# LONGFIELD SOLAR FARM

## Biodiversity Design Strategy

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Longfield Solar Farm Ltd.

Longfield Solar Farm
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Longfield Solar Farm

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# BIODIVERSITY DESIGN STRATEGY

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# Biodiversity at LSF

## Introduction

Longfield Solar Farm (LSF) located on 453 hectares of arable land west of Boreham, Essex is being developed as a joint initiative by EDF Renewables UK and Padero Solar to help the UK meet its targets of achieving net-zero carbon emissions by 2050 through low-carbon, renewable energy generation.

The Longfield Solar Farm Outline Landscape and Ecology Management Plan (OLEMP) states the landscape, habitat creation and mitigation measures required to mitigate the impacts of the solar farm and provide a positive gain for biodiversity, as detailed within the Environmental Statement. The biodiversity net gain (BNG) calculations suggest that once fully implemented the OLEMP will deliver a net gain in biodiversity (above the existing baseline) of approximately 79%, substantially more than a 10% gain as mandared by the Environment Bill. This is regarded as the minimum biodiversity gain that LSF will deliver.

The scale of LSF allows significant biodiversity benefits to be delivered without detriment to the capacity for energy generation. Therefore, over and above the ecology and landscape obligations set out within the OLEMP, the aim is for LSF to become an exemplar solar project that combines its positive climate benefits with a raft of natural capital and biodiversity benefits.

This document, the Biodiversity Design Strategy (BDS), outlines additional habitat creation and management suggestions to further enhance biodiversity at LSF above and beyond commitments secured in the OLEMP.

An exciting element of this is the potential development of a Biodiversity Trial Area. This will allow investigation into biodiversity benefits of long-term habitat management scenarios at solar farms in conjunction with an academic partner. The aim being to understand how management can achieve the best results for wildlife and to improve best practice in the solar industry towards restoring landscape, biodiversity and natural capital.

Note, this document is not intended to replace or duplicate the environmental commitments secured in the OLEMP, rather to provide additional refinements to further enhance biodiversity gain over time as habitat creation and management techniques are refined in partnership with the landowner and initial results from the Biodiversity Trial Area.

It is not anticipated that all that the additional habitat creation and refinement of management techniques outlined in the BDS will be adopted or delivered instantly but will be phased and implemented as the management of the LSF evolves over time. An initial BNG calculation suggests the design vision in the BDS has the potential to increase the anticipated biodiversity gain from 79% to something higher depending on what elements are adopted and taken forward.

It is anticipated that this BDS will influence the evolution of the final LEMP.

## The Scheme

Longfield Solar Energy Farm Limited (the Applicant) is applying for a Development Consent Order (DCO) for LSF. The consented scheme would comprise the construction, operation and maintenance, and decommissioning of a solar photovoltaic (PV) array electricity generating facility, electrical storage facility and export connection to the National Grid, including extension of the existing Bulls Lodge Substation (the Scheme).

Full details of the scheme are given in Chapter 2 of the Environmental Impact Assessment (EIA) (Longfield Solar Farm – Chapter 2 – The Scheme PINS Reference EN010118).

## Biodiversity Design

The baseline ecological conditions at LSF are described in detail in the EIA for the scheme (Environmental Impact Assessment (EIA) (Longfield Solar Farm– The Scheme PINS Reference EN010118), but in summary the proposed solar site comprises intensive arable farmland, with fields separated by degraded hedgerows. Blocks of woodland are scattered throughout but are primarily manged for timber. In the north of the site, on valley slopes of the River Terling, there are fields of improved pasture. The intensive farmland that forms the baseline for LSF sets the stage for its restoration to meet its full biodiversity potential.

The BDS has been informed by the baseline ecological, geological and soil conditions, the OLEMP and by biodiversity targets at the local (e.g. the Essex BAP and Buglife B-lines strategy), national (e.g. UK Pollinator Strategy and Biodiversity Net Gain policies in the Environment Bill) and international policy level (e.g. UN Sustainable Development Goals and Post –2020 Global Biodiversity Framework under the Convention on Biological Diversity (CBD).

Although this BDS document provides habitat creation and habitat management objectives, it is not designed to be overly prescriptive but to inform the evolution of the final LEMP, following consultation with stakeholders in accordance with the Requirements contained in Schedule 2 of the draft Development Consent Order (DCO).

The BDS covers the whole of LSF but excludes the cable route and Bull's Lodge substation where LSF will not have operational control.

## Work Packages

The Biodiversity Design encompasses the same physical footprint of land covered by the following Work Packages which relate the final scheme design:

- Work Package 6 - Comprises the installation of the solar array and the creation of biodiverse grassland under and between the arrays.
- Work package 10 – This encompasses all other habitat work to be delivered as part of the wider enhancement and restoration of the site's landscape and biodiversity.

The latter will include: restoration of lowland meadow and floodplain grassland; rewilding of the River Ter corridor; creation of field margins to benefit arable weeds, pollinators and farmland birds; hedgerow restoration; restoration of retained woodland and ponds; and creation of a Biodiversity Trial Area to generate and monitor practical biodiversity enhancement measures together with an academic partner.

FIGURE 1 LONGFIELD SOLAR FARM WILL BE AN EXEMPLAR RICH IN BIODIVERSITY AND ABUNDANT IN THE WIDER ENVIRONMENTAL BENEFITS FROM NATURE

# Biodiversity design details

## General principles

### Adaptive management and planning

As outlined in the OLEMP, the restoration of biodiversity at LSF will be directed throughout its operational life through adaptive management planning. Adaptive management and planning in conservation management is a process of identifying the best and most appropriate management regimes and interventions.

This approach first sets objectives for each habitat, then instigates management, monitors the outcomes and uses an evaluation of the data to adapt or amend the intervention if objectives are not being met (Figure 2). No adaptations are required if monitoring shows that objectives are being met.

For the additional habitat creation and management measures set out in this document some indicative objectives have been set which will act as triggers for management and will be set out in the LEMP. They will be clear, quantitative statements such as the number of species within 1m$^2$, the ratio of scrub to grass, or grass to herbs.  Setting well-defined objectives and management responses prevents the under- or over-management that can reduce biodiversity.

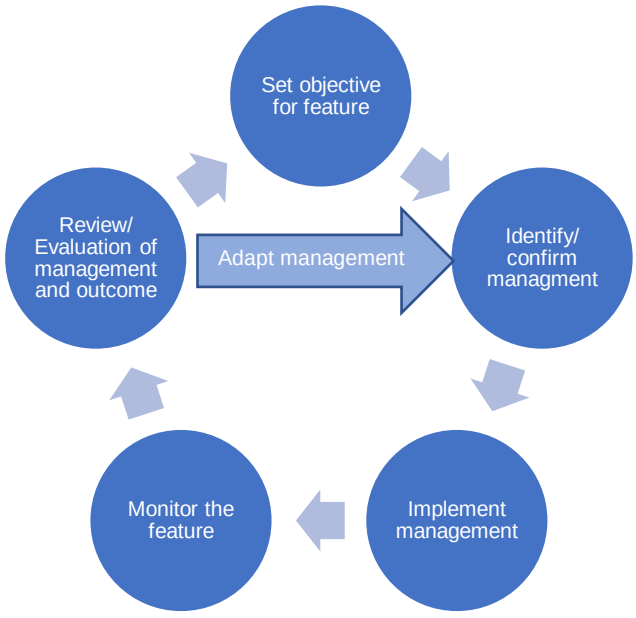


FIGURE 2 THE CYCLE OF ADAPTIVE MANAGEMENT AND PLANNING

### Accountability

Strong and transparent mechanisms will be implemented to ensure accountability for biodiversity. This will include implementing the biodiversity design at construction phase and ensuring long-term monitoring and management is secured during its operational phase.

LSF will have clearly defined accountabilities and personnel with responsibility for meeting goals ensuring biodiversity objectives are met. These are set out in the outline Construction

Environment Management Plan (OCEMP) for LSF, which is cross referenced in the OLEMP, and will be finalised within the CEMP.

## Nutrient neutrality

The soil nitrates and phosphates are currently high at LSF due to years of inorganic fertiliser application. High levels of these nutrients not only favours coarse grasses and leads to a less diverse sward (where many herbs typical of a species-rich grassland are outcompeted), but also contributes to the poor water quality seen in the River Ter.

At the earliest opportunity, once the Development Consent Order (DCO) is obtained, fertiliser application will end, thus preventing the continued build-up of these nutrients. Reducing these inputs will be critical to biodiversity restoration of the site.

It is not anticipated that sowing species-rich mixes into nutrient-rich soils will be effective, as grasses will outcompete wildflowers, and the yield (and therefore extent of nutrient depletion) will be reduced compared to a conventional grass seed mix for silage or hay cropping. The OLEMP suggests that the receiving soil will be sprayed with herbicide to remove existing growth and then a nutrient poor substrate incorporated with the topsoil (or removing topsoil) to reduce the nutrient levels of the receiving soil prior to sowing of wildflower seed. However, topsoil removal or deep inversion is unlikely to be consistent with LSF's decommission approach and may have implications for soil protection (see soil protection section below), and the subsequent return to arable farmland.

If the removal of topsoil or incorporation of a nutrient poor substrate is not practicable an alternative approach to reduce fertility could be as follows:

- Initial establishment of conventional grass ley (e.g. timothy grass or Italian rye-grass) on former arable soils with a cessation of fertiliser application;
- Cutting of grassland for silage or hay to deplete nutrients on at least 3-4 occasions prior to the sowing of wildflower seed.
- Removing grass from site to stop nutrients re-entering the system.
- Ploughing-in off this grassland and sowing with meadow grasses, so that these are established in advance of construction (timings will vary because of the phasing of the construction works).
- If ground conditions allow (i.e. little ground disturbance during installation of arrays is predicted), the wildflower component of these areas will be seeded at the same time (in spring or autumn);
- If more significant ground disturbance during construction is likely, meadow grasses will be seeded in advance, and will then be either lightly scarified or intensively grazed immediately prior to construction.
- Following installation of the arrays, wildflower seeds will be sown into the scarified turf (using hydroseeding) beneath the arrays, in spring or autumn.

This approach traps the nitrates and phosphates in the vegetation and transports it elsewhere, most likely as forage for livestock. Additional measures outlined in the BDS such as conservation grazing (if implemented) and additional mowing of the new habitats will continue to remove the nutrients from the site, though at a slower pace.

The final approach to reducing soil fertility before sowing wildflower seed will be detailed in the planting specifications and the LEMP. See below re soil protection.

## Protecting soils

An important consideration will be the protection of soils and ensuring that none of the habitat creation or restoration proposals compromise soil or prevent the Best and Most Versatile (BMV) land being returned to agricultural production when the solar farm is decommissioned. To this end an Outline Soil Resource Management Plan has been produced outlining the considerations that will be taken in to account in order to protect the soil resource.

It is not envisaged that any of the habitat creation or restoration objectives outlined in this Biodiversity Strategy or the OLEMP will compromise soil, but consideration will need to be given to the Outline Soil Resource Management Plan to ensure that habitat management prescriptions are aligned – for example ensuring grazing pressure does not cause compaction or poaching of soil and that stock numbers are limited or removed during periods of extremely wet weather for example.

The final habitat management prescriptions outlined in the LEMP will therefore have regard to the Outline Soil Resource Management Plan.

## Phasing habitat creation and restoration

Habitat creation will be phased during construction and operation. Habitats without any solar farm infrastructure will be created in advance of the commencement of works, allowing site biodiversity restoration to use these spaces for refuge during the construction phase. The Concept Design has identified what advance planning will be carried out in advance of construction.

Restoration of existing hedgerows and ponds will likely be undertaken over the first 5-10 years. Restoring all ponds and hedgerows simultaneously (e.g. through desilting/dredging or laying, respectively) could have a temporary adverse impact on the taxa using them, so it is crucial that these habitat restorations are phased, allowing habitats to recover after disturbance before the next section or area is restored. The final phasing of works would be included in the planting specification and the final LEMP prior to construction of works.

## Responsible sourcing of plants

While some habitats - such as the rewilding scrubland and naturally regenerating grasslands (see below) - will establish through natural dispersal and colonisation processes, others, such as the lowland meadow, species-rich grassland and new hedgerows, will require new planting or sowing of seed.

The responsible sourcing of plant species is important for local genetic diversity. There are several factors to consider when purchasing plants from commercial growers. This will include:

- British native species only;
- Provenance of all species must be known;
- Preference will be given to plants with local provenance;
- For biosecurity reasons, all plants will be sourced and grown from within the UK and not imported from outside the UK; and
- Clones (e.g. tree cuttings) will be avoided to ensure sufficient genetic diversity.

The final planting specification and LEMP will detail the requirements regards responsible sourcing of plants.

## Conservation grazing

The OLEMP proposes habitat management mostly through mechanical means (ie grass cutting). However, grazing is a fundamental process that can be effectively utilised in the management of natural and semi-natural habitats. Conservation grazing uses herbivores to maintain habitats in a specific desired state in line with a habitat management plan. This may be to keep coarse grasses in check and allow herbs to flourish, to prevent scrub succession, and/or stocking to create open spaces and a varied grassland structure. The density of animals is typically far lower than conventional grazing.

At LSF, the habitats that will benefit from conservation grazing are: the species-rich grassland beneath and around the panels; the floodplain grassland; and potentially the rewilding scrubland. Grazing in and around panels will generally be carried out using sheep, as they are less likely to damage infrastructure than larger herbivores. Cattle may also be used to graze habitats without site infrastructure (ideally outside the bird breeding season, to prevent impacts to ground-nesting birds).

Stocking densities will be monitored as part of the site's management for biodiversity. It will vary between seasons, habitats and years, with the actual stocking density and grazing timing dependent on factors like herb numbers, sward structure, litter depth and grass dominance. In partnership with the Terling Estate, LSF will therefore have a flexible approach to stocking density to ensure is always appropriate to meeting the biodiversity objective of the site.

Sheep are selective grazers and target herbs, so grazing outside of the main flowering periods can give the best results. As an indicative guide, it is anticipated at this stage that grazing would therefore be between September – April (estimate 30-36 weeks) avoiding summer months, at stocking densities of 0.6-0.8 livestock units (LU); 4-5 sheep/ha) for the grasslands and 0.3LU (0.3 cows/ha or 2 sheep/ha) or less for the rewilding scrubland.

Note, an important consideration will be careful siting of fencing will ensure that cattle, which may be used for conservation grazing in some areas, will not enter the PV array areas where they could damage the array and compromise the operational aspects of the scheme.

## Objectives and management actions

Detailed objectives and proposed management actions are set out in the OLEMP. Proposed habitat creation areas and management prescriptions over and above that outlined in the OLEMP are described below; these areas are shown on the Indicative Biodiversity Masterplan in Appendix B.

Measures outlined in the OLEMP and any additional measures taken forward from this BDS will collectively be developed into the planting specifications and the detailed LEMP from Year 0 (pre-development preparation works) through to Year 40 (i.e. the full operational life of LSF). The LEMP will likely evolve over the lifetime of the solar farm, informed by this BDS and the initial results from the Biodiversity Trial Area.

The adaptive habitat management process will allow adjustments to management, as required, and in addition the effectiveness of all management actions will be reviewed during Year 10 and a revised LEMP (if required) will be produced.

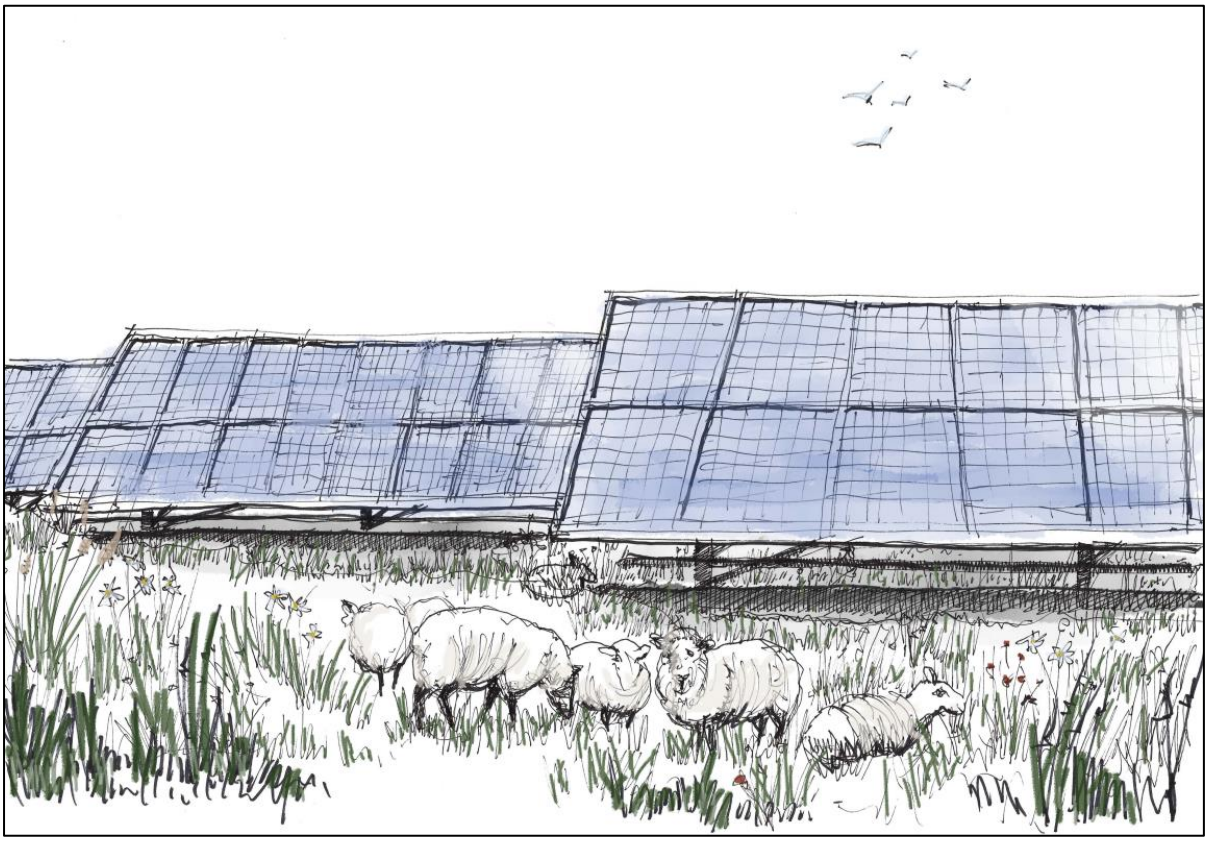

FIGURE 3 SPECIES-RICH GRASSLAND WITHIN THE ARRAY MANAGED WITH CONSERVATION GRAZING

# Habitat-specific measures

The OLEMP provides specific measures required to create and manage habitats for the benefit of biodiversity. These implementation and management measures are not repeated here, unless a change in management prescriptions or a new habitat creation item are likely to offer enhanced opportunities for biodiversity.

## Species-Rich Grassland habitats

Species-rich grassland in and around the arrays, and in adjacent field compartments is proposed in the OLEMPOLEMP Section 3.8). The following habitat specific measures build on the OLEMP habitat management prescriptions and outline how the species-rich grassland can be further improved further through alternative management principally by grazing but also a different approach to the management of grassland in the floodplain of the River Ter and the north facing banks of the River Ter valley. This section also includes some indicative objectives regarding the success of habitat establishment which will be used to inform the adaptive management prescriptions in the final LEMP.

## Species-rich grassland

*Grassland in and around the arrays will be biodiverse and rich in wildflowers Changing the mechanical management (hay cutting) proposed in the OLEMP to low density sheep grazing will*

*naturally create a varied structure and a tapestry of wildflowers which begin to blossom in spring and continue flowering through to late summer and into autumn (Figure 1 and 3). The combination of wildflower food sources throughout the summer and a diversity of microhabitats created by grazing, will support a wide range of invertebrates from butterflies to bugs that in-turn support dense populations of farmland birds. The grassland will also contribute to a breadth of environmental benefits that lock carbon into the soil and offer pollination services to the wider landscape. The diverse sward will provide a varied and nutritious forage for the grazing livestock, which will also minimise the need for mechanical management of the habitat.*

### Objectives

The overarching objectives for this habitat are to:

- Maintain vegetation with:
    - Species richness above 15 species/$m^2$;
    - 30% or more of the vegetation made up of wildflowers and sedges;
    - Less than 10% rye grass and white clover; and
    - Less than 50% coarse grasses.
- Maintain a structurally diverse sward.

### Management

The primary management tool for the species-rich grassland areas will be low-density grazing with sheep (see conservation grazing above). It is anticipated that stocking density will be 0.6 LU/ha. An adaptable management strategy will be employed to determine the exact timing and intensity of grazing, taking into account sward height and composition, ground conditions and welfare of the livestock, will be determined in the final LEMP and may change over time with the maturation of the grassland. In general grazing pressure will be less during the late spring and summer (April to August) in order to minimise the impact that selective grazing has on flowering and seed-set of wildflowers in the sward.

A number of small enclosures within the rows between the arrays will be fenced off and sheep prevented from grazing them. The coarse dense structure in these areas will be used by invertebrates for over-wintering and provide cover and forage for wintering birds. Some of these enclosures will be encouraged to develop low-growing scrub refuges for wildlife. These patches will be mown/strimmed in spring when grazing ends, to prevent scrub developing to a height that interfere with energy generation.

Chain harrowing may also be used between arrays in addition to grazing, if coarse grasses become too dominant, or if relatively less-grazed areas develop a ‘thatch’ of dead vegetation; as for grazing, criteria will be set to trigger action when required.

In addition, management in the first year could include further removal of nutrients by carrying out up to four cuts of the grassland between the arrays (depending on rate of grass growth) with removal of arisings. This will be carried out in addition to grazing.

## Species-Rich grassland (outside the solar arrays)

Species-rich grassland in outside of the arrays in adjacent field compartments is proposed in the OLEMP (OLEMP Section 3.8). An alternate approach to long-term management of species-rich grassland outside the arrays involving aftermath grazing is given below:

*In field compartments adjacent to the arrays, and around heritage features on the site, traditional diverse flower-rich meadows will be created These will be left uncut in spring and early summer, to allow abundant flowering and seed-set, before being cut for hay and grazed in the autumn and winter, as is traditional for lowland meadows. They will support a diverse range of flowering plants, which in turn will support invertebrate populations and their predators. Creation of more open areas will encourage ground-nesting birds such as skylark and predators such as barn owl. These areas will contribute to reversing the loss of this rare and declining habitat, support a wide range of species, and provide a visually appealing habitat which will lock carbon into the soil, and do so while continuing to be agriculturally productive.*

### Management

Management of the lowland meadow areas will be as traditional hay meadows, left un-grazed between March and mid-August inclusive, allowing ground-nesting birds such as skylarks to breed before hay is cut, turned and baled. Following the hay cut, low-density grazing with sheep over the autumn and winter will depress growth of vigorous grasses and create bare ground promoting germination of wildflowers.

If necessary, this management may be supplemented by chain harrowing in autumn or winter (to discourage vigorous grasses and create bare ground) and/or additional cuts of the vegetation, particularly in early spring to ensure sward height in summer is suitable for ground-nesting birds (e.g. skylark need a sward height of 20-50cm during the breeding season).

An adaptable management strategy will be employed to determine the precise management needs during the autumn and winter, taking into account sward height (at the time of management and/or projected sward height during the spring and summer), sward composition, ground conditions and welfare of the livestock.

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## Species-rich grassland (River Ter Floodplain)

The OLEMP outlines creation of species-rich grassland in the floodplain of the River Ter (Section 3.8). As floodplain grassland is inherently nutrient rich (due to centuries of silt deposition from flooding) rather than spraying off the existing grassland an alternative approach to enhancing the species-richness of the floodplain grassland would be as follows:

*On the floodplain of the River Ter, existing floodplain grassland will be restored to create more diverse grassland typical of traditional floodplain meadows. This area will be managed as hay meadow, allowing grassland plants to flower and set seed during the summer months, while also providing floodwater storage capacity when required throughout the year.*

### Objective:

The overarching objectives for this habitat are to:

- develop a typical floodplain flora through long-term management; and
- have less than 50% perennial rye-grass in the sward.

## Creation

As this area is already grassland, no specific habitat creation measures are required; the enhancement will be achieved through management of the area.

## Management

Management of this area will aim to enhance the existing grassland. The target composition of this area will be for an increased botanical diversity whilst maintaining permanent grassland on the floodplain. Reducing grazing and introducing a late-summer hay cut will encourage a greater number of grasses and herbs.

In addition, diversity of the sward will be accelerated through the spreading of green hay, either harvested locally downstream on the Ter, or from other high-value floodplain grasslands in Essex. Once seed has fallen from the spread hay, the hay should be collected and removed. Addition of this green hay will be carried out for up to ten years, to enhance the seed bank in the soil, with annual hay cuts thereafter.

As with the species-rich grassland areas, the Floodplain Grassland will be grazed during the autumn and winter by sheep or cattle at stocking densities of 0.6-0.8LU (4-5 sheep/ha) but ensuring poaching of soil does not occur during periods of extreme wet weather. The existing growing and pollarding of willows for cricket bats is not affected by these proposed changes to the management of the floodplain grassland.

FIGURE 4 POPULATIONS OF SKYLARK ARE FOUND IN THE SPECIES-RICH MEADOW HABITAT WHILE TURTLE DOVE NEST IN THE SCRUBBY WOODLAND EDGES

## Rewilding scrub

The OLEMP outlines prescriptions to create species-rich grassland on the slopes of the River Ter valley (Section 3.8). An alternative approach is to allow this area to establish naturally with minimal intervention and allow a mosaic of scrub and grassland to develop.

*On the north-facing slopes of the River Ter valley, passive rewilding will be used to create a mosaic of grassland and scrub, providing new habitat for species such as tree sparrow, turtle dove and nightingale. This area will also create links between existing woodlands at Lyonshall Spring, Terling Spring and Sandy Wood, creating a more integrated network of habitats. With its deeper root system, the scrubland will act as a buffer, reducing nutrient leaching from the ex-arable soils and improved grassland into the River Ter (Figure 6).*

### Objectives:

The overarching objectives for this habitat are to:

- Create and maintain a mosaic of scrub and grassland with cattle grazing;
- Reduce current grazing to 0.3LU maximum; and
- Maintain maximum scrub cover of 50%.

### Creation

As this area is already grassland, no specific additional habitat creation measures are required; the enhancement will be achieved through low-intervention management of the area.

### Management

Management of this area will comprise low-density grazing by large herbivores. It is proposed that initially this area will be allowed to establish with only grazing from wild deer, rather than domestic livestock, as this may be sufficient to achieve the target conditions. If not, additional grazing will be provided using cattle at a stocking rate of 0.3LU at most. This will favour creation of a mosaic of grassland habitat, in preferred grazing areas, and scrub in those less so. The ecological value of this area will be primarily achieved through its structural variation, rather than its botanical diversity.

As a rewilding area, this area will be managed with minimum intervention other than grazing. Unlike other areas with specific targets, this area will be allowed to develop complexity through natural processes, with the only management criteria relating to scrub cover in order to ensure neither too much nor too little grazing in the area; nominally, this is set at 50% scrub cover.

FIGURE 5 CATTLE GRAZE THE REWILDED SCRUBLAND CREATING A RICH MOSAIC OF GRASSLAND AND SCRUB WITH MINIMAL INTERVENTION.

## Pollinator greenway

*Running north to south through the site along public rights of way will be a corridor (the Greenway identified in the Concept design) devoted to providing flowers and habitat for pollinating insects and other wildlife. The corridor will connect other habitat areas across the site and will contain a variety of dwarf fruit trees, reflecting the fruit-growing heritage of the area. The greenway will provide a wildlife-rich and visually appealing amenity resource for the local community (Figure 1 and 7).*

FIGURE 6 A TAPESTRY OF BRIGHTLY COLOURED FLOWERS LINE THE POLLINATOR GREENWAY CREATING A NECTAR-RICH SUPERHIGHWAY FOR POLLINATORS

## Objectives:

The overarching objectives for this habitat are to:

- Create dense swathes of flowers throughout the spring, summer and early autumn;
- Ensure a minimum of 12 species of flowering plant are used, including knapweed, musk mallow, yarrow, oxeye daisy and wild carrot;
- Control grasses when they become greater than 20% of the sward;
- Establish fruit trees providing a valuable spring flowering resource; and
- Introduce rotational management to promote long-term flowering.

## Creation

Initially, the same methods as in the Biodiverse Grassland areas will be used to reduce soil nutrients and prepare the ground for seeding (i.e. cropping to remove nutrients, allowing weed seeds to germinate and ploughing them before seeding and, if necessary, using a cover crop in the short term to reduce weed colonisation prior to seeding).

Pollen- and nectar-rich perennial wildflower mixes (such as Emorsgate Seeds' EM3F mixture) will then be sown into these areas, and dwarf fruit trees (of native and local provenance) planted at intervals suitable for selected species. Unlike Species-rich Grassland and Lowland Meadows areas, however, no grasses will be sown into this area, to maximise the pollinator resources available. It is understood that the Estate has had success with the AB8 Flower Meadow and Enhanced Margin mix under Countryside Stewardship, which represents a potential alternative

seed mix for these areas. Final seed mixes and implementation methods will be included with the planting specification and outlined in the final LEMP.

### Management

Management of this area will comprise two cuts a year, with arisings collected and removed on each occasion. The first cut, in mid-May, will be applied over 50% of the Pollinator Greenway area, with the area to be cut alternated every two years.

Where this area forms a strip along both sides of a public right of way or access track, only one side will be cut each spring, in order to maximise the connectivity provided by the habitat. A second cut will be applied to all Pollinator Greenway areas in late-September or early October.

Dwarf fruit trees will be pruned to maintain balance between fruit production and vegetative growth.

# Tree and Hedgerow habitats

The OLEMP sets out prescriptions for retained and created hedgerows in Sections 3.3 and 3.4 respectively. The below measures enhance these proposals further by suggesting restarting the pollarding of oak trees.

## Pollarding

*Senescent oak pollards will be brought back into an active pollarding regime, which will potentially prolong the life of these valuable trees, thus maintaining and enhancing the habitats on site for invertebrates associated with dead wood habitat.*

### Objective:

The overarching objectives for this habitat are to:

- Re-establish oak pollarding (where appropriate); and
- Commence the process of establishing standard trees (particularly oaks) to ensure continuity as existing pollards reach the end of their lives.

### Management

Oak pollards on the site have not been managed for many years. Reinstatement of active pollarding must be undertaken sensitively because the response of individual trees to re-pollarding is variable. Bankside trees in the Floodplain Grassland would also benefit from being brought back into an active pollarding regime. Re-pollarding will be preceded by an arborist assessment of each of the oak pollards, looking at their current structure, their health and vigour (e.g. existing epicormic growth indicating high likelihood of re-growth following pollarding), their position on the site, and potential risks of pollarding.

An ecological assessment of these trees will also be carried out to identify any that are used by roosting bats, nesting barn owls or other protected species, as detailed in the OLEMP. A phased programme of re-pollarding, informed by the results of this assessment, will then be implemented. For some trees, the most appropriate management may be non-intervention. The branches cut during re-pollarding could be used for timber or to create habitat piles, described in the OLEMP.

The target condition for the oak pollards is to maintain and prolong the lives of these important trees, whilst increasing the variety of growth stages and therefore microhabitats available to wildlife within the pollards, including for dead-wood invertebrates.

## Hedgerow buffers

*Existing and newly created hedgerows will be protected from damage (i.e., movement of plant) and cultivation (i.e., creation of species-rich grassland and conservation field margins) by buffer zones of naturally regenerating grassland. These buffers will be up to 6m and could be managed in a different way than methods set out in the OLEMP to re-create traditional hedgerow base habitats with rank grass and tall perennial herbs that support wildlife dependent on microhabitats where grassland and woody shrubs are in close proximity.*

### Objectives:

The overarching objectives for this habitat are to:

- Maintain grassland buffers either side of hedgerows up to 6m;
- Ensure the grassland buffer around hedgerows is free from damage and cultivation;

- Develop the grassland buffer into a tussocky sward with perennial herbs; and
- Manage infrequently with late-summer mowing if scrub seedlings are >5% of the sward.

### Creation

Unlike other grasslands, these areas will be allowed to develop naturally from existing field margins and hedge-bank vegetation. These areas will not be cropped prior to establishment, as doing so (particularly the ploughing and harrowing associated with this management) could damage the root systems of the existing hedgerows and oak pollards.

### Management

Management of these areas will comprise cutting only when required to prevent colonisation by scrub, rather than routine cutting as proposed in the species-rich grassland. Unlike other grassland areas, management in these areas will not be targeted towards particular physical or diversity criteria, other than the broad requirement that they do not become scrub dominated. This will dictate the need for management if scrub cover is greater than 5% of the sward. When cutting is required this should take place outside the bird nesting season, and arisings will ideally be collected and removed.

## Woodland restoration

*Woodlands outside of the Scheme will remain under the control of the Terling Estate and are subject to existing agreements over felling and restocking areas. However, LSF will look to identify opportunities for collaboration and for input to woodland management plans which will enhance their ecological value, such as creation of clearings and rides, and re-establishment of a coppicing regime in areas of sweet-chestnut.*

### Objectives:

The overarching objectives for this habitat are to:

- Support good management practice and woodland enhancement by the estate; and
- Improve ecological value of adjacent woodlands.

## Sustainable Drainage Systems (SuDS)

*In addition to pond restoration described in the OLEMP, two new ponds will be created to manage surface water, principally through sustainable drainage systems, but designed to benefit wildlife too through bank profiling and operational management.*

### Objectives:

The overarching objectives for this habitat are to:

- Create two new ponds and a ditch as SuDS features that also benefits wildlife; and
- Allow for natural colonisation.

### Creation and Management

Surface water modelling will identify areas on the site which require drainage infrastructure (such as existing areas of pooling), in order to target the creation of new water features that will capture and store surface water from the site.

Although the primary purpose of the SuDS ponds will be to create sufficient storage capacity to attenuate peak surface water flows across the site, there will also be opportunities to maximise their wildlife value. Consequently, these features will be constructed with contoured, stepped margins, providing a range of deep and shallow water habitats irrespective of overall water depth. Underwater shelves will encourage growth of emergent plants which will act as passive treatment for surface water run-off from the site and provide habitat for a variety of wildlife, especially wetland invertebrates.

Water features will be designed to sit within the landscape, using existing linear boundaries and contours to inform their size and shape, rather than being constructed to a uniform design. As new water features tend to be colonised naturally, no planting is considered necessary or desirable in these areas.

FIGURE 7 SUDS COULD INCLUDE WILLOWS AND MARGINAL PLANTS TO PROVIDE VARIATION IN AVAILABLE MICROHABITATS

# Biodiversity trial area

*Empirical evidence of the effectiveness of different habitat management practices under solar arrays is lacking, but Longfield Solar Farm provides an opportunity for research to inform future projects. In partnership with academic collaborators, the biodiversity trial area will facilitate exciting new research to establish the best approach to manage solar farms for nature.*

## Objectives:

The overarching objectives for this habitat are to:

- Establish academic collaboration for biodiversity research; and
- Undertake high impact research for managing solar sites for biodiversity.

## Creation and management

The biodiversity trial area will comprise four fields dedicated to biodiversity research. The exact nature of the trials will be decided in collaboration with an academic partner. This will allow for high impact trials that can be designed to meet specific research questions and develop good practice for the biodiversity management of solar farms.

This research-led approach means there is no pre-defined habitat creation or management within and around the arrays of the trial area. The LSF proposal for collaboration is provided in Appendix A.

# Appendix A

# An Invitation for Collaboration on Biodiversity Research at LSF

## Who we are

Longfield Solar Farm is new energy plant capable of generating up 350MWp of electricity, with construction expected to begin in 2024. Once operational, it will make a major contribution to the UK's need for renewable energy and deliver on it's net-zero target. But we also want Longfield Solar Farm to have a positive impact on the local community and the environment.

Longfield Solar Farm will be located northeast of Chelmsford, Essex in what is currently intensively-managed arable farmland. Biodiversity at the site is impoverished and we hope to be able to make a positive contribution to its restoration. We recognise the important role of biodiversity and ecosystem function, and so, plan to create: species-rich grassland around the arrays managed with lowland meadow in the open areas; restored floodplain grassland; a rewilded scrubland; conservation field margins; woodland edge restoration; and restored hedgerows and watercourses. While we feel this will make a significant contribution to restoring local biodiversity, we believe there are evidence gaps. Knowledge of how best to enhance biodiversity within a solar park is limited by the amount of applied ecological research specific to this land-use type.

As the appeal of solar energy continues to grow, it is of vital importance that research is carried out to investigate how biodiversity should best be incorporated into them. We can apply conventional interventions like those described above, but habitat creation and management techniques were not designed for the unique environment of an operational solar park like Longfield. The sheer scale of Longfield means that there is scope to maximise biodiversity across the majority of the site while setting out a portion of it for long-term research. We therefore plan to create and support a Biodiversity Trial Area within the solar farm where research on the theme of biodiversity and natural capital can be supported to fill these knowledge gaps. Importantly, we expect this to be an experimental space where new and exciting approaches to enhancing biodiversity can be tested and developed.

## An open call for collaboration

To help us achieve our research ambition, we are looking to collaborate with an academic partner whose research is strategically aligned to our ambition to use solar energy sites to restore biodiversity. We recognise that biodiversity and the environmental benefits of nature are broad themes and we would look to our academic partner to propose and design biodiversity experiments. In the context of a solar farm, we are especially interested in the following broad research areas:

- Habitat restoration for carbon sequestration and biodiversity.
- Innovative approaches to habitat management on solar farms biodiversity.
- Soil biodiversity and restoration.

- Biodiversity and natural capital in the surrounding landscape.
- Approaches to maximising biodiversity and energy production through reflective properties of vegetation and substrate.
- Enhancing biodiversity through regenerative farming and conservation grazing with sheep.

## Our offer

Biodiversity is fundamental to how Longfield Solar Farm has been designed and will be managed into the future. This is reflected in the research package and resources that we will make available to our academic partner to undertake their trials:

- Full experimental control from the academic partner in the areas designated as Biodiversity Trial Area, comprising four fields and a total area of ~40ha.
- Opportunities for experimental manipulation in the remaining ~40Ha of the site providing it does not interfere with generation capacity, operational requirements or other ecological management and enhancement measures.
- An initial 10-year partnership.
- Facilitation of access to surrounding farmland.
- Management support from our land-management team and access to tools, equipment and plant.
- Facilitating partnership with other industrial partners.
- Electric vehicle charging points.

We would however prohibit any experimental interventions that interfere with the energy generating infrastructure. Animal welfare standards must be a high priority and we would look to limit the application of any chemicals on the land.

## Our expectation

In return we would expect our academic partner to:

- Agree their detailed proposals with our research panel, including agreeing any variations in advance.
- Demonstrate high standards of ethics, including animal welfare and the health, safety and wellbeing of all parties, in their research activities.
- Keep Longfield Solar Farm informed and updated as their work progresses, including regular budget reviews.
- Publish papers in peer-reviewed journals and present findings at conferences.
- Support Longfield Solar Farm staff with annual whole-site biodiversity monitoring to meet commitments to Solar Energy UK biodiversity monitoring.

## Expression of Interest

This is the expression of interest sent to all potential academic partners.

At this stage we anticipate partnering with a single academic partner and look to begin the collaboration in 2022, prior to construction. This will allow for baseline surveys of the Biodiversity Trial Area and allow any implementation of any specific habitat creation or management. Interested parties should send an expression of interest to stephanie.wray@naturepositive.com, giving the name of the Principal Investigator, the academic institution, and an outline of the proposed research themes. Expressions of Interest should be received by 30th November 2021. Stephanie Wray can also be contacted for an informal discussion about the opportunity on the email address above.

# Appendix B

# Biodiversity Masterplan

(Appended below)

N

Legend

- Species-rich Grassland
- Species-rich Grassland (outside the solar arrays)
- Natural Regeneration Woodland Edges
- Hedgerow Buffer
- Rewilding Scrub
- Species-rich Grassland (River Ter Floodplain)
- Pollinator Greenway
- SUDS Ponds
- Specimen Tree
- Biodiversity Trial Area
- Native Woodland Strip
- Restored Hedgerows
- New Hedgerows
- Public Rights of Way
- Primary Access
- Secondary Access
- Solar Panels
- Woodland Blocks Outside of the Scheme
- Retained Habitat

GENERAL NOTES

Do not scale from this drawing.

Only work to written dimensions.

Drawing is for planning purposes only not for construction.

All site dimensions shall be verified by the Contractor on site prior to commencing any works.

All contractors should ascertain the location of all underground services/utilities before undertaking any work and conflicts resolved.

It is assumed all work will be carried out by an experienced competent contractor working to an approved method statement.

| Rev. | Date | Amendment | Drawn | Chkd. | Appd. |
|---|---|---|---|---|---|
| 03 | 28/02/22 | Layout amendments and changes to RLB | SM | AT | AT |
| 02 | 04/02/22 | Layout amendments | SM | LH | LH |
| 01 | 04/11/21 | Layout amendments | SM | SM | MW |
| 00 | 04/10/21 | First Issue | SM | AT | AT |

Client: Longfield Solar Farm

Project Title: Longfield Solar Farn

Drawing Title: Biodiversity Design Strategy Masterplan

File Path: Longfield SF/DD/BDF/Biodiversity Overlay

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| Drawn | Date | Checked | Date | Approved | Date |
|---|---|---|---|---|---|
| SM | 04/10/21 | AT | 04/10/21 | AT | 04/10/21 |

| Scale | Orig Size | Status |
|---|---|---|
| 1:7500 | A0 | Draft |

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