

Rush Wall Solar Park

Environmental Statement

Appendix 2.3

Landscape and ecology management plan (LEMP)

# Landscape and Ecology Management Plan Rush Wall Solar Park November 2021

Report no: LEMP-526.2

A report by

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## Report details

Site name: Rush Wall Solar Park  
Site address: Redwick, Newport  
Grid reference: ST 416 853  
Report date: 16<sup>th</sup> November 2021  
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## Declaration of compliance

### BS 42020:2013

This study has been undertaken in accordance with British Standard 42020:2013 Biodiversity, Code of practice for planning and development.

### Code of Professional Conduct

The information which we have prepared is true, and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management's Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

### Revisions

Date	Report no:	Comment
22/06/2020	LEMP-526.1	Final report
16/11/2021	LEMP-526.2	Taking into account consultee comments

## Table of contents

1. Introduction .....	5
1.1. Background .....	5
1.2. Embedded mitigation .....	5
2. Existing features of ecological value.....	6
2.1. Statutory nature conservation sites.....	6
2.2. Habitats.....	6
2.3. Species .....	7
Map 1. Phase 1 habitats.....	9
3. Ecological and Landscape mitigation strategy.....	10
3.1. Introduction .....	10
3.2. Pre-construction phase .....	10
3.3. Pre-Construction phase .....	11
3.4. Decommissioning phase.....	17
4. Management plan .....	18
4.1. Aim and objective.....	18
4.2. Reens.....	18
4.3. Ditches .....	18
4.4. Hedgerows.....	19
4.5. Grassland buffers adjacent to reens, ditches and hedgerows .....	21
4.6. Grassland beneath solar panels .....	22
4.7. Bat and breeding bird boxes .....	22
5. Monitoring.....	24
5.1. Introduction .....	24
5.2. Invertebrate and aquatic flora monitoring .....	24
5.3. Habitats.....	25
5.4. Ornithology.....	26
5.5. Other fauna .....	26
Map 2. Landscape Ecology Management Plan .....	29
Appendix 1 - semi-aquatic mammals associated with reens .....	30
Mitigation for Otter .....	30
Mitigation for Water Vole .....	30
Appendix 2 - Breeding Lapwing mitigation.....	32
Appendix 3 - Over wintering Lapwing mitigation .....	34
Map 3. Lapwing mitigation areas.....	35
Appendix 4 - Great Crested Newt mitigation.....	36
Map 4. Great Crested Newt mitigation plan.....	38
Appendix 5 - Ground nesting bird strategy during the construction phase .....	39
Appendix 6 – Ditch management plan .....	40
Map 5. Ditches within Field blocks 4 and 5 .....	42
Map 6. Ditch management plan.....	47
Appendix 7 - Assessment of net gain. ....	48
Defra Biodiversity Metric 3.0.....	48
SPIES tool .....	50

# 1. Introduction

## 1.1. Background

This Landscape and Ecology Management Plan (LEMP) has been produced to accompany a planning application for a solar energy generation proposal on land near the village of Redwick, south east of Newport, Wales on the Gwent Levels.

The proposed solar park would export renewable energy to the local electricity network. The LEMP provides details of mitigation and enhancement requirements during the construction and operational phases, and a management framework during the operational phase.

It covers the period of the lifetime of the project, although this would be reviewed every five years, after which management would be reviewed against the current site conditions.

## 1.2. Embedded mitigation

It is recognised that physical changes as a result of a solar park development in this location, such as changes in views or ground disturbance, would result from the proposal. These changes are referred to as impacts. The design and layout of the solar park has responded to the location's value and sensitivities in order to reduce the magnitude of such impacts through primary (embedded) mitigation, as detailed within 'Responding to the Environmental Sensitivity of the Site', in paragraphs 2.41 and 2.42 of Chapter 2.

## 2. Existing features of ecological value

### 2.1. Statutory nature conservation sites

#### National designated sites

There are 10 sites of Special Scientific Interest (SSSI) within the Zone of Influence (5km) of the proposed development.

The Severn Estuary SSSI is located 1.2km to the south and been designated amongst other things for its wintering and passage wading birds including Curlew and Redshank populations, and most of its nationally important Ringed Plover and Grey Plover populations. Other waders which occur in significant numbers within the SSSI are Common Snipe, Knot, Whimbrel and Turnstone.

The proposed development is located within Gwent Levels – Redwick and Llandeenny SSSI. The Gwent Levels constitute the lowlands between Cardiff and Chepstow and are drained by an ordered network of drainage ditches. They are an example of one of the most extensive areas of reclaimed wet pasture in Great Britain. The Redwick and Llandeenny area supports rich assemblages of invertebrate species and a number of nationally rare plant species

Significant effect has been discounted within the Environmental Statement for all of these sites.

#### Internationally designated sites

Severn Estuary SPA and RAMSAR are located 1.2km to the south.

The SPA has been designated for its wintering and passage birds, which includes an assemblage during winter that includes Gadwall, Shelduck, Pintail, Dunlin, Curlew, Redshank, Bewick's Swan, Wigeon, Lapwing, Teal, Mallard, Shoveler, Pochard, Tufted Duck, Grey Plover, White-fronted Goose, Whimbrel.

The RAMSAR has been designated for migratory fish and migratory birds in spring and autumn, which include Common Ringed Plover, Dunlin, Whimbrel, and Common Redshank. The site also regularly supports more than 20,000 waterfowl.

Significant effect has been discounted for these Internationally designated sites.

### 2.2. Habitats

The footprint of the proposed solar park comprises 23ha of improved grassland and 59ha arable managed to provide fodder and forage for a dairy herd on a two to three year rotation (Map 1). This land is enclosed by 8.94km of species rich hedgerows associated with 1.18ha of ditches, and the site is crossed by 0.26ha of reens.

Occasional tall ruderals (0.36ha) are present along grassland and reen margins.

The site as a whole comprises an area of coastal and floodplain grazing marsh, a habitat listed under Section 7 of the Environment (Wales) Act 2016 and are a Local Biodiversity Action Plan priority habitat. Ditches are part of the area of coastal and floodplain grazing marsh. This habitat is also part of a network of ditches that are an interest feature of the Gwent Levels – Redwick and Llandeenny SSSI. Accordingly, this habitat is of National value for biodiversity. The majority of these ditches were overgrown with native shrub hedgerows and were generally dry.

Reens are part of the area of coastal and floodplain grazing marsh habitat and part of a network of reens that are an interest feature of the Gwent Levels – Redwick and Llandeenny SSSI. Accordingly, this habitat is of National value for biodiversity.

Hedgerows are listed under Section 7 of the Environment (Wales) Act 2016 and are a Local Biodiversity Action Plan priority habitat. The hedgerows would not qualify as ecologically important for the purposes of the Hedgerow Regulations 1997 due a lack of species diversity.

### 2.3. Species

Species listed here are those that are confirmed, or judged likely, to be present within the proposed development and its boundaries.

#### Amphibians

eDNA surveys have detected Great Crested Newt in the east of the site, whilst common amphibians are likely to be present elsewhere.

#### Badger

Evidence of occasional Badgers foraging has been identified across the site, although well-worn pathways are not present and no setts have been found.

#### Bats

Hedgerows provide good foraging habitat for a range of widespread bat species, whilst occasional larger trees just outside the development footprint have low potential for roosting bats.

During remote bat monitoring and bat activity transects in 2019, six species and two species groups of bats were recorded here, largely comprising Common Pipistrelle and Noctule, both commonly associated with intensively managed farmland.

#### Birds

Boundary habitats (hedgerows and reen margins) associated with the Solar Park will support widespread and common nesting bird species.

Breeding bird surveys were completed in spring/summer 2019, with passage/winter bird surveys in the periods 2018/2019 and 2019/2020.

A total of 52 bird species were recorded during breeding bird surveys, including at least 4 pairs of Lapwing, 2 of which attempted nesting but failed to raise chicks. A fairly diverse

range of birds did successfully breed within the site and its surrounds, including a number of species of Conservation Concern. These are all associated with the hedges, reens and the very limited areas of adjacent scrubby cover.

The fields themselves offer very limited nesting opportunities. Skylark and Lapwing were the only species trying to nest here, but silage cutting probably rendered all attempts unsuccessful and no juvenile Skylark or Lapwing were recorded.

Of the wintering birds, Pochard, Bewick's Swan, Teal, Curlew and Wigeon were recorded here in small numbers on a single visit. Lapwing, Snipe, Mallard were most commonly recorded, with occasional Lesser Black-backed Gull and Shelduck.

#### Invertebrates

Aquatic invertebrate and Shril Carder Bee surveys were completed in 2019. No Shril Carder Bees were recorded, whilst aquatic invertebrate communities were judged to be of Low importance for rare or scarce invertebrates.

#### Otter

Although no evidence of Otter was recorded associated with the reens, the records search strongly suggests they are present in the general area. However, the site has no evidence of holts or couches and it is extremely unlikely that Otter are resting here.

#### Water\_Vole

Although the majority of the site lacked recent evidence of Water Vole, a limited area within the centre of the site exhibited a high concentration of field signs indicating recent activity.

Water Vole are known to be in the local area, and as the reens are generally well connected across the Site, it is reasonable to conclude that Water Vole are present across the wider site.

#### Flora

No plants of restricted distribution were recorded here.

#### Reptiles

Grass Snake are present within the site.

#### Fish

European Eel will be present within the reens and larger ditches.



**Legend**

- Target note
- Intact hedge with trees, native species rich
- Intact hedge, native species rich
- A Arable
- Tall ruderal
- Ditch
- Reen
- I Improved grassland



Farmyard manure store with ruderal herbs

Farmyard manure store with ruderal herbs

Title: Map 1 Phase 1 habitats

Project: Rush Wall Solar Park

Checked by: CDH    Version: 03  
Date: 22/07/2021

## 3. Ecological and Landscape mitigation strategy

### 3.1. Introduction

This LEMP should be read in conjunction with the Environmental Statement (ES).

The strategy within this report will focus on existing features of nature conservation value (valued receptors) associated with the site, describing how the value of these features will be retained/protected during the proposed development, and then providing details on long-term management during the operational phase. Recommendations are also made to minimise biodiversity loss during future decommissioning.

Where it has been judged within the ES that there is potential that the proposed development will have a significant effect on a valued ecological feature of nature conservation interest, recommendations for mitigation are made based on the mitigation hierarchy;

- Avoidance – significant harm to wildlife species and habitats should be avoided through design.
- Mitigation – where significant harm cannot be wholly or partially avoided, it should be minimised by design, or by the use of effective mitigation measures that can be secured by, for example, conditions or planning obligations.
- Compensation – where, despite whatever mitigation would be effective, there would still be significant residual harm, as a last resort, this should be properly compensated for by measures to provide for an equivalent value of biodiversity.

To align with local and national planning policy, Appendix 5 of this report will provide detail of biodiversity net gain illustrated through the Defra Biodiversity Metric 3.0 and will assess proposed management through the Solar Park Impact on Ecosystem Services (SPIES) tool.

### 3.2. Pre-construction phase

#### Aims and objectives

The aim of this plan is to detail the ecological and landscape mitigation and enhancement that will be adopted during the pre-construction phase that reflects the conclusion of the surveys and impact assessment completed for this development. This mitigation will be adopted to avoid adverse impacts on:

- amphibians, Badger, Water Vole, Otter, Eel, reptiles, breeding birds, invertebrates and aquatic plants associated with reens and ditches.
- breeding and wintering birds associated with farmland habitats;
- qualifying features of statutory nature conservation sites present with the Zone of Influence;
- habitats listed under Section 7 of the Environment (Wales) Act 2016

### 3.3. Pre-Construction phase

Table 1 identifies mitigation measures to be adopted prior to the start of works.

Table 1. Mitigation measures to be adopted prior to the construction phase.

Item ID	Feature of nature conservation value	Avoidance/mitigation	Comments
<b>General</b>			
T1.1	Construction Environmental Management Plan	A Construction Environmental Management Plan (CEMP) will be produced. This will provide details of site compounds, storage and access, working methodologies, control of dust, noise and pollutants, timings of operations, public footpaths, site security, and pre- and construction phase ecological mitigation.	Responsible team: Client and subject specialists
T1.2	Ecological clerk of works	<p>Prior to the start of construction, and Ecological Clerk of Works (ECoW) will be appointed to oversee the construction phase. The ECoW will:</p> <ul style="list-style-type: none"> <li>• Advise on protecting valued biodiversity features;</li> <li>• Provide practical, site-specific and proportionate assistance on compliance with environmental legislation.</li> <li>• Manage ecological operatives engaged in ecological mitigation activities – such as undertaking ecological watching briefs and translocation of protected species.</li> </ul>	<p>Responsible team: Client</p> <p>The ECoW needs to be a suitably qualified and licenced ecologist with at a minimum of 1 year's experience of ECoW activities.</p>
<b>Habitats</b>			
T1.3	Reens, ditches and hedgerows	<p>Hedgerows, ditches and reens will be protected by a suitable buffer from all construction activities. For reens that are managed by NRW this buffer will 12.5 metres, and for all ditches and hedgerows this will be 7 metres.</p> <p>These buffers will be delineated by a suitable temporary fence approved by the ECoW</p>	<p>Responsible team: Construction contractor</p> <p>There should be no access, storage of materials, ground disturbance, burning or contamination within the buffer areas</p>
<b>Species</b>			
T1.4	Badgers, Otter and Water Vole	<p>Updated Badger, Otter and Water Voles surveys will be completed by the ECoW as near as practicable to the start of site development. These will be completed by a suitably qualified ecologist.</p> <p>These updated surveys will inform the location of drilling rigs for HDD along ditches and reens and hedgerows.</p>	<p>Responsible team: Client and ECoW</p> <p>This will ensure the assessment and resultant mitigation to be adopted during construction will be based on the most recent distribution of these species.</p>

T1.5	Breeding birds	Prior to works in the accepted bird nesting season (March to August inclusive), suitable habitats will be thoroughly inspected by the ECoW prior to disturbance. If nesting birds are found, all activities likely to damage the immediate area (within 5 metres) will be delayed until chicks have fledged. The 5 metre buffer will be delineated with a suitable temporary fence (Appendix 5).	Responsible team: Client and ECoW  This includes scrub, hedgerows and any areas of managed grassland/arable that is deemed suitable by the ECoW. This will depend on the timing of works and site management immediately prior to development.
T1.6	Breeding birds - Lapwing	Breeding Lapwing mitigation detailed in Appendix 2 will be in place prior to the first bird nesting season (March to August) within the construction period. This will include limited scrub removal and the installation of predator fencing	Responsible team: Client  12ha of existing grassland will be managed for the benefit of nesting Lapwing
T1.7	Over wintering Lapwing	Wintering Lapwing mitigation detailed in Appendix 3 will be in place prior to the first wintering nesting season (October to March) within the construction period.	Responsible team: Client  22ha of existing grassland will be managed for the benefit of wintering Lapwing
T1.8	Grass Snake	Areas with potential for Grass Snake likely to be affected by construction activities will be de-vegetated prior to any site activities under the supervision of the ECoW. Grassland to be removed will initially be strimmed to a height of no more than 20cm, having first used an ecologist to walk and beat the habitat. This will encourage reptiles to disperse naturally into the neighbouring uncut vegetation to the sides. After at least 24hrs, a second cut will be made as close to ground/bank level as possible.  This de-vegetation cannot proceed until nesting bird checks have been completed.	Responsible team: Client and ECoW  This includes scrub and areas of managed grassland/arable that is deemed suitable by the ECoW. This will depend on the timing of works and site management immediately prior to development.
T1.9	Great Crested Newt	Prior to works commencing in Field F22 and F23 in the east, a suitable temporary fence will be constructed under direct guidance of the ECoW at the ree/ditch buffer edge to ensure Great Crested Newts do not enter the construction site as detailed in Appendix 4. Areas within the fence will be subject to trapping and any Great Crested Newts captured will be placed in suitable habitat outside the fence and development footprint	Responsible team: Client and ECoW  A European Protected Species License will be required from Natural Resources Wales to allow the installation of this fence
	<b>Statutory nature conservation sites</b>		
T1.10	Severn Estuary RAMSAR, SPA and SSSI	Wintering Lapwing mitigation detailed in Appendix 3 will be in place prior to the first wintering season (October to March) within the construction period.	Responsible team: Client  22ha of existing grassland will be managed for the benefit of wintering Lapwing

Table 2 identifies mitigation measures to adopted during construction works.

Table 2. Mitigation measures during the construction phase.

Item ID	Feature of nature conservation value	Avoidance/mitigation	Comments
	<b>General</b>		
T2.1	Construction Environmental Management Plan	The Construction Environmental Management Plan (CEMP) will be adhered to.	Responsible team: Construction team and ECoW
	<b>Habitats</b>		
T2.2	Reens, ditches and hedgerows	Buffers to reens, hedgerows and ditches detailed in T1.3 will be retained during the construction period. These buffers will be delineated by a suitable temporary fence.	Responsible team: Construction team  There should be no access, storage of materials, ground disturbance, burning or contamination within the fenced areas
T2.3	Coastal and floodplain grazing marsh	Following the construction, bare areas restored by re-seeding with a suitable grass mix.  For the cable trenches, top and sub-soils will be stored separately and replaced in sequence following trenching and the route re-seeded with a suitable grass mix.	Responsible team: Construction team
T2.4	Cable route – reen, ditch and hedgerows	The cable trench will traverse valued habitats by Horizontal Direct Drilling (HDD) or through existing gateways	Responsible team: Construction team
	<b>Species</b>		
T2.5	Badgers	Any deep trenches left open at night (>1m deep) will have some means of escape for Badgers, such as the placement of a scaffolding board at one end.  Site security fences will have suitable gaps at corners to allow any Badger trapped in the site to escape.  HDD drilling rigs will be sited more than 20 metres from any badger sett entrances.	Responsible team: Construction team
T2.6	Otter and Water Vole	HDD drilling rigs will be sited more than 10 metres from any water vole entrances.  Buffers to reens, hedgerows and ditches detailed in T1.3 will be retained during the construction period.	Responsible team: Construction team

T2.7	Eel, aquatic invertebrates, aquatic plants and scrub/reed/water nesting bird	Buffers to reens, hedgerows and ditches detailed in T1.3 will be retained during the construction period.  These buffers will be delineated by a suitable temporary fence.	Responsible team: Construction team  There should be no access, storage of materials, ground disturbance, burning or contamination within the fenced areas
T2.8	Bats	No night works during the bat active period of April to October inclusive.	Responsible team: Construction team
T2.9	Breeding birds	Site habitats within the solar array footprint will be managed to deter breeding birds during the construction phase by cutting on a regular basis (Appendix 5). Prior to each cut, the ECoW will check the area of nesting birds.	Responsible team: Construction team and ECoW
T2.10	Breeding birds - Lapwing	Breeding Lapwing mitigation detailed in Appendix 2 will be in place prior to the first bird nesting season (March to August) within the construction period, and will be retained for whole of the construction phase.	Responsible team: Client  12ha of existing grassland will be managed for the benefit of nesting Lapwing
T2.11	Over wintering Lapwing	Wintering Lapwing mitigation detailed in Appendix 3 will be in place prior to the first wintering season (October to March) within the construction period, and will be retained for whole of the construction phase.	Responsible team: Client  22ha of existing grassland will be managed for the benefit of wintering Lapwing
	<b>Statutory Nature Conservation Sites</b>		
T2.12	Gwent Levels – Redick and Llandeenny SSSI	No works within 12.5 metres of reen and 7 metres of ditches. Reen/ditch crossings will be achieved across existing bridges.  Adoption of suitable CEMP.	Responsible team: Construction contractor  There should be no access, storage of materials, ground disturbance, burning or contamination within the fenced areas
T2.13	Severn Estuary RAMSAR, SPA and SSSI	Wintering Lapwing mitigation detailed in Appendix 3 will be in place prior to the first wintering season (October to March) within the construction period and will be retained during the operational period.	Responsible team: Client  22ha of existing grassland will be managed for the benefit of wintering Lapwing

## Operational phase

Table 3. Details mitigation measures to be adopted during the operational phase

Table 3. Mitigation measures during the operational phase.

Item ID	Feature of nature conservation value	Avoidance/mitigation	Comments
	<b>Habitats</b>		

T3.1	Reens, ditches and hedgerows	<p>Buffers to reens, hedgerows and ditches detailed in T1.3 will be retained during the operational phase.</p> <p>Existing gateways will be used for site access.</p>	Responsible team: Solar park operator
T3.2	Coastal and floodplain grazing marsh	<p>Permanent access tracks will be seeded with a suitable grass mix through hydro-seeding.</p> <p>Areas beneath panels will be managed by sheep grazing, although this may change during the lifetime of the solar farm depending on changing agricultural practices and management.</p>	Responsible team: Solar park operator
T3.3	Ditches	Ditches within the two field compartments included in the development will be managed to attain favourable condition for 50% of ditches within 7 years of development. This will be followed by a 7-year rolling program of management to ensure these ditches remain in favourable condition during the 35 year operation of this development. See Appendix 6.	Responsible team: Solar park operator
	<b>Species</b>		
T3.4	Badgers	Site security fences present during the operational phase will have suitable scrapes to allow Badgers access under the fence so that they may continue to use the site. The locations will be determined through the pre-construction Badger survey.	Responsible team: Solar park operator and ECoW
T3.5	Breeding birds - Lapwing	Breeding Lapwing mitigation detailed in Appendix 2 will be retained for operational phase.	<p>Responsible team: Solar park operator</p> <p>12ha of existing grassland will be managed for the benefit of nesting Lapwing</p>
T3.6	Over wintering Lapwing	Wintering Lapwing mitigation detailed in Appendix 3 will be retained for operational phase.	<p>Responsible team: Solar park operator</p> <p>22ha of existing grassland to the south will be managed for the benefit of wintering Lapwing</p>
T3.7	Shrill Carder bee	In a central swathe through the site, grassland will be cut for hay in late September every second year to enhance this area for Shrill Carder Bee by creating a tussocky structure with nesting potential	Responsible team: Solar park operator
	<b>Statutory nature conservation sites</b>		
T3.8	Gwent Levels – Redick and Llandeenny SSSI	<p>A comprehensive ditch management plan will be adopted (See Appendix 6)</p> <p>Buffers to reens, hedgerows and ditches detailed in T1.3 will be retained during the operational phase.</p> <p>Existing gateways will be used for site access.</p>	<p>Responsible team: Solar park operator</p> <p>There should be no access, storage of materials, ground disturbance, burning or contamination within the buffer areas</p>

		Buffer habitats will be managed to create a more diverse grassland sward.	
T3.9	Severn Estuary RAMSAR, SPA and SSSI	Wintering Lapwing mitigation detailed in Appendix 3 will be in place prior to the first wintering season (October to March) within the construction period and will be retained during the operational period.	Responsible team: Solar park operator  15ha of existing grassland to the south will be managed for the benefit of wintering Lapwing
	<b>Monitoring</b>		
T3.10	Onsite habitats	Monitoring of ditches, hedgerows, buffer grassland and grassland beneath the solar panels will occur on an annual basis for the first five years following construction	Responsible team: Solar park operator  After this period, the results of monitoring will be assessed to inform a new five-year Management Plan.
T3.11	Wintering Lapwing mitigation	Monitoring of land managed for wintering Lapwings will occur on an annual basis for the first five years following construction.	Responsible team: Solar park operator  After this period, the results of monitoring will be assessed to inform a new five-year Management Plan.
T3.12	Breeding Lapwing mitigation	Monitoring of land managed for breeding Lapwings will occur on a two-monthly basis for the first six months following creation. Following successful formation of a suitable habitat for breeding Lapwing, monitoring will occur on an annual basis for the first five years following construction.	Responsible team: Solar park operator  After this period, the results of monitoring will be assessed to inform a new five-year Management Plan.
T3.13	Aquatic plant and invertebrate monitoring	Aquatic flora and aquatic invertebrate surveys of ditches and reens will be updated in the first suitable period (Spring/summer). This will include both the development site and the breeding and wintering Lapwing mitigation areas. After this period, surveys will be repeated every year for the first 5 years of operation, after which the need for monitoring will be assessed in consultation with NRW.	Responsible team: Solar park operator
T3.14	Shrill carder bee monitoring	Shrill Carder Bee surveys will be updated and will map suitable foraging and nesting habitat across the development site and the breeding and wintering Lapwing mitigation areas, along with a survey of the bees. After this period, surveys will be repeated every year for the first 5 years of operation, after which the need for monitoring will be assessed in consultation with NRW.	Responsible team: Solar park operator  Precise methodology will be in agreement with NRW but with be repeatable along agreed transect routes with sampling every 10 metres.



### 3.4. Decommissioning phase

Table 4. Details mitigation measures to be adopted during the decommissioning phase

Table 4. Mitigation measures during the decommissioning phase.

Item ID	Feature of nature conservation value	Avoidance/mitigation	Comments
	<b>General</b>		
T4.1	All	Preparation of decommissioning management plan	Responsible team: Decommissioning team
	<b>Habitats</b>		
T4.2	Reens, ditches and hedgerows	Methods for the removal of cabling associated with these habitats will be agreed with NRW prior to decommissioning  Existing gateways will be used for site access.	Responsible team: Decommissioning team
T4.3	Coastal and floodplain grazing marsh	Permanent access tracks, solar panels and associated infrastructure will be removed and the land returned to agricultural production.	Responsible team: Decommissioning team
	<b>Species</b>		
T4.4	Great Crested Newt, Badgers, Otter and Water Vole	Updated Great Crested Newt, Badger, Otter and Water Vole surveys will inform decommissioning.	Responsible team: Decommissioning team
T4.5	Over wintering Lapwing	Wintering Lapwing mitigation detailed in Appendix 3 will be returned to normal agricultural management	Responsible team: Decommissioning team
T4.6	Breeding Lapwing	Breeding Lapwing mitigation detailed in Appendix 2 will be returned to normal agricultural management.	Responsible team: Decommissioning team
	<b>Statutory nature conservation sites</b>		
T4.7	Gwent Levels – Redick and Llandeenny SSSI	Buffers to reens, hedgerows and ditches detailed in T1.3 will be retained during the decommissioning phase, after which they will be returned to agricultural production. These buffers will be delineated by a suitable fence.  Existing gateways will be used for site access.	Responsible team: Decommissioning team

## 4. Management plan

### 4.1. Aim and objective

The aim of the Management Plan is to ensure the long-term management and maintenance of ecological features during the operational phase of the Solar Park. The overarching objectives are:

- To promote wildlife value and species diversity whilst maintaining the existing local landscape character;
- To secure the appropriate management of Gwent Levels – Redwick and Llandeenny SSSI interest features;
- To ensure that other existing ecological features are retained, connected and sensitively managed to maximise their ecological value in the long-term;
- Provide opportunities for a range of faunal species;
- To apply good horticultural and ecological practice to all operations; and,
- To monitor the Site and adjust management prescriptions as necessary.

The key management features for the purpose of this report are:

1. Habitat compensation for breeding Lapwing (see Appendix 2)
2. Habitat compensation for over wintering Lapwing (see Appendix 3)
3. Watercourses (reens and ditches) and associated flora and fauna
4. Hedgerows
5. Coastal and floodplain grazing marsh
6. Buffers between the security fence and reens/ditches and hedgerows
7. Grassland beneath solar panels
8. Bat and breeding bird boxes

### 4.2. Reens

Main reens are currently managed by NRW. This body is likely to continue to manage these features for the operational period of the solar park.

### 4.3. Ditches

The majority of ditches associated with field boundaries have been unmanaged, which has resulted in them becoming overgrown with scrub. Management of the overgrown ditches will not be possible without scrub removal.

To allow long-term management and improve the ecological value of field ditches to bring them into a favourable condition, hedgerow reduction will take place. Currently, approximately 80% of ditches (by length) are either shaded or dry due to the presence of dense native shrub hedgerows. This shading inhibits the establishment of aquatic plants and associated invertebrates that are interest features of the Gwent Levels – Redwick and Llandeenny SSSI.

It is proposed that ditches within the two field blocks associated with the development will be managed through scrub removal and casting. This will be completed over a 7-year cycle with subsequent management occurring on a rolling seven year program.

A Ditch Management Plan is provided in Appendix 6.

#### 4.4. Hedgerows

The aim of management is to ensure retained hedgerows are maintained with a good structure to provide connectivity for faunal species and support a diverse flora. The main objectives for hedgerow management are:

- Manage hedgerows on a regular, rotational basis to promote structural and botanical diversity;
- Maintain the connectivity of the Site to facilitate the movement of wildlife through and across the Site;
- Provide visual screening where required and deliver good integration of the development into the landscape;
- Enhance gappy hedgerows to increase biodiversity, connectivity and strengthen local landscape character; and,
- Allow and encourage a diverse ground flora to develop along hedgerow bases.

##### Additional plantings

Any large (>2m) gaps in hedgerows will be in-filled with native hedgerow species. This will comprise: Shrubs and trees of local provenance and the species mix will reflect the mix within the adjacent hedgerow sections.

Hedging will be planted in two staggered rows at a density of not less than 5 per metre, with approximately 450mm between plants in the same row, and 300-400mm between rows. Hedgerows are best planted between November and March, avoiding periods of heavy frost. When planting, it is important to avoid windy conditions as these can rapidly dry out bare-rooted plants and kill them. Where this is not possible, ensure that the roots of the young trees are not exposed to the wind or sun so that they remain moist.

Watering: Immediately after planting, thoroughly and without damaging or displacing plants or soil.

Firming: Lightly firm soil around plants and fork and/or rake soil, without damaging roots to a fine tilth with gentle cambers and no hollows.

The hedge will be 60cm tall when planted. Trees will be supplied as whips and will be planted at regular intervals within the hedgerows.

##### Plant handling

- Bare-rooted planting stock is invariably delivered from the nursery in plastic, light-proof bags and should be stored upright in cool conditions away from direct sunlight. If they are to be stored for long periods (more than a few days), they should be removed from the bags and 'heeled in' to prepared trenches with the roots completely covered in well-cultivated soil until they can be planted.

##### Hedge planting technique

- Notch planting – insert spade and rock back and forth to form a notch. Insert roots well down into notch. Pull the plant upwards a little to straighten the roots. Firm the soil lightly with heel to exclude air.

#### Management of additional plantings

- Maintain a weed free area around each tree and shrub, minimum diameter the larger of 1 m or the surface of the original planting pit.
- Tree stakes, if required, should be inspected annually as follows:
  - Check stakes for looseness, breaks and decay, and replace as necessary to original specification. If a tree with a defective stake has grown sufficiently to become self-supporting, remove stake(s) and fill the hole(s) with lightly compacted soil.
  - Adjust, refix or replace loose or defective ties as necessary, allowing for growth since planting and to prevent chafing. Where chafing has occurred, reposition or replace ties to prevent further chafing.
  - Where stakes are longer than half the height of the clear stem of the tree, cut the stake to this height in spring and retie to tree firmly but not tightly with a single tie.
  - Remove redundant tapes, tags, ties, labels and other encumbrances.
  - Remove stakes and ties during spring when no longer required to support tree.
- Plants/shrubs that have failed to thrive will be rectified and replaced with equivalent plants/shrubs. Replacements will match the size of adjacent or nearby plants of the same species. Making good will occur during the next suitable planting season.
- The new plantings will not be cut in the first growing season. In the second year the previous season's growth will be trimmed back between November and early March by approximately half to encourage bushy growth. In the third year the lateral and lead branches and shoots will be trimmed back to give a more even shape.
- After any new section of hedgerow has become established (potentially after 3 years), mechanical trimming will be used.

#### Established hedgerows

Management of established hedgerows will aim to create a continuous, moderately high bushy structure with a diversity of fruit and flowers available throughout the year.

- Hedgerows solely comprising native shrubs will be managed to maintain a minimum height of 3.5m.
- Hedgerows will be managed on rotation (except in areas where safety/ visibility dictates otherwise), with each hedgerow cut every 2 – 3 years
- Only one side of each hedgerow will be cut in any given year;
- Trimming must take place during November to February inclusive to avoid the breeding bird season and minimise effects on Dormice, preferably in January - February to allow foraging opportunities for wildlife through the winter.

#### 4.5. Grassland buffers adjacent to reens, ditches and hedgerows

Grassland management within buffer areas will aim to create a more diverse sward through natural succession.

There will be no net reduction in grassland habitat area across the Site as the existing arable areas will be planted to grassland. The aim of management is to:

- Manage the areas of buffer grassland to enhance the ecological value of the grassland;
- Maintain the connectivity of the Site to facilitate the movement of wildlife through and across the Site;
- Prevent the build-up of fertility by removing cuttings;
- Monitor and manage, as appropriate, the spread of scrub and invasive species;
- Provide easy access to allow management of boundary features.

##### First year following construction

In the first autumn following construction, any bare ground will be seeded with a suitable grass mix, as the soils are significantly improved and unlikely to develop a diverse sward without some additional seeding. A suitable seed mix will take into account advice of NRW on the introduction of species not usually found with the Gwent Levels and would include Red Clover and Common Knapweed.

##### Management

Buffer grassland will be managed by taking a single hay cut in late September onwards. This will be done using a mower set to approximately 50mm. Cut hay will be left to dry and shed seed for 1- 7 days and the resulting hay removed. This can be used as animal fodder.

Encroaching scrub will be removed annually outside the bird nesting season.

No chemical fertilizer or insecticide inputs will occur within this habitat.

Grassland will be maintained in a healthy vigorous sward, free from disease, fungal growth, discolouration, scorch or wilt.

In a central swathe through the site (Map 2), 7.7ha of grassland will be cut for hay in late September every second year to enhance this area for Shril Carder Bee by creating a tussocky structure with nesting potential. In even years, the buffer zone to the east of ditches and reens will be cut, and in the odd years the buffer to the west will be cut. Areas to the north and south will be cut annually and all areas will be enhanced for this bee through additional plantings of wildflowers into bare areas created by disturbance (e.g. harrowing) and comprising a species mix agreed with NRW.

It is expected that should permission be given, a detailed management plan for approval by the relevant authority, would be required through conditions.

#### 4.6. Grassland beneath solar panels

The aim of management beneath solar panel is to;

- Minimise shading of solar panels;
- Provide forage for low numbers of sheep;
- Enhance the ecological value of the grassland

In the first autumn following construction, any bare ground will be seeded with a suitable commercial grazing mix for beneath panel habitats.

##### Sowing

Seed can be sown by surface broadcasting. Rolling is not usually needed for autumn applications as the weather will settle the seed to the soil.

##### First year management – to be applied to newly sown areas only

Most sown grass species are perennial; they will be slow to germinate and grow and will not usually flower in their first growing season. There will often be a flush of annual weeds from the soil in the first growing season which may grow up and obscure the meadow seedlings beneath. This annual weed growth is easily controlled by topping or mowing.

Areas of retained grassland and sown areas associated with the panels will be managed together after the first year. The area beneath the panels will be grazed by sheep at suitable stocking levels (around 6-8 animals per ha) with the security fence preventing these animals accessing the buffer habitats to ditches and reens.

Weeds and scrub will be controlled by targeted application of a suitable herbicide.

No chemical fertilizer or insecticide inputs will occur within this habitat.

Any changes in management during the lifetime of the solar farm will be in agreement with the planning authority and NRW.

#### 4.7. Bat and breeding bird boxes

The aim of the Bat and breeding bird box scheme is to provide additional habitats for roosting bats and breeding birds.

Ten woodcrete bat boxes and 10 woodcrete bird boxes suitable for birds that nest in cavities will be fitted onto trees surrounding the site. These are detailed in Table 5 with indicative locations shown on Map 2. Final locations will be agreed in consultation with a suitably qualified ecologist.

Table 5. Bird and bat boxes

Item ID	Type	Number	Comments
---------	------	--------	----------

T5.1	Bird nest box: Schwegler 1B (32mm entrance)	5	Hung at a height of 1.5 metres or higher. Nest boxes should be angled so that they face away from the prevailing wind (usually south-westerly in the UK). The chances of occupation are higher if there is good tree (particularly oak) or hedge cover nearby as these will provide a good source of insect food for the nestlings when they hatch.
T5.2	Bird nest box: Schwegler 1B (26mm entrance)	5	Hung at a height of 1.5 metres or higher. Nest boxes should be angled so that they face away from the prevailing wind (usually south-westerly in the UK). The chances of occupation are higher if there is good tree (particularly oak) or hedge cover nearby as these will provide a good source of insect food for the nestlings when they hatch.
T5.3	Bat box: 2F Schwegler	10	The 2F bat box can be sited on a tree or building and is best positioned at a height of between 3 to 6 metres in an open sunny position. A group of 2 to 3 boxes facing in different directions will provide a variety of micro-habitats.

## 5. Monitoring

### 5.1. Introduction

Monitoring is fundamental to the success of this management plan and is required to assess biodiversity changes and identify potential issues. It allows an informed assessment of any changes to be identified, when compared to baseline data. This will enable the effectiveness of mitigation or compensation to be identified.

The lifetime of the solar scheme is likely to be 35 years. Every five years during operation, the management activities will need to be reviewed against the condition of the site, and a new five-year Management Plan produced.

A Management Plan related to decommissioning will also be required to ensure that solar panel removal does not have a negative impact on biodiversity. An adaptive management approach should be adopted whereby the results of monitoring feedback into the appropriate management of the Site.

A summary of proposed monitoring is provided in Table 6.

### 5.2. Invertebrate and aquatic flora monitoring

The following baseline data will be collected in the first survey season after granting of permission:

- aquatic flora and aquatic invertebrate surveys of ditches and reens will be updated in the first suitable period (Spring/summer). This will include both the development site and the breeding (Appendix 2) and wintering (Appendix 3) Lapwing mitigation areas and will adopt the methodology given in '*A manual for the survey and evaluation of the plant and invertebrate assemblages of ditches*' published by Buglife.
- Shril Carder Bee surveys will be updated and will map suitable foraging and nesting habitat across the development site and the breeding and wintering Lapwing mitigation areas, along with a survey of the bees. Precise methodology will be in agreement with NRW but will be repeatable along agreed transect routes with sampling every 10 metres.

After this period, surveys will be repeated every year for the first 5 years of operation, after which the need for monitoring will be assessed in consultation with NRW.

The following baseline data will be collected in the first survey season after construction of the solar farm:

- Survey of egg-laying invertebrates on solar panels to determine if any of the interest feature species of Gwent Levels SSSI are egg-laying on panels. This should comprise near-dusk observations of egg laying attempts on solar panels adjacent to both sides of the central reen during suitable weather and at a suitable time of year. This will need to be completed by an ecologist that is familiar with the aquatic



invertebrate fauna at this site and should be complemented by searches of the panels to detect actual egg-laying.

If no egg-laying is observed, surveys will be repeated annually for the first 3 years of operation, after which the need for monitoring will be assessed in consultation with NRW.

If egg-laying by interest feature species of Gwent Levels SSSI is observed, a mitigation strategy will be adopted with suitable monitoring of mitigation outcomes agreed.

### 5.3. Habitats

Monitoring of ditches, hedgerows, buffer grassland and grassland beneath the solar panels will occur annually for the first five years following construction.

Monitoring will be completed by a suitably qualified ecologist who will assess the floral species diversity and make recommendations if issues are encountered.

Details on the monitoring of ditches to be managed to provided enhancement for the Gwent levels SSSI is provided in the Ditch Management Plan.

Reen management is completed by NRW and a such a monitoring scheme will need to be agreed with them.

#### Hedgerows

Hedgerows at the site are already established although new management is proposed.

Indicators to be assessed will include:

- No encroachment into adjacent ditches and grassland.
- A bushy hedgerow at least 3.5 metres high
- No gaps greater 2 metres
- Large willow shading ditches and reens managed (coppiced)
- Absence of non-native species

#### Buffer grassland

Buffer grassland will be monitored in June/July to assess the success of management.

Indicators to be assessed will include:

- Areas sown with additional wildflowers thriving
- Areas of bare ground less than 5%
- Negligible scrub encroachment
- Increased forb and grass diversity
- Ruderal weeds rare or absent
- Presence of non-native species

#### Grassland beneath solar panels

Grassland beneath solar panels will be monitored in June/July to provide an understanding of how species composition changes over time. This will comprise least 20 x fixed 1m<sup>2</sup> quadrats recording the following:

- Records of all plant species rooted within a given quadrat;
- Estimates of cover by each species;

Baseline data will be collected in the first year after permission is given with subsequent surveys completed in years 2 - 5 after construction. Site selection will be determined by precise layout but would ideally include 10 quadrats in shaded habitats beneath panels, and 10 quadrats inside the security fence, but unshaded the majority of the time.

After this period, the results of monitoring should be assessed to inform a new five-year Management Plan.

#### 5.4. Ornithology

Monitoring of land managed for wintering Lapwings will occur on an annual basis, during winter months, for the first five years following construction. It will be completed by a suitably qualified ecologist who will assess the habitat types within the mitigation area and make recommendations if issues are encountered.

Monitoring of land managed for breeding Lapwings will occur on a two-monthly basis for the first six months following creation. It will be completed by a suitably qualified ecologist who will assess the habitat types within the mitigation area and make recommendations if issues are encountered. Following successful formation of a suitable habitat for breeding Lapwing, monitoring will occur on an annual basis for the first five years following construction.

#### 5.5. Other fauna

No monitoring for other fauna is required.

Table 6. Summary of proposed monitoring

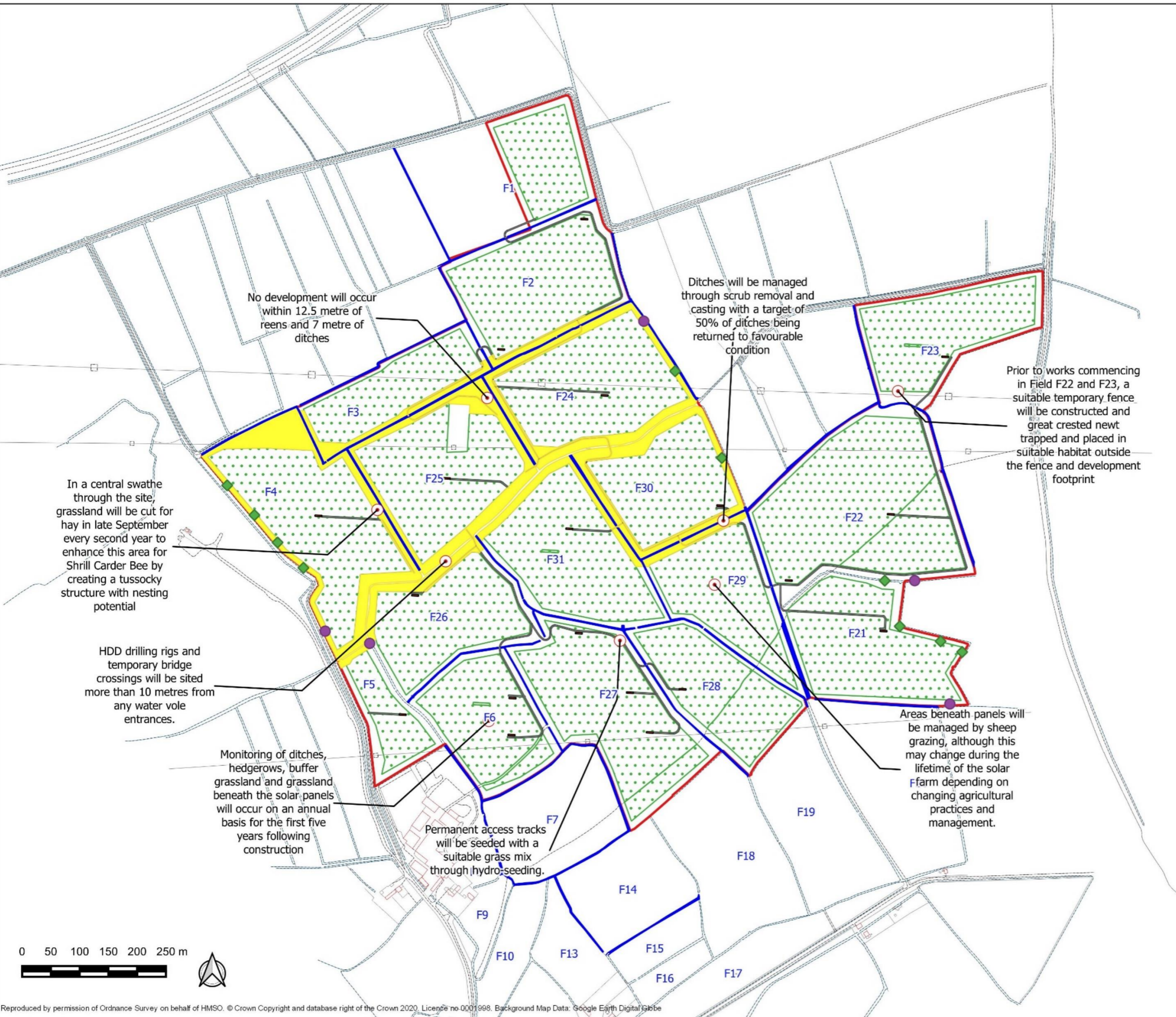
Feature	Initial monitoring	Subsequent monitoring	Comments
Aquatic flora and aquatic invertebrate within ditches and reens within the application site and breeding and wintering lapwing mitigations areas	First survey season after granting of permission	Annually for the first 5 years of operation	After this initial period the need for monitoring will be assessed in consultation with NRW.
Shrill Carder Bee habitat within the application site and breeding and wintering lapwing mitigations areas	First survey season after granting of permission	Annually for the first 5 years of operation	After this initial period the need for monitoring will be assessed in consultation with NRW.
Egg laying insects on panels	First survey season after construction of the solar farm	If no egg-laying is observed, surveys will be repeated annually for the first 2 years of operation	If egg-laying by interest feature species of Gwent Levels SSSI is observed, a mitigation strategy will be adopted with suitable monitoring of mitigation outcomes agreed.
Ditches	First management visit	During subsequent management visits.	See Appendix 6
Reens, hedgerows and grassland	First survey season after construction of the solar farm	Annually for the first 5 years of operation	It should be completed by a suitably qualified ecologist who will assess the floral species diversity and make recommendations if issues are encountered including encroachment of scrub, ruderal herbs and presence of non-native species.
Grassland beneath panels	First survey season after granting of permission	Annually for the first 5 years of operation	To provide an understanding of how species composition changes over time
Wintering lapwing habitat	First survey season after granting of permission	Annually for the first 5 years of operation	It will be completed by a suitably qualified ecologist who will assess the habitat types within the mitigation area and make recommendations if issues are encountered.
Breeding Lapwing mitigation land	Twice every month in the first survey season after granting of permission	Following successful formation of a suitable habitat for breeding Lapwing, annually for the first 5 years of operation	

### Decommissioning

After operation it is likely that the site will be restored to its original condition. Prior to any restoration, habitats will be assessed by a suitably qualified ecologist to determine their value and potential to support species of restricted distribution. These pre-decommissioning surveys will establish the value of the site for biodiversity and form the basis of a formal decommissioning strategy for biodiversity.

**Legend**

- Development footprint
- Invertor tracks
- Habitat under panels managed by sheep grazing
- Ditches to be managed
- Shriill carder bee area
- Bat box
- ◆ Bird box
- ⊙ Target note



Title: Map 2. Landscape Ecology Management Plan

Project: Rush Wall Solar Park

Checked by: CDH    Version: 03  
Date: 16/11/2021

0 50 100 150 200 250 m



## Appendix 1 - semi-aquatic mammals associated with reens

### Mitigation for Otter

Otter, and their breeding or resting places (holts and couches), are protected under the Wildlife and Countryside Act 1981 (as amended), and The Conservation of Habitats and Species Regulations 2017. They are identified as European Protected Species. Under these laws, it is an offence to:

- Capture, kill, disturb or injure otters (deliberately or by not taking enough care)
- Damage or destroy a breeding or resting place (deliberately or by not taking enough care)
- Obstruct access to their resting or sheltering places (deliberately or by not taking enough care)
- Possess, sell, control or transport live or dead otters, or parts of otters.

Otter are listed under Section 7 of the Environment (Wales) Act 2016.

Otter surveys were completed in Spring 2020. Although no evidence of Otter was recorded associated with the reens, the records search strongly suggests they are present in the general area. However, the site has no evidence of holts or couches and it is extremely unlikely that Otter are resting here.

An update survey should be completed prior to construction activity. If an Otter resting place is found, the location of HDD and panels should be modified to be more than 30 metres from the resting place. If this is not possible, the occupation of the resting place will be ascertained with certainty using motion detection cameras, and if necessary a European Protected Species Licence (EPSL) obtained from Natural Resources Wales to allow temporary disturbance during the construction phase.

It should be noted that the site will not be lit at night during the construction and operation phases, and therefore no light mitigation is required.

### Mitigation for Water Vole

Water Vole is protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Under the Act it is an offence to:

- intentionally capture, kill, disturb or injure Water Voles (on purpose or by not taking enough care);
- destroy or block access to their places of shelter or protection;
- possess, sell, control or transport live or dead bats, or parts of them.

Water Vole are listed under Section 7 of the Environment (Wales) Act 2016.

Water Vole surveys were completed in Spring 2020. Although the majority of the site lacked recent evidence of Water Vole, a limited area within the centre of the site exhibited a high concentration of field signs of recent activity.

Water Vole are known to be in the local area, and as the reens are generally well connected across the Site, it is safe to conclude that Water Vole are present across the wider site.

A Water Vole conservation strategy is provided in Appendix 5.7 of the ES (*Water Vole Survey, Rush Wall Solar Park, August 2021 Report no: WVole-526.2*) and includes:

- An update survey prior to construction to inform location of HDD rigs.
- Displacement methods if needed.
- Timing of ditch management works to autumn across much of the site during the operational period
- Ecological compliance audit

## Appendix 2 - Breeding Lapwing mitigation

A maximum of two pairs of Lapwing were recorded attempting to breed within the site during breeding bird surveys in Spring/Summer 2019, although it is unlikely they successfully fledged chicks due to land management in their nesting area.

Mitigation for loss of breeding Lapwing habitats will comprise 12ha of grassland which will be set aside for breeding Lapwing to the north east of the development (Map 3) and secured with legal agreements. Average Lapwing nesting territories are between 0.4 and 0.8ha<sup>1</sup>. This land has been managed by a different landowner to the development and has more suitable habitat for nesting Lapwing when compared to the proposed solar farm site, with only a slightly improved sward, few boundary features and more diverse grassland and herb community.

Currently the site comprises species-poor semi-improved grassland that is managed in a traditional manner through grazing and topping, and is enclosed by ditches with limited amounts of scrub.

As well as providing a valuable habitat for nesting Lapwing and other ground nesting birds, this will also provide additional habitat area for wintering Lapwing.

This area will be managed as follows:

1. No stocking in the period Feb to April.
2. After this period, low stocking density is possible: one cow/horse per ha in May and June to but no young livestock as they risk trampling of chicks.
3. Grazing will aim to keep a short sward across about 75% of the mitigation area during the nesting season.
4. Grazing is needed in the period Jul to Feb, outside the breeding season, to prepare the sward for the following breeding season. No restriction on stocking density in this period.
5. No applications of manure (organic or inorganic) during the period mid-March to end of June (egg laying, nesting and dependent chicks on the ground period).
6. Herbicides, if used, must be targeted on limited areas.
7. No mechanical works (tractors etc) will occur in the period mid-March to mid-June, as this will adversely affect egg laying, nesting and any dependent chicks on the ground.
8. Hay cut can be taken after mid-July
9. Creation of shallow scrapes will increase invertebrate numbers and provide a food resource for both adults and chicks. These will be agreed with the landowner, and

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<sup>1</sup> See: <https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/lapwing/breeding-and-nesting-habits/>



will be in areas that naturally hold water already and are towards the centre of the mitigation area, away from any predators potentially associated with boundaries.

10. Vegetation along ditch edges will be maintained at a low height (approximately 1m) to avoid creating habitat for ambush predators within the site and at its margins.

11. Predator fencing will be added at the mitigation site boundaries, and woody scrub areas within the lapwing area will be managed to open up the landscape for this bird.

Monitoring of land managed for breeding Lapwings will occur on a two-monthly basis for the first six months following creation. It will be completed by a suitably qualified ecologist who will assess the habitat types within the mitigation area and make recommendations if issues are encountered. Following successful formation of a suitable habitat for breeding Lapwing, monitoring will occur on an annual basis for the first five years following construction after which it will be completed every five years.

During winter months, this land will provide additional habitat for over wintering Lapwing.

It is expected that should be permission be given, a detailed management plan will be developed in consultation with the RSPB for approval by the relevant authority, would be required through conditions.

## Appendix 3 - Over wintering Lapwing mitigation

Winter and passage bird surveys were completed during the period 2018 to 2020 to identify its importance for this group of birds, in particular those species that may be interest features of nearby statutory nature conservation sites associated with the Severn Estuary.

The following birds that are over wintering interest features of the nearby statutory nature conservation sites were recorded here during the 32 site visits:

- Wigeon, Teal, Pochard, Curlew and Bewick's Swan were only encountered in small numbers on a single visit. The site is of negligible value for these over wintering species associated with nearby statutory nature conservation sites.
- Shelduck were present on five occasions with a maximum of 5 birds on 25<sup>th</sup> February and 14<sup>th</sup> March 2020.
- Lesser Black-backed Gulls were present on five occasions with a maximum of 77 individuals on 7<sup>th</sup> March 2020.
- Snipe were recorded on 13 of the 32 survey visits with a maximum of 43 birds on 28<sup>th</sup> February 2020.
- Mallard were recorded on 24 of the 32 site visits with a maximum of 50 birds on 13<sup>th</sup> October 2019.
- Lapwing were recorded on 21 of the 32 site visits with a peak of 164 birds on 27<sup>th</sup> November 2018.

An area of agricultural land to the south of the proposed solar farm will be managed for wintering birds. This comprises a group of 6 fields (Map 3) that will be managed under rotation such that in any given winter (October to March) at least 10ha is managed for wintering birds. In addition, breeding mitigation to the north of the development will be available for wintering birds, resulting in at least 22ha of habitat managed for wintering birds each year.

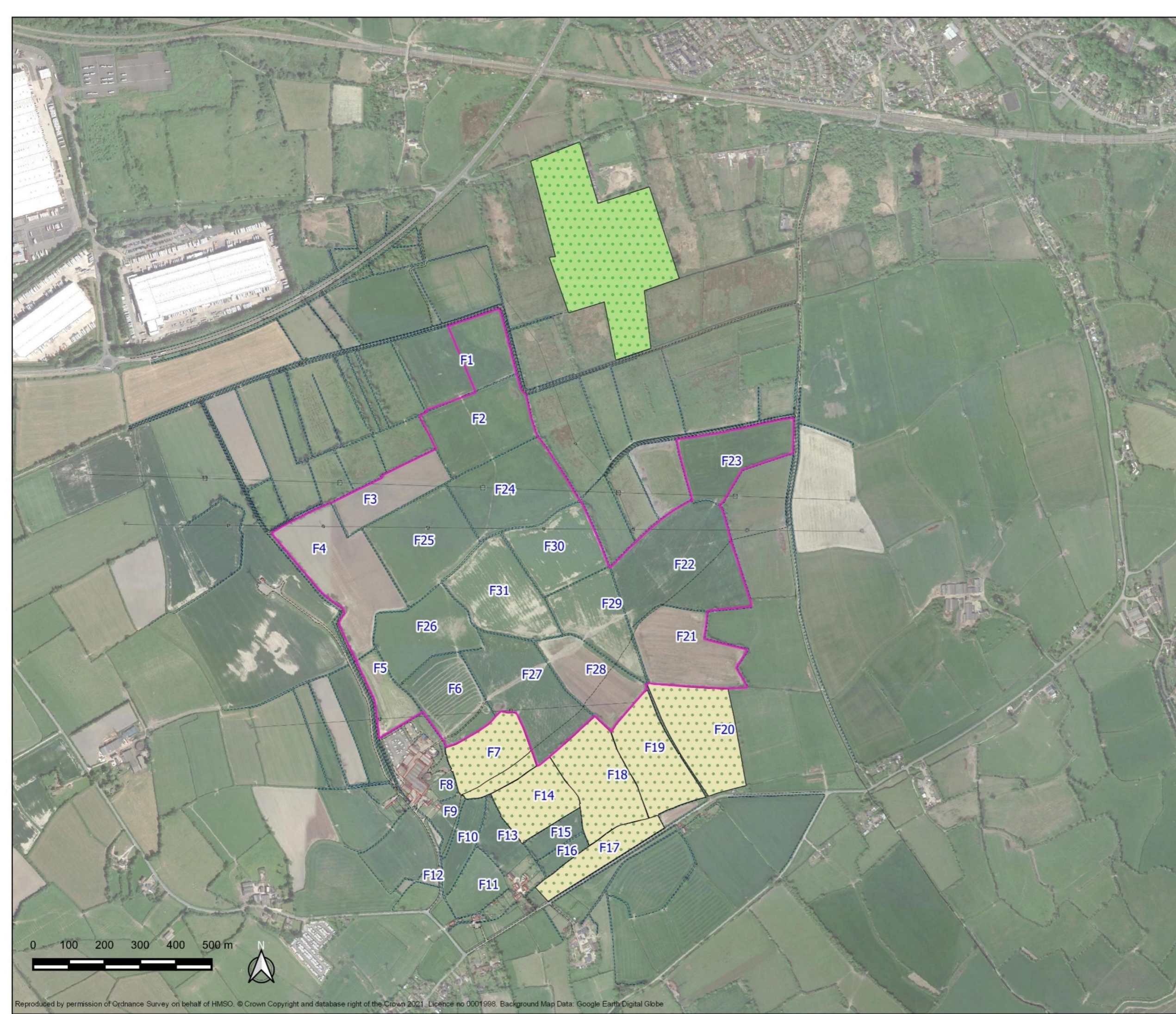
These areas will be managed as follows:

1. No dirty water from livestock spread in that area.
2. Well-rotted animal manure permitted.
3. Maintain a diversity of habitats such as stubble and short sward grazed wet grassland where invertebrates are plentiful during the over winter period
4. Maintain existing scrape type depressions which are subject to periodic flooding.
5. No undersowing into cereal/maize stubble on the mitigation land.
6. Over wintering period is defined as October to March inclusive.
7. Grazing by cattle and sheep in the winter months would be acceptable, as it will help maintain the short sward suitable for foraging Lapwing.

It is expected that should be permission be given, a detailed management plan for approval by the relevant authority, would be required through conditions.

**Legend**

- Operational development footprint
- Summer/winter mitigation
- Winter mitigation



Title: Map 3. Lapwing mitigation areas

Project: Rush Wall Solar Park

Checked by: CDH      Version: 04  
Date: 25/08/2021

## Appendix 4 - Great Crested Newt mitigation

Great Crested Newt eDNA surveys were completed on the 7 water bodies within the survey area in Spring 2019.

GCN eDNA was found within ditch 50 along the northern boundary of field F23 (Map 4). Other watercourses to the immediate west and south of the adjacent field F22 provided negative results, indicating that GCN are not present elsewhere within the eastern part of the development site. The GCN EDNA is likely to be the result of a population centred to the east of the development site or a migrating animal.

Activities that could adversely impact GCN relate to installation of the solar PV array, fencing, access tracks and electrical cabinets/cable routes within 500 metres of ditch 50.

A GCN Conservation strategy has been developed and is provided in Appendix 5.5 of the ES (Great Crested Newt surveys) and includes:

- Requirement of a European Protected species License for works
- Fencing development areas within 250 metres of ditch 50 and completion of translocation program
- Protection of buffer habitats within 500 metres
- Timing of management for ditches in the vicinity to the period 1st November to 31st January.
- Ecological compliance audit

A European Protected Species Mitigation Licence will be required to allow installation of the fence. The Licence application should be informed by an updated GCN eDNA survey.

Prior to issuing a licence, NRW will need to be confident that the 'Three Tests' are met as follows:

1. The proposed development must meet a purpose of 'preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.
2. There is no satisfactory alternative.
3. The action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

Test 1 is met as the project meets a specific need in providing green energy.

Test 2 requires a consideration of alternatives. At this site, winter build out is not feasible due to poor ground conditions during wet periods. Although Field 23 could be left in an undeveloped state, installation of solar panels elsewhere will isolate it from retained operational areas of the farm. This would not a proportionate response to the low level of impact associated with this development.

This appendix provides the detail to ensure Test 3 is met.

Due to difficulties associated with Natural Resources Wales during the Covid 19 emergency, it was not possible to consult with their amphibian lead prior to submission.

**Legend**

- Development footprint
- Target note
- Access track
- GCN fence enclosing area to be cleared of GCN prior to construction



Title: Map 4. Great Crested Newt mitigation plan

Project: Rush Wall Solar Park

Checked by: CDH    Version: 02  
Date: 24/08/2021

## Appendix 5 - Ground nesting bird strategy during the construction phase

Due to the size of this site, there is potential for ground, reed and scrub (hedgerow) nesting birds to establish within the site before and during the construction phase. Activities associated with the construction phase that could impact these birds in a way that could be considered an offence under relevant wildlife legislation include hedgerow removal/management, installation of solar panels and associated infrastructure (including the cable route), and HDD operations.

The following method statement will be adopted for works during the bird nesting season (March to August inclusive):

1. Prior to the start of works a nesting bird toolbox talk will be provided to all site staff involved in ground works by a responsible person. Staff will be made aware of the law in relation to nesting birds and their potential to be present at this site.
2. Within 5 days prior to removal of vegetation with potential for nesting birds, a nesting bird survey will be completed of affected areas by the ECoW. This will include observations for nesting activity (such the transport of nesting materials or food items) and a search for active nests.
3. Once the ecologist is certain that nesting birds are not present, that section of vegetation will be removed.
4. If evidence of nesting birds is found, the nest site will be protected by barrier tape to a buffer of at least 5 metres, and a sign indicating its function will be placed. A record will be kept of all nests encountered.
5. This protection will remain in place until and nested chicks have fledged, after which it will be removed, and the vegetation cut.

## Appendix 6 – Ditch management plan

This plan is in response to comments received from Natural Resources Wales (NRW) on 08/01/2021 which stated:

*Habitat management:*

- *A comprehensive ditch management program during the lifetime of the project, to include details of the channel and bankside ditch management to enhance the site to meet favourable condition status. The plan must achieve a large proportion of well connected ditches that are open to sunlight to support the SSSI's aquatic flora and fauna features.*
- *Details on management of reed and ditch buffers as enhancement for the SSSI Shrill carder bee features and wider biodiversity.*
- *A larger mitigation area to provide enhancement for the Shrill carder bee.*

And:

*Habitat management for a large scheme such as this, within a designated site, should deliver a comprehensive management program to safeguard and enhance the features of the SSSI. The habitat management should work towards achieving favourable condition of this specific area of the SSSI.*

And:

*To be in favourable condition each field block unit (group of ditches within a land block) must have: No more than 50% of ditches to be category 2, 2d, 3 or 4c.*

And:

*Ditches in favourable condition are categorised as:*

- 1 - Ditch open on one side and hedged on other side (single hedged)*
- 4a - Intermittent hedge (gappy hedge) on one or both sides of ditch*
- 4b - Ditch has water in it (at least 5cm deep) and no hedge on either side (ditch is open)*

*Ditches in unfavourable condition are categorised as:*

- 2 - ditch hedged on both sides (double hedged)*
- 2d - ditch hedged on both sides (double hedged) and dry*
- 3 - Ditch is dry and has no hedge on either side (is open)*
- 4c - hedge on one side of ditch and intermittent hedge (gappy hedge) on other side*

The aim of this report is to provide a comprehensive ditch management program for the lifetime of the project to ensure at least 50% of ditches within field blocks 4 and 25 are in favourable condition i.e. not categorised as double hedged, dry or hedged to one side and partially hedged to the other.



### Field survey

A site walkover to classify ditches was completed in April 2019 and updated in June and September 2021. During the survey, digital images were collected for each ditch, and they were categorised based on % shading and evidence of drying.

For shading classification, a ditch was classified as 50% shaded if a hedgerow was present to one side, and 100% shaded if the ditch was double hedged.

### Results

A total of 61 ditches with a combined length of 14,540m were classified (Map 5).

#### Field Block 4

Field Block 4 contains 39 ditches with a combined length of 9343m. Of these, only 2113m are considered in favourable condition. The remainder were in unfavourable condition due to drying, double hedgerows, and hedgerow to one side and partial hedgerow to the other (Table 1).

Table 1. Category of ditches within Field block 4

Category	Number of ditches	Length (m)
1 - Ditch open on one side and hedged on other side	10	2113
2 - ditch hedged on both sides (double hedged)	27	6734
2d - ditch hedged on both sides (double hedged) and dry	1	221
4c - hedge on one side of ditch and intermittent hedge (gappy hedge) on other side	1	275

#### Field Block 25

Field Block 25 contains 22 ditches with a combined length of 5195m. None are considered in favourable condition due to drying, double hedgerows, and hedgerow to one side and partial hedgerow to the other (Table 2).

Table 2. Category of ditches within Field block 25

Category	Number of ditches	Length (m)
1 - Ditch open on one side and hedged on other side	0	0
2 - ditch hedged on both sides (double hedged)	14	3210
2d - ditch hedged on both sides (double hedged) and dry	6	1563
4c - hedge on one side of ditch and intermittent hedge (gappy hedge) on other side	2	422

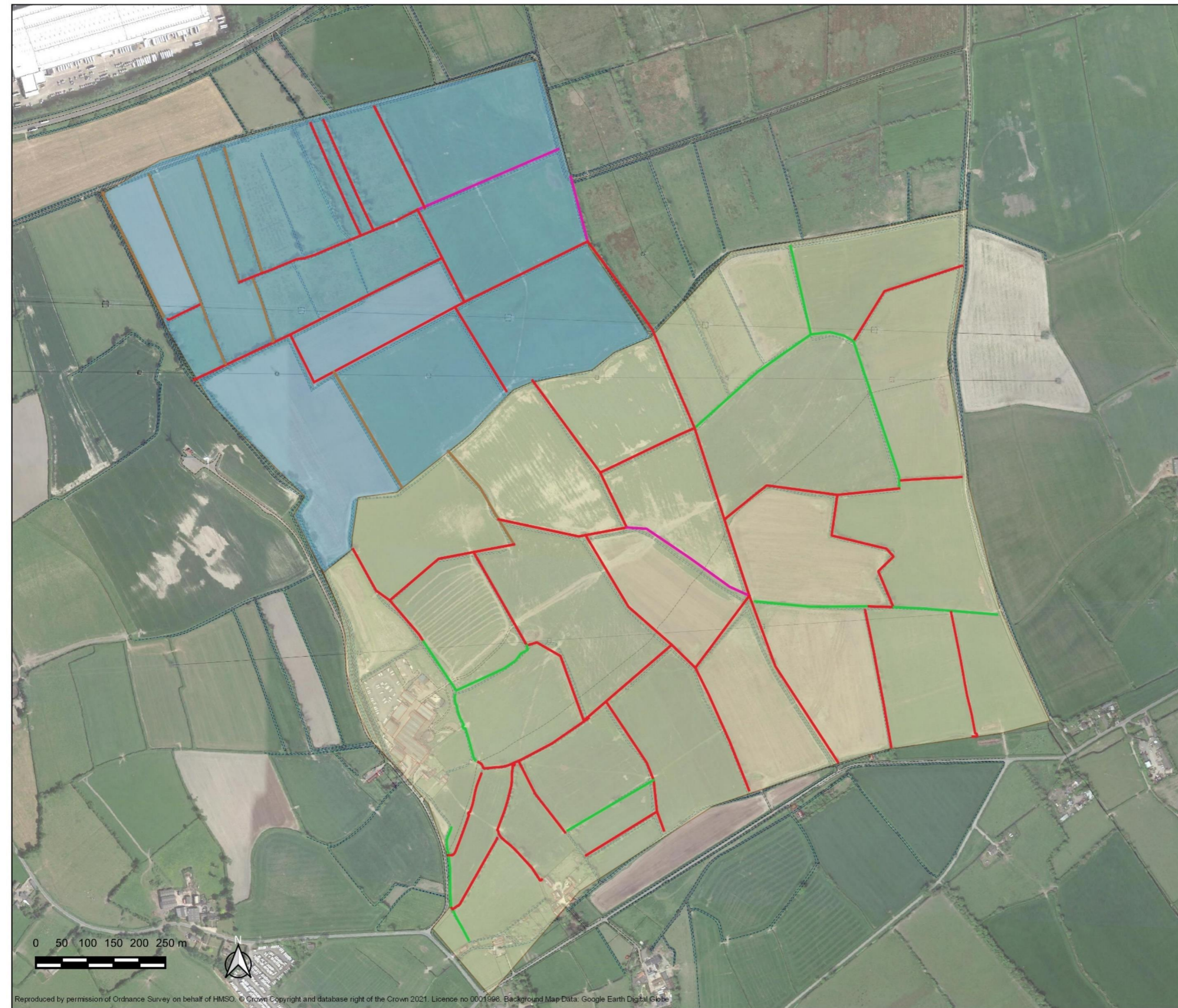
**Legend**

Ditch category

- 1 (favourable)
- 2 (unfavourable)
- 2d (unfavourable)
- 4c (unfavourable)

Field blocks

- 25
- 4



Title: Map 5. Ditches within field blocks 4 and 25

Project: Rush Wall Solar Park

Checked by: CDH      Version: 03  
Date: 26/10/2021

## Management program

### Management target

The target is to remove scrub and cast ditches to attain favourable condition for 50% of the ditches within field compartments 4 and 25 within 7 years of development. This will be followed by a 7-year rolling program of management to ensure these ditches remain in favourable condition during the 35 year operation of this development. Management will only be possible on ditches within the lease area. In Field block 4 this will comprise an additional 3064m<sup>2</sup> of ditches improved to Category 1, and 2733m<sup>3</sup> improved within Field block 25.

Ditch management will be completed along approximately 5800m of ditches in the category 2, 2d and 4c over the 7-year cycle (Table 2 and Map 2). Ditches have been selected using the following criteria:

- connect into main reens and to each other, thereby creating a strong pathway for colonisation by plants and animals important for the Gwent Levels SSSI.
- will provide connectivity into ditches that are currently in favourable condition.
- allow proper management and control of habitats on both banks by only selecting ditches with both banks within the solar park.

In addition, 1912m of ditches in Category 1 (favourable condition) in Field Block 4 will be managed to retain this favourable condition status.

There are two main elements to management, the removal of shading scrub and casting of ditches.

### Scrub removal – unfavourable condition ditches in lease area

Scrub removal will adopt the following methodology:

- Scrub removal will be undertaken during the period 1 September to 28<sup>th</sup> February to avoid the accepted bird nesting season.
- Scrub will be removed from the southern/eastern side of the ditch using hand-tool and arisings will be removed from site.
- To prevent re-growth, cut stems will be treated with a suitable eco-plug, fitted as per the manufacturers recommendation.
- Scrub removal will take into account the presence of other protected species, including great crested newt, (associated with the reen adjacent to ditch 33). To allow this, scrub will be cut back to 30cm proud of the ground during the winter months, with stems cut back to ground level and treated with eco plugs during the following May/June. More detail is provided in within the relevant sections of the LEMP.

### Ditch casting – unfavourable and favourable condition ditches

All ditches subject to scrub removal will require casting, along with ditches that are currently Category 1 and detailed on Map 2.

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<sup>2</sup> Only 2566m of ditches need to be managed to favourable condition to meet the 50% target in field block 4. However, an additional 500m has been added to ensure the target is fully met.

<sup>3</sup> Only 2607m of ditches need to be managed to favourable condition to meet the 50% target in field block 4. However, an additional 123m has been added to ensure the target is fully met.

With the exception of ditches in the east of the site, ditches will be cast in late Autumn due to the likely presence of Water Vole.

Ditches 14, 27, 28, 30 & 33 in the east will be cast in the period November to January inclusive, due to the presence of great crested newt in this area.

Table 3. Schedule of initial ditch management in Years 1 to 7

Field Block	Type	Ditch code <sup>4</sup>	Category	Initial casting	Initial scrub removal	Length (m)
4	Unfavourable	12	2	Y1	Y1	339
4	Unfavourable	13	2	Y1	Y1	202
4	Unfavourable	15	2d	Y1	Y1	222
4	Unfavourable	18	2	Y1	Y1	253
25	Unfavourable	8	2	Y1	Y1	190
25	Unfavourable	9	2d	Y1	Y1	260
25	Unfavourable	44	2	Y1	Y1	211
4	Unfavourable	17	2	Y3	Y3	272
4	Unfavourable	19	4c	Y3	Y3	276
4	Unfavourable	20	2	Y3	Y3	208
4	Unfavourable	23	2	Y3	Y3	206
4	Unfavourable	24	2	Y3	Y3	337
4	Unfavourable	W	2	Y3	Y3	245
25	Unfavourable	4	2	Y3	Y3	265
25	Unfavourable	5	2	Y3	Y3	330
25	Unfavourable	6	2	Y3	Y3	329
25	Unfavourable	7	2	Y3	Y3	103
25	Unfavourable	10	2	Y3	Y3	206
4	Favourable	21	1	Y5	NA	114
4	Favourable	22	1	Y5	Y5	170
4	Favourable	R	1	Y5	NA	193
4	Unfavourable	T	2	Y5	Y5	163
4	Favourable	U	1	Y5	NA	141
4	Favourable	V	1	Y5	NA	229
25	Unfavourable	2	4c	Y5	Y5	293
25	Unfavourable	3	2	Y5	Y5	200
25	Unfavourable	43	4c	Y5	Y5	129
25	Unfavourable	A	2	Y5	Y5	218
4	Unfavourable	14	2	Y7 (Winter)	Y7	341
4	Favourable	27	1	Y7 (Winter)	NA	375
4	Favourable	28	1	Y7 (Winter)	NA	175
4	Favourable	30	1	Y7 (Winter)	NA	299

<sup>4</sup> Ditch codes: Numbered ditches are inside the proposed development, lettered ditches are within the lease area

4	Favourable	33	1	Y7 (Winter)	NA	216
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#### Monitoring and long-term management

Ditches detailed in Table 3 and Map 2 will be cast for the life of the project on a rolling 7-year schedule detailed in Table 4.

Monitoring will be completed on all managed ditches during each management visit (Table 5) by a suitably qualified and experienced ecologist and will:

- evaluate the impact of management on biodiversity within the site,
- assess the need for additional management practices,
- assess the need for changes in management frequency,
- provide recommendation for ongoing management,
- report outcomes to NRW and the planning authority.

During each casting, woody scrub regrowth will also be assessed on eastern and southern banks all ditches and will be managed by cutting and Eco plugs if above 0.5m high.

Table 4. Rolling 7-year schedule of ditch management

Ditch code	Current category	Length (m)	Program of managed ditch monitoring
12	2	339	Yr1, Yr8, Yr15, Yr22, Yr29 (autumn)
13	2	202	Yr1, Yr8, Yr15, Yr22, Yr29 (autumn)
15	2d	222	Yr1, Yr8, Yr15, Yr22, Yr29 (autumn)
18	2	253	Yr1, Yr8, Yr15, Yr22, Yr29 (autumn)
8	2	190	Yr1, Yr8, Yr15, Yr22, Yr29 (autumn)
9	2d	260	Yr1, Yr8, Yr15, Yr22, Yr29 (autumn)
44	2	211	Yr1, Yr8, Yr15, Yr22, Yr29 (autumn)
17	2	272	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
19	4c	276	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
20	2	208	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
23	2	206	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
24	2	337	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
W	2	245	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
4	2	265	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
5	2	330	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
6	2	329	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
7	2	103	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
10	2	206	Yr3, Yr10, Yr18, Yr24, Yr31 (autumn)
21	1	114	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
22	1	170	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
R	1	193	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
T	2	163	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
U	1	141	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
V	1	229	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
2	4c	293	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)

3	2	200	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
43	4c	129	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
A	2	218	Yr5, Yr12, Yr20, Yr26, Yr33 (autumn)
14	2	341	Yr7, Yr14, Yr22, Yr34, Yr42 (winter)
27	1	375	Yr7, Yr14, Yr22, Yr34, Yr42 (winter)
28	1	175	Yr7, Yr14, Yr22, Yr34, Yr42 (winter)
30	1	299	Yr7, Yr14, Yr22, Yr34, Yr42 (winter)
33	1	216	Yr7, Yr14, Yr22, Yr34, Yr42 (winter)

Table 5. Monitoring schedule

Ditch number	Program of managed ditch monitoring
All ditches	Yr1, Yr3, Yr5, Yr7, Yr8, Yr10, Yr12, Yr14, Yr15, Yr18, Yr22, Yr26, Yr26, Yr29, Yr31, Yr33 & Yr34

**Legend**

Field blocks

25

4

Ditch category

1 (favourable)

2 (unfavourable)

2d (unfavourable)

4c (unfavourable)

Number	Initial_casting	Category
12	Y1	2
13	Y1	2
15	Y1	2d
18	Y1	2
17	Y3	2
19	Y3	4c
20	Y3	2
23	Y3	2
24	Y3	2
W	Y3	2
21	Y5	1
22	Y5	1
R	Y5	1
U	Y5	1
V	Y5	1
T	Y5	2
14	Y7 (Winter)	2
27	Y7 (Winter)	1
28	Y7 (Winter)	1
30	Y7 (Winter)	1
33	Y7 (Winter)	1

Casting schedule in Field Block 4

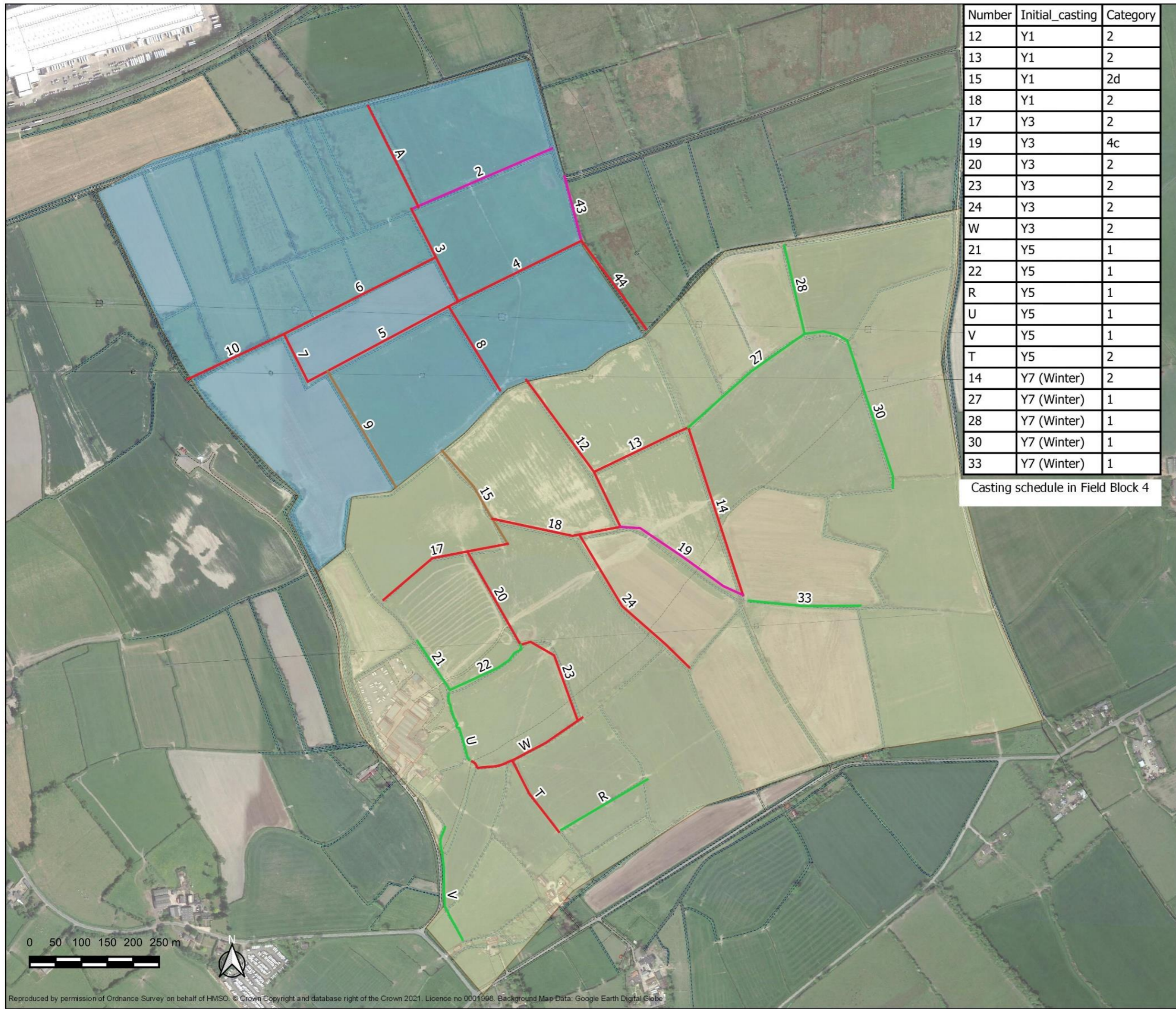
Number	Initial_casting	Category
8	Y1	2
9	Y1	2d
44	Y1	2
4	Y3	2
5	Y3	2
6	Y3	2
7	Y3	2
10	Y3	2
2	Y5	4c
3	Y5	2
43	Y5	4c
A	Y5	2

Casting schedule in Field Block 25

Title: Map 6. Ditch management plan

Project: Rush Wall Solar Park

Checked by: CDH      Version: 03  
Date: 16/11/2021



## Appendix 7 - Assessment of net gain.

### Defra Biodiversity Metric 3.0

In the absence of other tools specific to Wales, Defra Biodiversity Metric 3.0 has been applied to habitat areas and watercourses at this site to provide a quantitative assessment of biodiversity net gain. This has not been applied to hedgerow habitat.

Taking the following into account, a predicted net gain of 144 habitat units is likely, representing a 75% increase over site baseline:

- habitat losses associated with built infrastructure and associated access tracks,
- improvement of habitat quality associated with under panel grassland habitats,
- improved grassland habitat quality associated with reed and ditch buffers,
- improvement in areas where arable has been planted to grassland.

In addition, taking the following into account, a predicted net gain of 19.9 River units is likely, representing a 18% increase over site baseline

- improvement in ditch habitat quality due to changes in land management and active scrub removal to open up ditch habitat.

The detailed results page from the metric is provided below.



**Summary Figures**

<b>Net project biodiversity units</b> <small>(Including all on-site &amp; off-site habitat restoration)</small>	<b>Mature units</b>	<b>144.53</b>
	<b>Hedge/row units</b>	<b>19.59</b>
<b>Total project biodiversity % change</b> <small>(Including all On-site &amp; Off-site Habitat Creation + Restored Habitats)</small>	<b>Mature units</b>	<b>75.16%</b>
	<b>Hedge/row units</b>	<b>0.00%</b>
	<b>River units</b>	<b>18.17%</b>

**Combined habitat retention and enhancement**

	Habitats	Hedge/rows	Rivers
<b>Total area / length</b>			
Total area	131.93	0.00	138.59
Area / length retained	0.00	0.00	0.00
Units retained	0.00	0.00	0.00
Area / length proposed for enhancement	0.00	0.00	0.00
Biodiversity units proposed for enhancement	0.00	0.00	0.00
Area / length lost	131.93	0.00	138.59
Units lost	131.93	0.00	138.59

**Area habitats**

**On site change by broad habitat type**

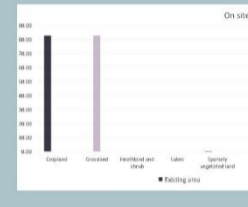
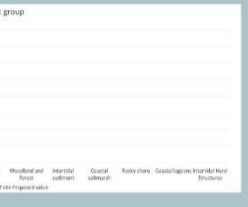
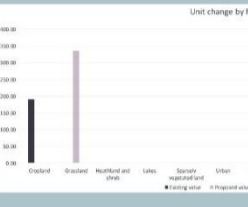
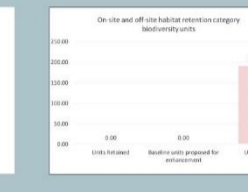
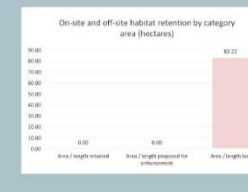
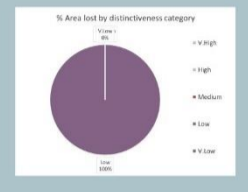
Habitat group	Baseline		Post development on site		On-site Change	
	Existing area	Existing value	Proposed area	Proposed value	Area change	On-site Dist. change
Coastland	0.00	0.00	0.00	0.00	0.00	0.00
Coastland and scrub	0.00	0.00	0.00	0.00	0.00	0.00
Lakes	0.00	0.00	0.00	0.00	0.00	0.00
Recently revegetated land	0.37	1.38	0.00	0.00	-0.37	-1.38
Meadow	0.00	0.00	0.00	0.00	0.00	0.00
Woodland and forest	0.00	0.00	0.00	0.00	0.00	0.00
Woodland and forest	0.00	0.00	0.00	0.00	0.00	0.00
Coastal saltmarsh	0.00	0.00	0.00	0.00	0.00	0.00
Coastal saltmarsh	0.00	0.00	0.00	0.00	0.00	0.00
Rocky shore	0.00	0.00	0.00	0.00	0.00	0.00
Coastal lagoons	0.00	0.00	0.00	0.00	0.00	0.00
Intertidal Hard Structures	0.00	0.00	0.00	0.00	0.00	0.00

**Off site change by broad habitat type**

Habitat group	Baseline		Post development off-site		Off-site Change	
	Existing area	Existing value	Off-site Proposed area	Off-site Proposed value	Off-site Area change	Off-site Dist. change
Coastland	0.00	0.00	0.00	0.00	0.00	0.00
Coastland and scrub	0.00	0.00	0.00	0.00	0.00	0.00
Lakes	0.00	0.00	0.00	0.00	0.00	0.00
Recently revegetated land	0.00	0.00	0.00	0.00	0.00	0.00
Meadow	0.00	0.00	0.00	0.00	0.00	0.00
Woodland and forest	0.00	0.00	0.00	0.00	0.00	0.00
Woodland and forest	0.00	0.00	0.00	0.00	0.00	0.00
Coastal saltmarsh	0.00	0.00	0.00	0.00	0.00	0.00
Coastal saltmarsh	0.00	0.00	0.00	0.00	0.00	0.00
Rocky shore	0.00	0.00	0.00	0.00	0.00	0.00
Coastal lagoons	0.00	0.00	0.00	0.00	0.00	0.00
Intertidal Hard Structures	0.00	0.00	0.00	0.00	0.00	0.00

**Combined on site and off site change by broad habitat type**

Habitat group	Baseline		On-site and Off-site post development		Combined change	
	Existing area	Existing value	Combined Proposed area	Combined Proposed value	Proposed area change	Proposed value change
Coastland	0.00	0.00	0.00	0.00	0.00	0.00
Coastland and scrub	0.00	0.00	0.00	0.00	0.00	0.00
Lakes	0.00	0.00	0.00	0.00	0.00	0.00
Recently revegetated land	0.37	1.38	0.00	0.00	-0.37	-1.38
Meadow	0.00	0.00	0.00	0.00	0.00	0.00
Woodland and forest	0.00	0.00	0.00	0.00	0.00	0.00
Woodland and forest	0.00	0.00	0.00	0.00	0.00	0.00
Coastal saltmarsh	0.00	0.00	0.00	0.00	0.00	0.00
Coastal saltmarsh	0.00	0.00	0.00	0.00	0.00	0.00
Rocky shore	0.00	0.00	0.00	0.00	0.00	0.00
Coastal lagoons	0.00	0.00	0.00	0.00	0.00	0.00
Intertidal Hard Structures	0.00	0.00	0.00	0.00	0.00	0.00



**Hedgerows and lines of trees**

**On site change by hedgerow type**

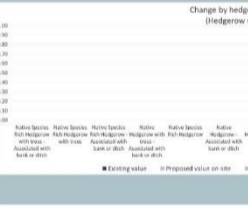
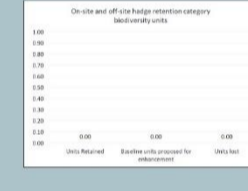
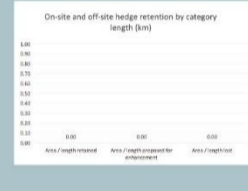
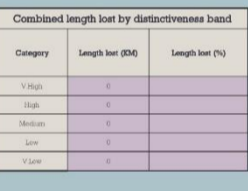
Hedgerow type	Baseline		Post development on site		On-site Change	
	Existing length	Existing value	Proposed length	Proposed value	Length change	On-site Dist. change
Native Species Rich Hedgerow with trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Species Rich Hedgerow with trees	0.00	0.00	0.00	0.00	0.00	0.00
Native Species Rich Hedgerow - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow with trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow with trees	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees (Ecologically Variable) - with Bank or Ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees (Ecologically Variable) - with Bank or Ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Hedge (Conventional Non Native)	0.00	0.00	0.00	0.00	0.00	0.00

**Off site change by hedgerow type**

Hedgerow type	Baseline		Post development off-site		Off-site Change	
	Existing length	Existing value	Off-site Proposed length	Off-site Proposed value	Off-site Length change	Off-site Dist. change
Native Species Rich Hedgerow with trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Species Rich Hedgerow with trees	0.00	0.00	0.00	0.00	0.00	0.00
Native Species Rich Hedgerow - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow with trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow with trees	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees (Ecologically Variable) - with Bank or Ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees (Ecologically Variable) - with Bank or Ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Hedge (Conventional Non Native)	0.00	0.00	0.00	0.00	0.00	0.00

**Combined on site and off site change by hedgerow type**

Hedgerow type	Baseline		Post development on site		On-site and Off-site Change	
	Existing length	Existing value	Combined Proposed length	Combined Proposed value	Proposed length change	Proposed value change
Native Species Rich Hedgerow with trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Species Rich Hedgerow with trees	0.00	0.00	0.00	0.00	0.00	0.00
Native Species Rich Hedgerow - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow with trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow with trees	0.00	0.00	0.00	0.00	0.00	0.00
Native Hedgerow - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees (Ecologically Variable) - with Bank or Ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees (Ecologically Variable) - with Bank or Ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Line of Trees - Associated with bank or ditch	0.00	0.00	0.00	0.00	0.00	0.00
Hedge (Conventional Non Native)	0.00	0.00	0.00	0.00	0.00	0.00



**Rivers and Streams**

**On site change by river type**

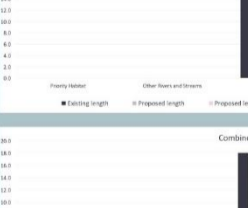
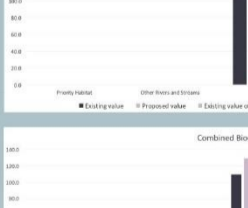
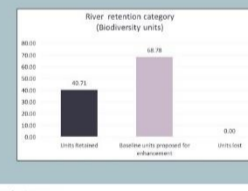
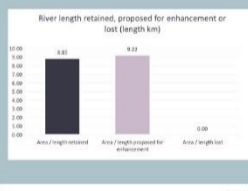
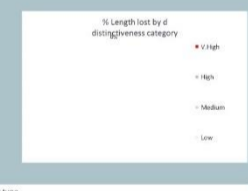
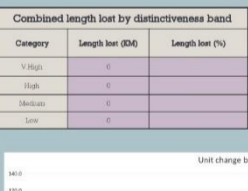
River type	Baseline		Post development on site		On-site Change	
	Existing length	Existing value	Proposed length	Proposed value	Length change	On-site Dist. change
Priority habitat	0.0	0.0	0.0	0.0	0.0	0.0
Other Rivers and Streams	0.0	0.0	0.0	0.0	0.0	0.0
River	0.0	0.0	0.0	0.0	0.0	0.0
Stream	0.0	0.0	0.0	0.0	0.0	0.0
Channel	0.0	0.0	0.0	0.0	0.0	0.0

**Off site change by river type**

River type	Baseline		Post development off-site		Off-site Change	
	Existing length	Existing value	Off-site Proposed length	Off-site Proposed value	Off-site Length change	Off-site Dist. change
Priority habitat	0.0	0.0	0.0	0.0	0.0	0.0
Other Rivers and Streams	0.0	0.0	0.0	0.0	0.0	0.0
River	0.0	0.0	0.0	0.0	0.0	0.0
Stream	0.0	0.0	0.0	0.0	0.0	0.0
Channel	0.0	0.0	0.0	0.0	0.0	0.0

**Combined on site and off site change by river type**

River type	Baseline		Post development on site		On-site and Off-site Change	
	Existing length	Existing value	Combined Proposed length	Combined Proposed value	Proposed length change	Proposed value change
Priority habitat	0.0	0.0	0.0	0.0	0.0	0.0
Other Rivers and Streams	0.0	0.0	0.0	0.0	0.0	0.0
River	0.0	0.0	0.0	0.0	0.0	0.0
Stream	0.0	0.0	0.0	0.0	0.0	0.0
Channel	0.0	0.0	0.0	0.0	0.0	0.0



## SPIES tool

The SPIES tool<sup>5</sup> assesses proposed management interventions against peer reviewed scientific papers and provides an evidence-based summary of likely impacts. For this project, interventions proposed within the LEMP will result in changes significantly weighted towards enhancement for the following:

- Maintaining habitats and biodiversity
- Pollination regulation
- Water quality regulation
- Climate regulation
- Flood regulation
- Water cycle support

The assessment was as follows;

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<sup>5</sup> <https://www.lancaster.ac.uk/spies/>

# Solar Park Impacts on Ecosystem Services (SPIES)

## SUMMARY REPORT - MANAGEMENT ACTIONS

<https://www.lancaster.ac.uk/spies/>



Simomics



### Introduction

The solar park impacts on ecosystem services (SPIES) decision support tool provides an accessible, evidence-based assessment of the impacts of solar park management on biodiversity, natural capital and ecosystem services for the UK solar industry. The SPIES tool was co-developed by Lancaster University, the University of York and a broad cross-sectoral stakeholder group, including the National Solar Centre, the Solar Trade Association, the National Farmers Union, and those involved in solar park development, operation and maintenance, nature conservation bodies, land owners, and the farming community.

The SPIES tool was converted into a web-based app by Simomics and the project funded by the Natural Environment Research Council.

This document provides an overview of the evidence from peer-reviewed scientific literature on the effect of current and proposed management action strategies on ecosystem services. It provides a:

1. List of the current and proposed management actions.
2. Visual summary of the evidence, providing an overview of the quantity of evidence, the magnitude and direction of the effect.

## 1 List of the Current and Proposed Management Actions

The user-selected current and proposed management actions are:

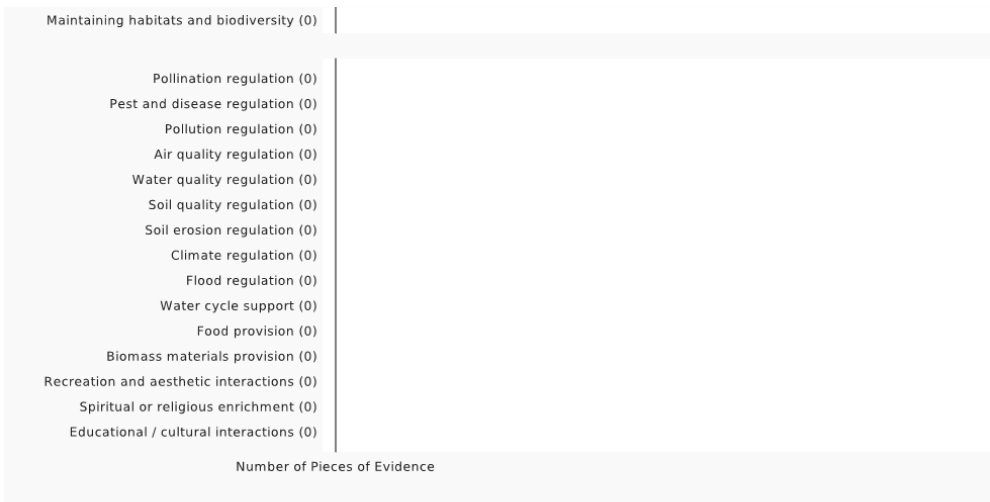
Category	Current	Proposed
Grazing		Reduce grazing intensity if previously grazed Replace mowing with grazing if previously mowed
Drainage		Install/maintain subsurface drains
Habitats		Create/maintain buffer zones/field margins/set-aside Install/maintain bat boxes Install/maintain bird boxes
Pollution & Chemical Inputs		Reduce pollution and green waste inputs into ditches Reduce/cease pesticide and fertiliser use if previously used
Vegetation		Transfer hay/diaspores to soil
Trees & Hedges		Cut hedges in winter
Mowing		Mow later in the year Reduce mowing regime to once a year

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## 2 Evidence Summary



### Impact from current actions:



### Impact from proposed actions:

