We intend to examine how many of the sites were known to be used by these species prior to construction of the solar farm.

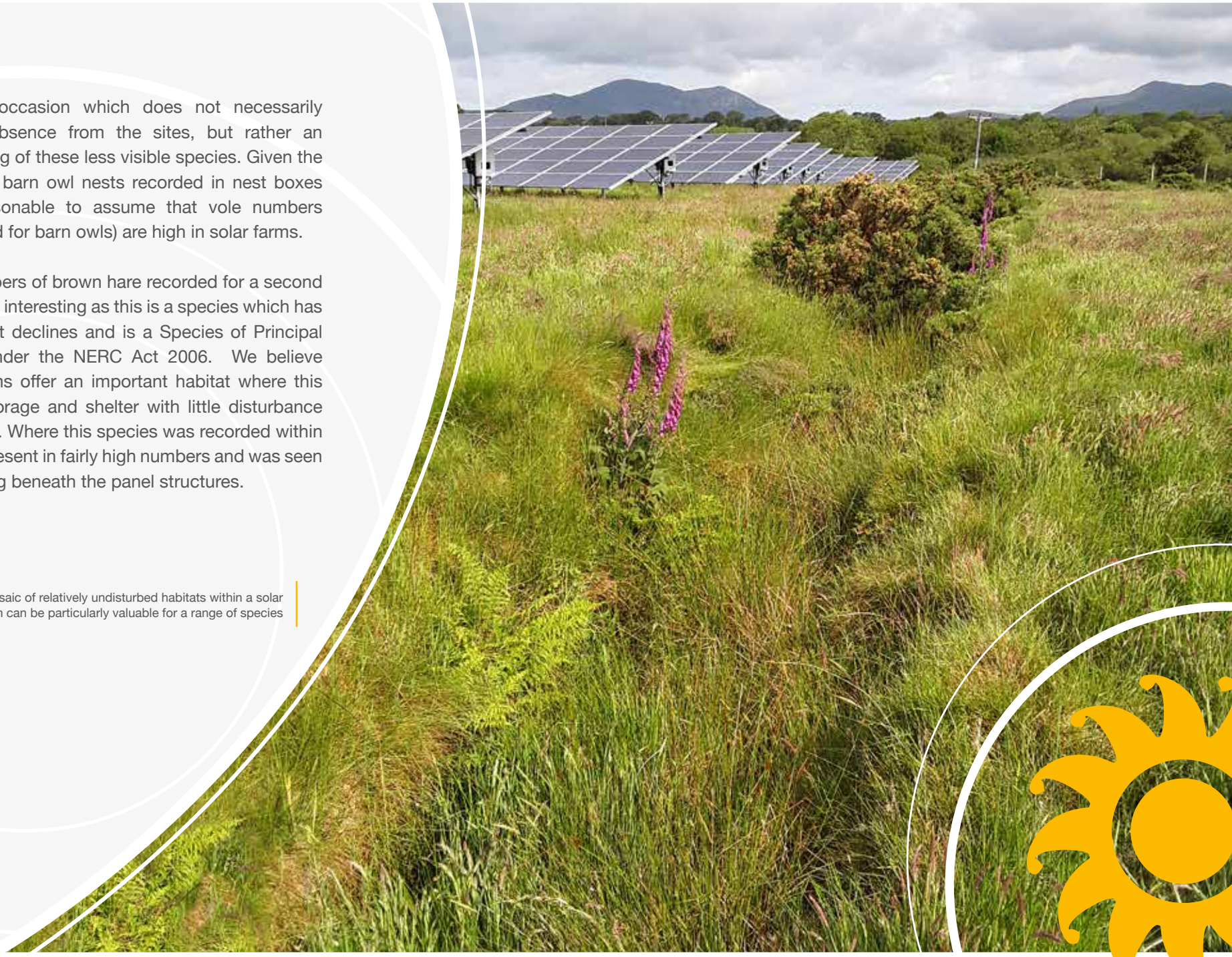
Despite the 6ft deer proof fencing, roe deer were sighted within 12% of the sites, as shown in the adjacent photograph. All solar farms found to be used by deer are grazed by sheep.

Common species such as field voles (8% of sites) and moles (4% of sites) encountered during the 2019 monitoring, were only recorded

A roe deer spotted within a solar farm

on the odd occasion which does not necessarily indicate an absence from the sites, but rather an under-recording of these less visible species. Given the abundance of barn owl nests recorded in nest boxes it seems reasonable to assume that vole numbers (a primary food for barn owls) are high in solar farms.

The high numbers of brown hare recorded for a second year in a row is interesting as this is a species which has suffered recent declines and is a Species of Principal Importance under the NERC Act 2006. We believe that solar farms offer an important habitat where this species can forage and shelter with little disturbance or persecution. Where this species was recorded within sites, it was present in fairly high numbers and was seen to be sheltering beneath the panel structures.



The mosaic of relatively undisturbed habitats within a solar farm can be particularly valuable for a range of species

SOLARVIEW

Invertebrates

We recorded 75 ad-hoc observations of different invertebrate species across the sites monitored in 2019, with 28 species of butterflies; 4 moths; 11 beetles; 8 dragon/damselflies; 7 bees; 3 grasshoppers and crickets; as well as 14 other species.

We conducted two detailed surveys, recording butterflies and bumblebees on a total of 7 transects within one site and four separate visits to survey for butterflies on another site. For the remainder of the sites, invertebrate information was obtained through ad-hoc observations noted by surveyors as they were undertaking the walkover survey. As such, the invertebrate data is affected by the same limitations as the bird data. Large numbers of invertebrates were likely under-recorded, with only the most visible and easily identifiable species recorded.

As with the 2018 findings, almost half of the invertebrates recorded (49%) were butterflies. Butterflies were recorded on 95% of the sites we surveyed in summer 2019 with an average of 4 butterfly species per site.

Buff tailed bumblebee on red clover
Banded demoiselle on red clover within a solar farm

Meadow brown was the most commonly recorded invertebrate, found on 71% of sites we surveyed. Similarly, easily distinguishable and common bumblebee species were commonly recorded; red-tailed bumblebee on 46% of sites and buff-tailed bumblebees on 33% vvof sites.

Of the 28 different butterfly species recorded, small heath, grayling and dingy skipper are 'High' Butterfly Conservation Trust priority species and Species of Principal Importance under the NERC Act 2006, each of which were recorded on single sites.

Sites with higher botanical diversity (recorded during botanical surveys) seemed to have higher recorded diversities of invertebrates (from the ad-hoc recordings only). Statistical analysis indicates that there is no significant correlation at present within our data. Butterfly diversity shows a similar non-significant correlation with botanical diversity as can be seen from the scatter graph below. The variable approach taken to invertebrate recording makes drawing comparisons from different sites difficult. To enable accurate comparisons to be drawn, a standardised survey methodology for each site would be required with each solar farm being subject to survey on several occasions over a season. We are looking out for opportunities to begin this sort of study as invertebrate diversity is an excellent indicator of ecosystem health and biodiversity.

Case Study: **Invertebrates**

Kencot Solar Farm – Foresight Solar Fund Ltd

Kencot Solar is a 48ha (37MW) solar farm; due to the size and complexities of the site we undertake 30 botanical quadrats (split between the northern and southern parcels) as well as detailed butterfly surveys. The 2019 monitoring survey recorded differences between the north and south despite comparable management, with 38 different flowering species and 10 different grass species in the northern parcel (which is the exact same number as found in the 2018 survey) compared to 7 different grasses and 36 other species in the southern, with slightly higher occurrences of injurious weeds in the southern parcel. This helps to inform future management works and ensure the best result for biodiversity within the site. This highly diverse site is where the Butterfly Conservation Trust 'High' priority dingy skipper and small heath were recorded. Both species have been regularly recorded on this site throughout, from the initial pre-construction surveys to the annual monitoring. The monitoring shows a steady increase in invertebrate diversity over time with 22 species in 2018, 15 in 2017 and 10 in 2016.

SOLARVIEW

Conclusion

The compilation of the dataset outlined within this report is the result of multiple companies appointing us to conduct ecological monitoring of solar farms throughout the country. This remains a unique study and to the best of our knowledge there remain few other studies which have aimed to aggregate data from ecological monitoring of solar arrays with the aim of presenting an overview of the ecological performance of these sites.

In this report we are able to provide a valuable summary of our initial findings, which helps to underpin the way we (and the industry as a whole) conduct pre-planning surveys and prepare management plans going forwards. The industry needs an evidence base to ensure that ecological impact assessments are accurate and the opportunities for ecological enhancement are maximised.

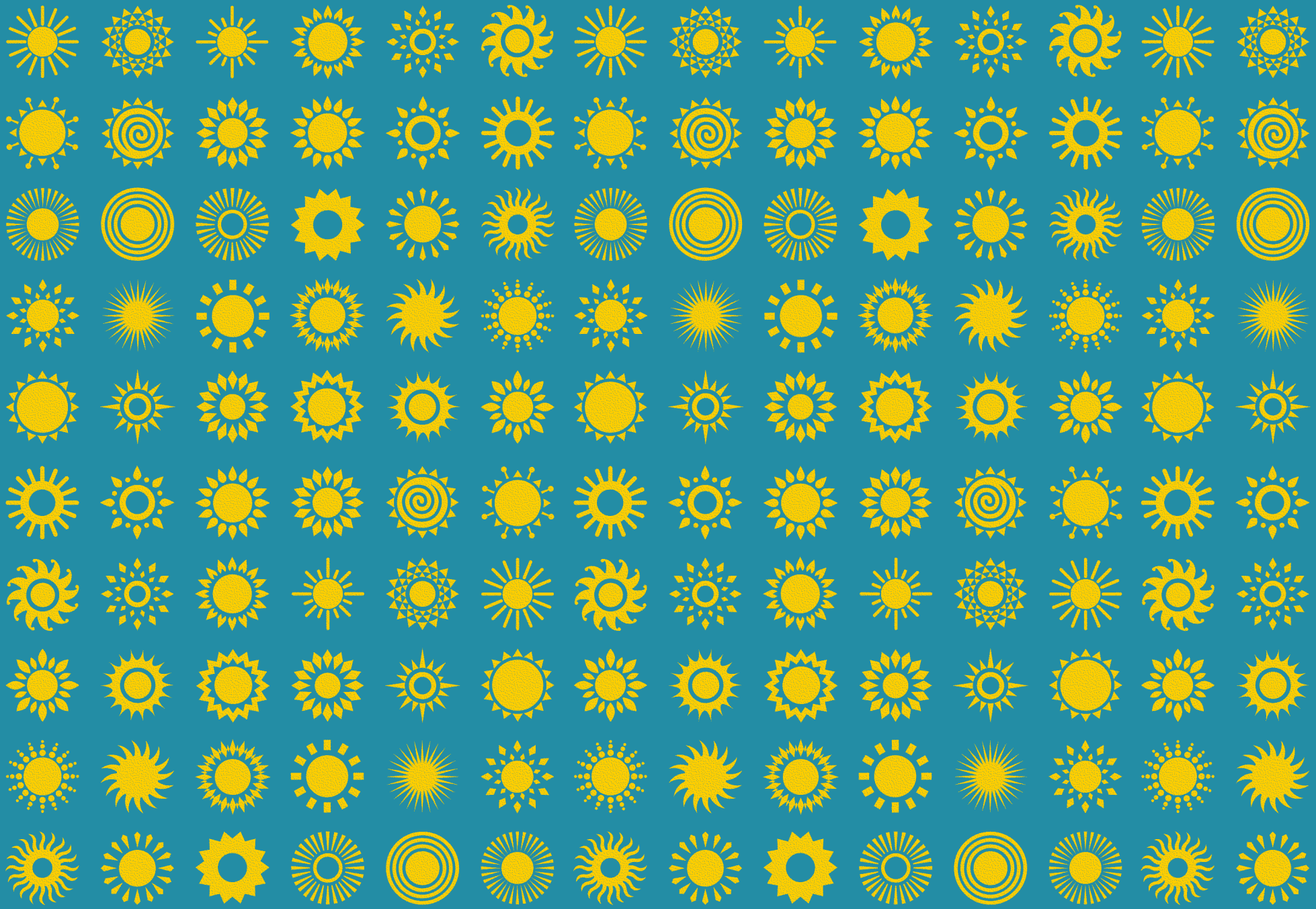
We are currently collaborating with Wychwood Biodiversity as well as Lancaster and York Universities to collate the information we (Wychwood Biodiversity and Clarkson & Woods) have, as well as carrying out a range of multivariate statistical analysis into the effects of various extraneous variables on solar farm biodiversity and the ecosystem services solar farms can provide. This will be submitted to a peer reviewed journal this coming year.

We will continue working with academic institutions so that further detailed statistical analysis examining how different solar farms can maximise their biodiversity potential. With the aim of monitoring ever more sites across the UK we hope to gather enough of a dataset that the results can be extrapolated to represent the scale of ecological enhancements delivered by the solar industry across the UK.

Additionally, we have had input into a tool being created by a group of academics, led by Lancaster University, known as SPIES (Solar Park Impacts on Ecosystem Services). This evidence based tool is aimed at helping solar park developers and operators make management choices which will benefit the environment and people (https://www.lancaster.ac.uk/spies/).

If you would like to know more about the monitoring surveys we conduct, or if you have a solar site which requires upcoming monitoring and would like your site to be included within our important study please feel free to get in touch.

Common blue butterfly within a Solar Farm



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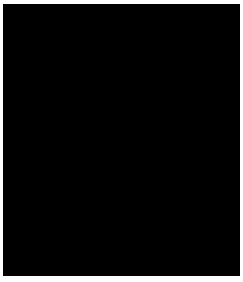
APPENDIX 4

Blithe Spirit: Are Skylarks Being Overlooked in Impact Assessment?

Figure 1. Skylark, *Alauda arvensis*, in flight. Photo credit: Keith Williams.



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Keywords: arable farmland, bird mitigation, ground nesting birds, set-aside

In the absence of guidance, potential effects of development on ground-nesting birds (GNBs) of open habitats are being overlooked, with mitigation often being arbitrarily formulated. This article focuses on skylarks *Alauda arvensis* to encourage a re-examination and discussion of assessment and mitigation best practice for GNBs of conservation concern.

Introduction

The spiralling song of the skylark is so embedded in the national psyche that for many, it embodies much of the British landscape. The likely UK population is around 1.5 million pairs, less than half of what it was in the early 1980s (https://app.bto.org/birdtrends/species.jsp?s=skyla&year=2018). The steady decline of the skylark population since the 1970s due to agricultural intensification and habitat loss is well documented and has led to their inclusion on the IUCN Red List, as well as being Priority Species throughout the UK. Indeed, the species is emblematic of the general decline in populations of many farmland birds, especially ground-nesting birds (GNBs) of open habitats, including lapwing *Vanellus vanellus*, yellow wagtail *Motacilla flava* and grey partridge *Perdix perdix*. Yet despite the publicity, and their capability of being material considerations in the planning process, it appears that skylarks and other GNBs are often undervalued – or simply missed altogether – in ecological assessments. Furthermore, where mitigation *is* recommended, are we sure that it is based on an ecologically sound rationale?

The highest densities of skylarks occur in upland and coastal regions and the arable heartlands of the east of England. Here, and in Northern Ireland, are the scenes of the greatest losses of skylarks in recent decades (Figure 2). The Centre for Ecology and Hydrology reported in 2020 that some 768,000 ha of

grassland (including arable) were lost mostly to urban development and woodland planting between 1990 and 2015. Around 1–2% of greenbelt land is developed annually according to the Office for National Statistics, with the Government pledging to build a further 300,000 new homes per year. In a bid to tackle climate change and energy security, the Government has suggested the UK's solar energy generation capacity could grow five-fold to 70 GW and pledged a surge in support for onshore wind energy. While the fortunes of GNBs may be dramatically influenced by changes in agricultural policy, piecemeal developments have the potential to exacerbate local declines and place greater pressure on remaining habitats to absorb displaced birds.

Having examined publicly available Ecological Impact Assessments of developments on land supporting skylark territories, it would appear there is an inconsistency in understanding of not only skylark ecology, but opinion on what might constitute an impact, and what mitigation could be employed. This is likely to be the case for other GNBs but is understandable given the scant guidance on impact assessment for birds. Advice on the issue given to clients by different consultants varies wildly. This situation risks undermining the industry and creating a 'race to the bottom' where potentially ecologically harmful advice becomes prevalent.

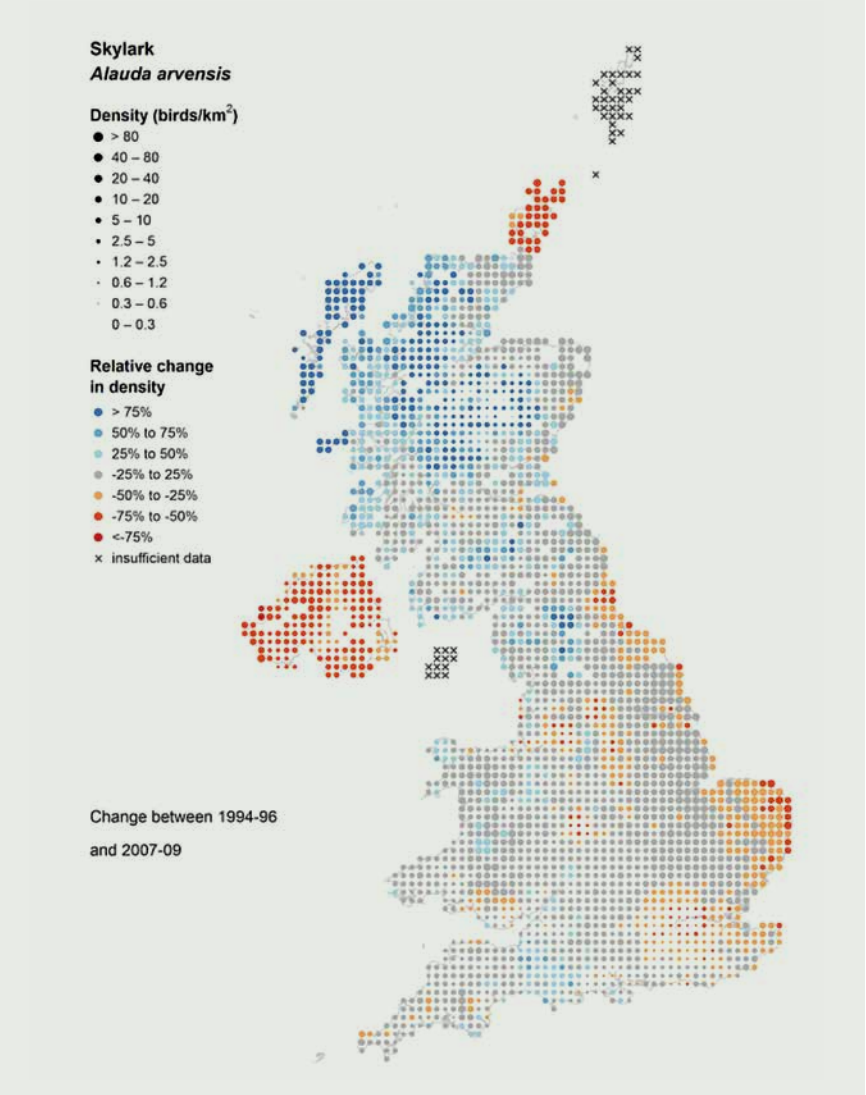

Figure 2. Skylark population change between 1994–96 and 2007–9. Data from the British Trust for Ornithology.

Skylark ecology

Skylarks have evolved to rely on secrecy and vigilance to avoid predation. Edge habitats are used by predators for hunting and cover (Donald 2004), so when selecting nest sites, skylarks require long, unbroken sightlines (Wilson *et al.* 1997). Tall structures such as trees, buildings or tall hedgerows all cause even optimal habitat to be avoided (Donald *et al.* 2001), unless the field area is particularly large (Whittingham *et al.* 2003). One study estimated the effect of dissuasion by tall structures to span approximately 200 m (Oelke 1968).

The height and density of vegetation for nesting is important because access to the ground, for moving through the vegetation back to nests, needs to be sufficiently free. Consequently, skylarks have a clear preference for vegetation height of between 20 and 60 cm, although taller crops such as linseed and rapeseed can be tolerated where the vegetation is less dense at ground level (Toepfer and Stubbe 2001).

Figure 3. Skylark nest. Photo credit: Hannah Montag.

In optimal habitat, skylarks can have up to four broods per year. The number of nesting attempts a pair is able to make each year is a strong indicator of the stability of a skylark population (Donald 2004). As arable farmland is typified by 'winter cereals' (where the next crop is sown shortly after the summer harvest), the head start that crops receive over traditional spring sowing often precludes a third – or even a second – brood as they overtop 60 cm sooner (Donald and Vickery 2000). Additionally, taller vegetation forces birds to nest closer to tramlines, thereby increasing predation rates (Morris and Gilroy

2008), while more spraying and an earlier harvest together cause significant nest mortality. The loss of spring cereals alone has been said to account for the majority of change in skylark population in the last 30 years (Donald 2004).

While chicks are almost exclusively fed on invertebrates, adult birds also feed on seeds, grains and leaf shoots. As grassland habitats are usually less productive for invertebrates than for example, woodland, skylarks nest at comparatively lower densities than many other songbirds. Table 1 shows the relative densities of skylarks foraging in different agricultural habitats. The greatest densities are in unimproved grasslands and heaths, but in an agricultural setting, set-aside and fallow (where weeds encroach) is best (Poulsen *et al.* 1998). Pasture and other improved grassland usually supports the very lowest densities of skylarks on farmland (Donald 2004).

Development impacts

On a typical housing or solar scheme, it is difficult to see how potential displacement impacts on skylarks can be overlooked. Even with the inclusion of amenity grassland, easements or buffers of retained habitats are likely to be incompatible with the requirements of nesting skylarks, unless very large, undisturbed and managed to promote invertebrates. For example, in preparing this article, no conclusive records of skylark nests within an active solar array were found. This includes data derived from the post-construction monitoring of over 100 solar installations in England and Wales by our company and from observations from associates in the industry.

Male skylarks are frequently observed advertising territories over solar arrays. However, singing is not a conclusive indicator of a viable nest. Skylarks, like many other birds, exhibit strong nest-site fidelity (Donald 2004) and results from one well-established 60 ha solar site that we monitor showed that numbers of singing birds waned following construction from a peak of seven in 2015 to zero in 2020 and 2021.

Skylarks have, however, been recorded many times foraging within solar arrays and even feeding recently fledged young. Fledglings can disperse considerable distances from their nests in just a few days and continue to be fed by parent birds for between 8 and 12 days after fledging (Donald 2004), so this behaviour alone may not be considered evidence of nesting on site. It is possible, therefore, that development sites with suitable grassland might even provide 'nursery' habitat where nesting takes place on adjacent farmland.

The fate of displaced skylarks is unclear. As ecologists we will need to decide the likely significance of effects and whether mitigation should be considered. This decision will be informed by the number of territories displaced versus retained, any wider habitat fragmentation, the habitat type and territory density on surrounding land and the management of any retained or created habitat.

Considering the above, if the carrying capacity of neighbouring habitat allows, some degree of 'absorption' into the surroundings is theoretically possible. Where sites are in proximity to heaths, moorland or coastal grassland this may be more likely. However, in intensive arable landscapes, this is less so and an acceleration of a decline of local breeding success is possible, especially in combination with other development.

Options for mitigation

Their specific nesting requirements mean that effective compensation for skylark displacement requires either the provision of newly available habitat or the enhancement of existing habitat. Habitat enhancement could be designed to increase either the carrying capacity within mitigation land (thereby hosting displaced pairs) or the breeding success of pairs already present.

Arable sward-diversification measures which have been trialled with success for GNB enhancement include 'beetle banks', wider uncultivated margins and increased numbers of tramlines. While margins may be less likely to host actual nest sites, they are often incorporated into territories to exploit the foraging habitat they support and reduce the distance flown per foraging bout (Wilson *et al.* 1997, Donald 2004).

Perhaps the most familiar enhancement is the inclusion of 'skylark plots' within neighbouring arable land. Developed

Table 1. Example skylark territory densities according to habitat type and management. Adapted from Donald (2004) with additional data from research in References.

Habitat	Average density per hectare
Coastal marshes	0.76
Organic set-aside	0.56
Heath and steppe	0.56
Spring cereals	0.46
Set-aside/fallow	0.39
Organic cereals	0.38
Organic winter cereals	0.36
Intensive set-aside	0.36
Arable farmland	0.28
Rootcrops	0.27
Natural grassland	0.27
Moorland	0.26
Winter cereals	0.23
Mixed farmland	0.23
Organic silage	0.22
Pastoral farmland	0.18
Intensive cereals	0.17
Intensive winter cereals	0.15
Legumes	0.12
Oilseed	0.12
Organic grazed pasture	0.1
Brassicas	0.1
Intensive silage	0.08
Orchards	0.07
Rough grazing	0.06
Improved grassland	0.05
Intensive grazed pasture	0.02

by the RSPB in the 1990s, skylark plots are small (approx. 5 × 5 m) patches of undrilled land within arable fields created by turning off the seed drill momentarily at a rate of two per hectare. Plots are not designed to provide nest locations; rather, once colonised by weeds, they act as oases for invertebrates upon which birds can feed, increasing prey accessibility by opening up the sward. Several studies indicate success of plots in increasing territory densities, especially later in the season as the sward rises (Ogilvy *et al.* 2006).

It is common to see ecologists propose a basic metric such as two plots for each skylark territory displaced. It is not clear how this is decided upon and appears to confuse the 2 plots/ha rate of RSPB farmland management advice with a suggested rate per displaced territory. Territory densities in cereal crops vary between approximately 0.1 and 0.4 territories/ha (Donald 2004), increasing up to 0.8/ha with plots, so it is highly unlikely that 1 ha with plots would be able to support an additional displaced territory. We therefore argue against using this rate.

More recent research suggests confounding effects of plots on breeding success. An increase in predation has been shown in fields with plots (especially alongside aforementioned sward-diversification measures which create 'edges'; Morris and Gilroy 2008). Other studies fail to show significant benefits from incorporating plots, possibly due to poor colonisation by weeds, or increased pesticide overspray (Smith *et al.* 2009, Field *et al.* 2010). It is clear that the use of plots must be carefully judged and be just one of several options used, although not in the same fields.

The reversion to traditional spring-sown regimes with retention of winter stubbles provides a longer nesting season and better winter forage (Donald 2004). This is perhaps the best conventional arable management for skylarks, while set-aside and fallow are also excellent habitats (Poulsen *et al.* 1998), with organic farming showing further benefits, owing to reduced pesticide use and slower growing varieties.

An alternative mitigation metric

In the absence of other guidance, an alternative metric is presented that promotes optimal off-site compensation based on research into territory densities across different habitat types. The following method determines the amount of land which, when managed or enhanced accordingly, should accommodate a desired number of displaced skylark territories.

1. Use survey data to quantify the number of breeding territories in the development footprint. Example: 20 territories.
2. Calculate the density of territories across all skylark-suitable habitat to be impacted (the 'donor' site). Example: 20 territories/100 ha site = 0.2 territories/ha.
3. Decide on the number of territories to be compensated.
    a. It may be appropriate to discuss 100% compensation with your client as a worst-case scenario. Depending on the balance of other likely ecological impacts and benefits, there may be an 'acceptable' number of un-compensated displaced territories. Ultimately, this will be a professional judgement call based on site and development specifics.
    b. Other ecological effects inherent in the proposals may allow for a reduction in the need for compensation. For example, where the development site will retain or create sufficient grassland *foraging* habitat for skylarks, territories close to the edges of the development may benefit through increased breeding productivity. For example, we might assume that 50% of on-site territories occurring within 75 m of the development edge may not need to be compensated when suitable foraging land will be present on site, provided *sufficient nesting habitat is present on adjacent land to absorb them*. Example: eight on-site territories within 75 m of development boundary; 50% × 8 = 4 so 20 territories to be compensated becomes 16.
    c. If sufficiently open habitat is retained within proposals, or where there is an abundance of suitable habitat nearby which is likely to be below carrying capacity for GNBs, some absorption may theoretically reduce this further. However, caution should be exercised, and this effect may require baseline survey evidence.
    d. Cumulative impacts due to other development in proximity to donor and receptor sites should be examined, potentially raising compensation requirements.

Figure 4. Skylark on the ground. Photo credit: Keith Williams.

4. Determine the baseline territory density at the receptor site either from site survey or referencing research-based figures by crop type/land use (e.g. Table 1). If the habitat is sufficiently similar to the 'donor site', it may be more appropriate to apply the figure calculated in step 2.
5. Calculate the net change in territory density possible at a receptor site before and after enhancement.
   a. Determine the theoretical territory density achievable through a positive change in management at the receptor site (see Table 1). Example: 0.56 territories/ha in set-aside.
   b. From this, subtract the actual (surveyed) or assumed (Table 1/step 2) receptor baseline. Example: 0.56 – 0.2 = 0.36.
6. Divide the number of territories to be compensated by the net density change figure (step 5b) to give the number of hectares to be positively managed to accommodate displaced territories. For example, 12/0.36 = 44.4 ha.

Candidate receptor fields should feature low (<2 m high) boundary features, no buildings and a short axis of >200 m. The more ambitious the proposed habitat enhancement (e.g. grazed pasture to set-aside), the less receptor land required. In the absence of grassland creation or arable de-intensification, this calculation could at least indicate the area over which measures such as skylark plots, margins, headlands, etc., should be adopted. The management prescriptions on farmed receptor sites resemble familiar agri-environment scheme options and would cause a slight reduction in agricultural productivity. The concept of reimbursement for income foregone is well-established and serves as a useful starting point for discussion with landowners. Agreements may need to build in a degree of crop rotation within the landholding. Compensatory management should be secured in the long term and be accompanied by a degree of monitoring to further understanding of development impacts and mitigation effectiveness.

Conclusions

The prototype methodology given here is not perfect, makes several assumptions and is as yet without monitoring data. However, it is anticipated to provide a starting point for discussion on GNB mitigation. Hopefully, potential impacts on GNBs can be better anticipated and considered within impact assessment. We look forward to hearing the opinions of other ecologists and researchers on the severity or otherwise of development upon GNBs and the potential for successful mitigation, including refinements to data in Table 1. We would like to see the development of a forum on bird mitigation for use by practitioners, with examples and resources. In time, this should improve the general understanding of bird ecology among ecologists and result in more consistency.

Since GNBs require a lot of space, it is unsurprising that these calculations often indicate large compensation areas might be required. Clearly, this is likely to result in difficult conversations with clients where previously none may have taken place. In our opinion, this only serves to reinforce the need for more scrutiny of the issue by the industry, and more widely by policy-makers.

On development projects, the onus is typically placed on developers or agents to source receptor sites, negotiate management contracts and ensure monitoring is undertaken. Often, this can lead to poor outcomes for wildlife with the breakdown of agreements or lack of follow-up, continuity of personnel or enforcement. Perhaps there is an opportunity to integrate compensation with targets under schemes such as the proposed Environmental Land Management programme? Or alternatively, a system for brokering ecological mitigation between developers and land managers along the lines of that carried out through district-level licensing or natural capital marketplaces. The reversion of relatively small areas of intensive farmland to traditional, low-intensity management with the inclusion of set-aside and wide headlands and winter stubbles could contribute meaningfully to net gain and Nature Recovery targets.

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