atmos CONSULTING

48006/R3/Rev1

Technical Appendix 8.2

Biodiversity Management Plan

Caudwell Solar Farm

Green Energy International

May 2023

Contents

Tables

Figures

Document Prepared For

Mathew Bayley
Green Energy International
Trinity House
Stockport
SK7 5DA

Document Prepared By

Jessica Hosier
Senior Ecologist
jessica.hosier@atmosconsulting.com

Document Approved By

Alexander Hatton
Technical Director, Ecology and Environmental Management
Alex.hatton@atmosconsulting.com

Version	Date	Reason
48006/R3/Rev1	31st May 2023	Draft for client review

URS is a member of Registrar of Standards (Holdings) Ltd.

1 Introduction

1.1 Terms of Reference

Atmos Consulting Ltd (Atmos) were commissioned by Green Energy International in December 2022 to prepare a Biodiversity Management Plan (BMP) and Biodiversity Net Gain Calculations. This was part of a broader scope of work to inform a planning application for a proposed solar farm at Caudwell Farm, Lincolnshire PE12 8ES (TF 40459 30556), hereafter referred to as the 'Site'.

The BMP has been informed by the results of the baseline ecology surveys, reported in chapter 8 of the EIA document (NI 2709 Caudwell Solar Farm, Ecology and Ornithology Chapter, Atmos, 2023) and the original Atmos ecology report (Atmos ref: 48006 R1 Rev2).

1.2 Overview

The BMP specifically covers the areas surrounding the proposed solar infrastructure within the red line boundary.

It is designed to inform and complement Chapter 8 of the EIA report (NI 2709 Caudwell Solar Farm, Ecology and Ornithology chapter), and is based on landscaping plans (ref) and BNG calculations, which are presented in full in section x.

The main objective of the BMP is to provide an integrated approach to nature conservation which is compatible with the operation of the proposed solar farm and the current and future land uses on the wider site. This will be achieved through a programme of biodiversity management and enhancement with the aim of enhancing and improving the habitats naturally present and enhancing the general biodiversity of the area.

1.3 Project Description

The project involves the erection of a 49.9MW ground mounted solar array with associated underground cable routes, substation with POC mast, battery storage, ancillary equipment and structures at Caudwell Solar Farm.

2 Ecological Baseline

Surveys of the Site were undertaken in 2021 and 2022 and the results are included below. The biodiversity management plan has been based on enhancing the habitats and protected species naturally present on the Site.

2.1.1 Habitats

The habitats recorded on Site are as follows and are shown in figure 1 at the end of this report.

Cultivated land – arable

The Site is comprised of arable fields sown with a variety of crops from cauliflower *Brassica sp*. to wheat *Triticum sp*. at the time of survey (TN1).

Hedgerows – intact

There are several hedgerows bordering the fields on Site. A hedgerow, to the west of the Site that runs along the grid connection route, is relatively unmanaged, with evidence of historical flailing (TN6). The predominant species were hawthorn *Crataegus monogyna* and elder *Sambucus nigra* with ivy *Hedera helix* and nettle *Urtica dioica*. The hedgerow runs along a ditch which was dry at the time of survey.

Standing water

A large ditch runs along the east of the Site and held water at the time of the August 2022 survey (TN2). The banks were approximately 45° and vegetated but appeared to have been recently cut. An area to the north of this ditch was narrow, but still holding water. It was more densely vegetated than the rest of the watercourse with overhanging sedge, and the water ran clearer (TN3).

There are also two ponds located just outside of the Site boundary, located within a small area of woodland (P1 & P2).

Dry ditches

Several smaller ditches ran along some of the field boundaries. These were however dry at the time of the August 2022 survey.

Broadleaved woodland

There is an area of woodland located adjacent to the most western boundary of the Site, containing two ponds (TN7). Species comprised hawthorn, larch *Larix decidua*, privet *Ligustrum vulgare*, white willow *Salix alba*, goat willow *Salix caprea*, crack willow *Salix fragilis*, elder, and snowberry *Symphoricarpos albus*. The woodland contains mature trees that may support bat roost features, but this woodland is outside the Site boundary and adjacent only to the grid connection route.

Introduced shrub

An area to the south of the Site contained laurel hedges arranged in a concentric semi-circular pattern, with earth bunds around (TN4). Vegetation on the bunds included

blackthorn *Prunus spinosa*, elder *Sambucus nigra* and nettle *Urtica dioica*. The nearby concrete platform was being used for straw storage.

Scattered trees

A line of sycamore *Acer pseudoplatanus* trees was present along the boundary between the field and the road at the west of the Site (TN5). They do not form a continuous intact boundary.

2.1.2 Protected species

Water vole

There were 15 records of water vole *Arvicola amphibius* within 2 km of the Site, with many located within the ditch that ditch that runs along the east of the Site boundary. The August 2022 survey found water level of the ditch was fairly low and not flowing, appearing stagnant in areas with a growth of brown algae on the surface. There was little aquatic vegetation with pond sedge *Carex riparia* and floating sweet grass *Glyceria fluitans* emergent in some areas. There were burrows present within the ditch banks, but due to the lack of any latrines, feeding stations, or prints that indicate the current presence of active water vole, it was considered that the burrows were those belonging to rats. A footprint was also found which was likely to be rat.

Otter

There were no records of otter *Lutra lutra* within 2 km of the Site. The ditch is however linked to further water courses in the area. During the survey there were no signs of otters, such as spraints, holts or slides. The ditch has limited suitability for holts but may be suitable for commuting.

2.1.3 Ornithology

During the WeBS surveys, there was a single record of two oystercatcher within the Site boundary and two shelduck were also noted within the buffer, during the same survey. They were observed during the 24th March survey and are therefore likely to be breeding pairs.

Other species of interest noted were marsh harrier *Circus aeruginosus* and red kite *Milvus milvus*, which are Schedule 1 species, were both observed flying over Site. Golden plover *Pluvialis apricaria* were recorded using the Site and the surrounding fields on multiple occasions.

It is considered that the arable fields and hedgerow boundaries would provide suitable habitat for nesting birds.

3 Biodiversity Net Gain

3.1 Methodology

In order to calculate the baseline biodiversity unit value (BU) of the Site, the effects of the proposed development and to quantify the proposed mitigation, enhancement and habitat creation measures, a biodiversity metric was populated. This utilised the DEFRA Biodiversity Metric 4.0 to calculate the overall net gain (or loss) achieved by the development. It followed three steps.

1. First of all, the existing baseline habitat data, as obtained from the extended Phase 1 habitat survey, was input into the metric via selecting the most appropriate habitat type from the drop-down menu. This included area-based habitats (such as fields and ponds) and linear habitats (hedgerows). This determines the baseline biodiversity unit (BU) value of the Site;
2. Second, the projected habitat enhancements were input, based on areas of retained habitats which were capable of enhancing to improve biodiversity; and
3. Finally, the proposed habitat creations were input into the metric. These, when compared to the baseline minus the habitat loss, indicate the overall biodiversity net gain (or loss).

Further details are provided in this Section, including the assumptions and metric results.

3.2 Results

The habitat creation and enhancement measures set out above were input into the Defra metric beta version 4.0. The results are included in Appendix A of this report and summarised below.

Table 1: Summary of biodiversity net gain (BNG) calculations

Baseline habitats area (ha) / length (m)	Baseline biodiversity (BU) / hedgerow units	Habitats lost	Habitats enhanced	Habitats created	Post habitat creation/ enhancement biodiversity units (BU) or hedgerow units	BNG (%)
Bare ground 0.3 ha	1.32 BU	0	0	0	0.13 BU	**181.87 % net gain in habitat units** **Increase of 464.22 BU**
Other woodland; broadleaved 0.03 ha	0.41 BU	0.01	0	0	0.27 BU	
Arable 110.05 ha	440.20 BU	105.74 ha of arable land lost	0	105.74 ha of the arable land changed into various grassland or infrastructure, details in	9.48 BU	

Baseline habitats area (ha) / length (m)	Baseline biodiversity (BU) / hedgerow units	Habitats lost	Habitats enhanced	Habitats created	Post habitat creation/ enhancement biodiversity units (BU) or hedgerow units	BNG (%)
				lower rows.		
Modified grassland 1.48	9.77 BU	0.33 ha lost to planting	0	0	7.59 BU	
Introduced shrub 0.74 ha	1.63 BU	0.35 ha lost to planting	0	0	0.86 BU	
Developed land 1.06 ha	0	0	0	Further 4.23 ha of developed land created (taken from baseline arable land)	0	
Orchards 0.07 ha created post development	N/A	N/A	N/A	0.07 ha of orchard plating (taken from baseline arable land)	0.45 BU	
Arable field – pollen and nectar 16 ha created post development	N/A	N/A	N/A	16 ha of grassland seeding in original baseline arable land	67.94 BU	
Ponds 0.14 ha created post development	N/A	N/A	N/A	0.14 ha pond creation (taken from baseline arable land)	1.11 BU	
Mixed woodland 0.83 ha created post development	N/A	N/A	N/A	0.83 ha woodland planting alongside watercourses	2.51 BU	
Neutral grassland 85.43 ha created post development	N/A	N/A	N/A	85.43 ha of grassland seeding in baseline arable fields	629.11 BU	
Species rich native hedgerow with trees 0.11 km	2.28 hedgerow units	0	Filling gaps in western hedgerow c. 200m	1.21 km of further hedgerow planting across the Site	10.89 hedgerow units	**187.47 % net gain in hedgerow units Gain of 39.62**

Baseline habitats area (ha) / length (m)	Baseline biodiversity (BU) / hedgerow units	Habitats lost	Habitats enhanced	Habitats created	Post habitat creation/ enhancement biodiversity units (BU) or hedgerow units	BNG (%)
Native hedgerow with trees 0.49 km	4.51 hedgerow units	0	0.49 km of hedgerow gap infilling and planting to enhance to good condition	0	9.22 hedgerow units	**hedgerow units**
Native hedgerow 3.12 km	14.35 hedgerow units	0	3.12 km of planting to enhance to good condition species rich hedgerow	0	38.37 hedgerow units	
Ditches 2.08 km	27.46 watercourse units	0	0	0	27.46 watercourse units	**No change, all retained**
Streams 2.13 km	42.17 watercourse units	0	0	0	42.17 watercourse units	

The calculations have indicated that the solar farm will result in an overall biodiversity net gain. This exceeds the minimum of 10%, due to the combination of the low value of the agricultural habitats that are being lost, the retention and enhancement of higher value habitats on-site and creation of higher value habitats.

Assumptions

The calculations above included both default assumptions (that are inbuilt into the metric) and criteria which were selected from a series of drop-down menus. The assumptions that were selected are listed below for transparency.

Baseline habitats, hedgerow and watercourses

- Habitat Condition: Not required for agricultural habitats or urban habitats (developed land / introduced shrub). Woodland, grassland, species rich hedgerows and ditches selected as 'good'. Bare ground selected as 'moderate'. Native hedgerows selected as 'moderate due to lack of diversity.
- Strategic significance: On a precautionary basis the option of 'Location ecologically desirable but not in local strategy' was selected for any habitats (baseline, enhancement and creation) not mentioned in local plans. Local plans refer to woodland and hedgerows and so these are marked as 'formally identified in local strategy'.

Habitat Creation

- Orchards;
  - Habitat condition: Moderate.
- Field margins, pollen and nectar;
  - Habitat condition: N/A.
- Developed Land;
  - Habitat condition: N/A.
- Ponds;
  - Habitat condition: Moderate.
- Mixed Woodland;
  - Habitat condition: Moderate.
- Neutral Grassland;
  - Habitat condition: Moderate.

Hedgerow Enhancement and Creation

- Native hedgerow with trees enhanced into species rich native hedgerow with trees;
  - Good condition, formally identified in local strategy.
- Native hedgerow enhanced into species rich native hedgerow;
  - Good condition, formally identified in local strategy.
- Species-rich native hedgerow created;
  - Good condition, formally identified in local strategy.

Summary

The biodiversity net gain calculations for the proposed solar development at Caudwell Farm have down an increase in biodiversity units for the Site by 181.87% and for hedgerow units by 187.47%.

4 Biodiversity Enhancements

As demonstrated in Section 3, the Proposed Development, Caudwell Farm Solar Site, has potential to provide a percentage increase of 181.87 % habitat units, 187.47 % hedgerow units and no net loss of watercourse units. The enhancements and measures required to achieve these BNG results are included below, including recommendations for during and post construction phases.

4.1 Construction Phase Management Plan

Good Practice Measures

As previously stated, the layout is focused on the arable fields, avoiding the more sensitive woodland, ditches, and pond habitats.

Working areas will be clearly marked, along with protective fencing ('Heras' style or similar) being in place to maintain suitable buffers of at least 2m from ditches, ponds, hedgerows, and woodland edges.

Construction materials and vehicles will be stored in the construction compound when not in use. Access to/from working areas have been determined via the least sensitive and damaging route, using existing tracks where possible, including existing ditch crossings.

The installation of the security fencing will ensure that access for species utilising the ditch network can be maintained. In addition, small 'letter box' access gaps (1.5 m x 0.2 m) will be maintained at the base of the fencing in locations to be agreed with the Project Ecologist to allow the passage of small mammals such as hedgehog and hare.

When working in close proximity to the ponds and ditches there is a possibility these watercourses could become polluted. Work will be undertaken under a pollution protection plan, with good biosecurity measures in place, such as spraying boots and wheels to prevent spread of invasive species.

Vegetation Removal

Where mature trees have to be removed or are subject to significant surgery, they should be checked in advance by a suitably experienced ecologist for signs of use by roosting bats and breeding birds.

Woody material, especially logs, should be retained on site, either to provide natural barriers to dissuade human access to some of the woodland edge and encourage use of designated paths, or to be sectioned and used to create log piles and hibernacula structures in shaded woodland areas, or in/beside water features.

Woody vegetation should be removed outside of the main bird breeding season (approximately March to August inclusive), if possible. Where this is not possible then within 24 hours prior to the removal of vegetation, but ideally on the same day, a suitably experienced ecologist should check for signs of nesting birds. If an active nest is discovered then a buffer of at least 3m should be marked using fencing, coloured tape or paint, and no human or vehicle access permitted within that buffer until the young birds have fledged.

4.2 Post Construction Habitat Creation and Enhancement

The design of the solar farm has incorporated a number of ecological design principles as embedded mitigation, which reduce the impact on the habitats present on Site via the mitigation hierarchy. No hedgerows, trees or shrubs are to be removed, and the ponds and ditches will be retained and protected.

The proposed habitat creation and enhancement measures are set out in a Landscape and Ecological Management Plan (LEMP) figure (4.2.0 GEI-IH-CDW-LP Layout Plan, Caudwell V9 Landscape Plan). The exact details such as grassland seed mixes and management measures are presented in this LEMP. The measures are summarised below.

- The solar panels, tracks and associated infrastructure are to be located on the existing arable fields. The panels will be underplanted with a species/herbal rich grassland mix. This will be managed for biodiversity and to reduce soil fertility, with the emphasis on a sward height which does not cast shade on the panels.
- Wildflower rich field margins will be sowed in the margins of the fields. Management measures of these areas will focus on reducing the high levels of soil fertility, which would otherwise favour grasses as opposed to wildflowers. Cutting of the sward will take place in late summer when seeds have set, and arisings removed from the area and either baled or placed in areas agreed by the Project Ecologist to provide habitat piles. Around some of the margins of the fields, there is potential for a bird seed rich mix to be sown. This would be sown in the spring to provide seeds over winter for wild birds such as finches, as well as cover as it is left over winter. The exact specifications and locations will be agreed with the Project Ecologist.
- A new pond will be created on Site. From the outset, the cessation of agricultural practices, reduced disturbance and reduced leaching of nutrients and fertilisers into the water will result in improved water quality and terrestrial habitat around the existing watercourses and ponds on Site and in the wider area. In conjunction with this, some or all of the below will be implemented:
  - Creation of hibernacula for amphibians (comprised of stones uncovered during construction, piled up with soil on top and covered with turf/seeded).
  - Cutting back of trees/shrubs which may be casting excessive shade and leaf litter.
  - Planting of native marginal and aquatic plants if vegetation cover and egg-laying material appears to be limited. These will be plants will be native and will not be spreading such that they reduce the areas of open water or water levels.
- Bird and bat boxes will be installed in suitable habitats around the Site. Locations will be agreed on the ground with the Project Ecologist. The specification of the boxes will be developed to provide habitat for a range of species (i.e. a range of hole sizes, tunnel and open fronts). Due to the lack of cover within the solar farm area itself, bird boxes will typically be located close to field boundaries and ponds to provide perching locations for birds before entering boxes and cover from predators.
- New hedgerows will be planted along the Site boundaries, with existing hedgerows infilled and planted with another line of trees to increase screening onto the Site.
- Dead wood piles will be created around the Site for invertebrate interest.

The construction works are not considered to cause any more disturbance than the existing arable farming regime. In the long-term, the scheme will result in an improvement in biodiversity and a reduction in overall disturbance as solar farms require little ongoing maintenance.

4.3 Protected Species

Bats

Bat boxes will be installed in suitable trees around the boundaries of the Site to enhance the roosting habitat for bats. These will be selected to suit a range of crevice-dwelling bat species and will be constructed of Woodcrete which is more durable than wood and also predator proof.

Tree and hedgerow planting will improve habitat connectivity across the Site and will increase the availability of foraging habitats and flightlines for bats.

To prevent negative effects on foraging bats, there will be no additional night-time lighting of compounds or working areas during construction.

During the operation of the solar farm, in normal circumstances there will be no night-time lighting. A security light may be installed on the substation in case emergency work is required at night-time. This will be designed to be bat friendly, with a directional light pointing away from the woodland edge so as to not affect foraging activity. Once details are known as to the light specification and location, a lighting plan will be developed in conjunction with the Project Ecologist to ensure the lighting (lux) levels do not affect foraging bats.

Great crested newt

Whilst the Site is limited in its potential to support GCN populations, the habitat enhancements implemented on the Site for biodiversity net gain will nonetheless benefit amphibians that may be present in the ponds, including GCN.

The cessation of agricultural practices and sowing of wildflower grasslands will improve the terrestrial habitat around the ponds as well as improving connectivity to other habitats such as woodlands. Enhancement measures will be implemented to improve the aquatic and marginal habitats around the ponds, as set out in Section 4.2. This will include hibernacula and aquatic/marginal plants as appropriate.

Good practice construction measures will be in place during the works to ensure there is no encroachment of materials or vehicles into the ponds and pollution prevention measures.

Badger

Whilst there are no signs of badger on Site, it remains a possibility that they may range onto Site. As a good practice measure, any excavations should be covered overnight, or a mammal ladder placed inside to prevent any ranging mammals (such as badger) from becoming trapped.

Breeding Birds

The nesting habitats on Site will be enhanced via the provision of bird boxes, hedgerow planting and secure ground nesting bird habitat due to the cessation of agricultural practices and installation of security fencing which will discourage access for ground-based predators.

Nest boxes will be a variety of hole sizes and types (e.g. tunnel front, open fronted) to appeal to a range of species. They will be constructed of Woodcrete as this is more durable than wood and predator proof.

Foraging habitat will be improved via planting of seed rich wildflower areas and rough grassland which will become suitable for foraging barn owl.

It is recommended that a pre-construction check is completed by the Project Ecologist prior to any works in the arable fields during the breeding season (March to August inclusive) to check for any ground nesting birds. If evidence of nesting is found, the Project Ecologist will identify a suitable buffer area in which no works will take place until the young have fledged.

For the habitat enhancement measures including gapping up of hedgerows and seed planting, if this takes place in the breeding season, a check will be carried out of the planting/seeding area beforehand by an ecologist.

Invertebrates

As mentioned above, a wildflower rich grassland mix will be planted beneath the solar panels and in the field margins, along with a species rich hedgerow, fruiting and flowering trees, dead wood piles and pond enhancements. These measures will provide a range of food sources and shelter invertebrates and enhance the Site for these species groups.

Otter and Water Vole

Due to the potential for water vole in the ditches, the design of the solar farm has avoided any works within proximity of these habitats. There will be a stand off from all ditches and ponds, to ensure the potential water vole corridors are retained. Where fencing crosses ditches, if necessary, it will be installed in such a way that free movement of animals along the watercourse can be maintained.

Working areas will be fenced via Heras fencing (or similar) to ensure there is no encroachment of vehicles or materials storage. Pollution prevention and sedimentation prevention measures will be adopted to avoid indirect impacts to this species through potential pollution of the watercourses.

Other Mammals

Free movement to/from the Site will be maintained via the inclusion of small gaps at the base of the security fencing, in locations to be agreed with the Project Ecologist.

4.4 Management and Monitoring

Trees

Although the number of trees on Site is relatively limited, their roots should be protected in line with BS 5837: 2012; this area should be marked out on the ground so ensure plant and machinery is kept out of the root protection zone.

Operational Management

With the landscape and habitat options developed within this Proposed Solar Scheme, the requirement to manage the area for ecological interests is minimal and would fit within grounds maintenance requirements necessary to maintain the areas (for example, grass cutting of short grass areas).

Post-Construction Monitoring

It is proposed that, as long as the surrounding areas to the Site continue to be subject to the same style of agricultural management as at present, annual monitoring through a walkover survey of the entire site to verify whether or not habitats have altered significantly will be sufficient to ensure that this BMP remains up-to-date and does not need modifying .

Formal monitoring surveys, i.e. those that are undertaken to document specific changes over time in baseline conditions following the implementation of ecological mitigation or management, are not currently anticipated to be a requirement of proposed development works at Caudwell Farm.

5 Appendices

5.1 Appendix A – Extended Phase 1 Baseline

Figure 1: Baseline Extended Phase 1 Results

Caudwell Farm

Green Energy International

Phase 1 Habitat Results

538000 539000 540000 541000

331000 330000 329000

TN 1 TN 2 TN 3 TN 4 TN 5 TN 6 TN 7 P 1 P 2

Key

Site boundary

Habitat areas

- Broadleaved woodland - natural
- Broadleaved Parkland/scattered trees
- I — Improved grassland
- A — Cultivated/disturbed land - arable
- Introduced shrub
- Standing water
- Buildings
- Road
- Bare ground
- Running water
- Dry ditch
- Intact hedge - species-poor
- Hedge with trees
- Hedge with trees - species-poor

Target Note

atmos CONSULTING

0 100 200 400

Metres

N

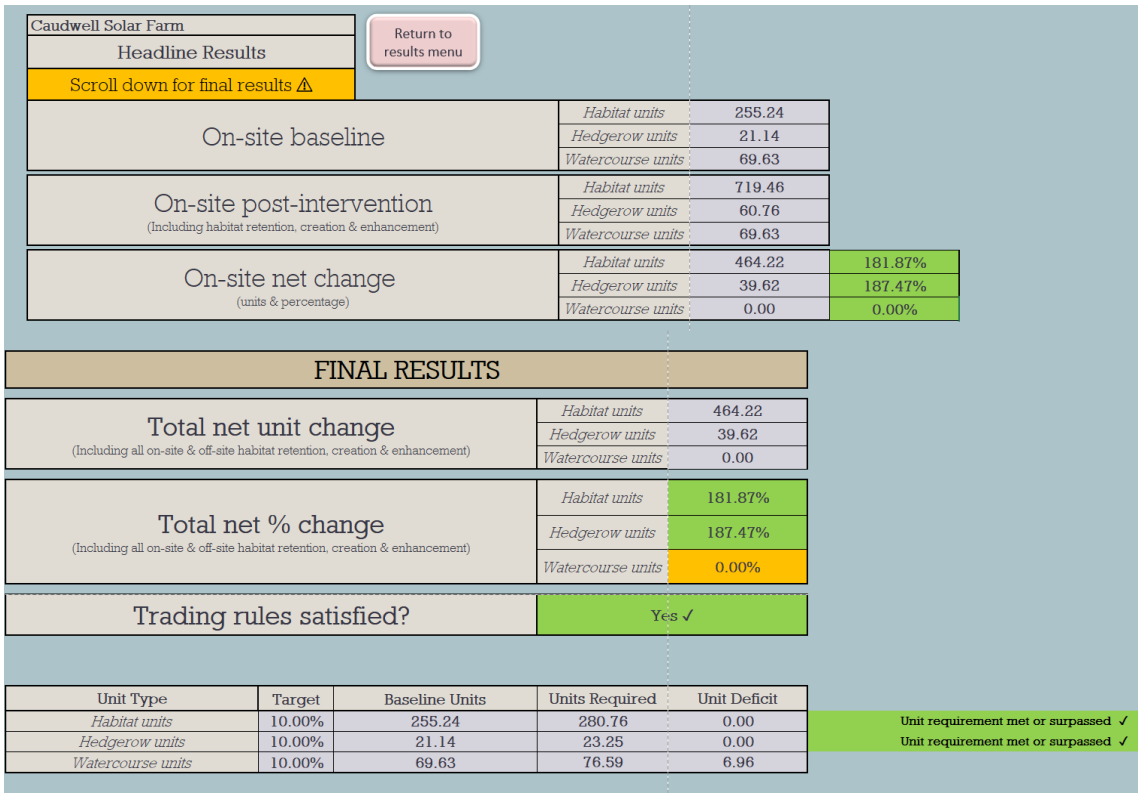
Scale @ A3:

1:12,500

24/08/2022 48006/HB/003c

Drawn by: AF Checked by: KM Approved by: TH

5.2 Appendix B – BNG Results



Caudwell Solar Farm

Headline Results

Scroll down for final results ⚠

Return to results menu

On-site baseline	Habitat units	255.24
	Hedgerow units	21.14
	Watercourse units	69.63
On-site post-intervention (Including habitat retention, creation & enhancement)	Habitat units	719.46
	Hedgerow units	60.76
	Watercourse units	69.63
On-site net change (units & percentage)	Habitat units	464.22
	Hedgerow units	39.62
	Watercourse units	0.00

		181.87%
		187.47%
		0.00%

FINAL RESULTS

Total net unit change (Including all on-site & off-site habitat retention, creation & enhancement)	Habitat units	464.22
	Hedgerow units	39.62
	Watercourse units	0.00
Total net % change (Including all on-site & off-site habitat retention, creation & enhancement)	Habitat units	181.87%
	Hedgerow units	187.47%
	Watercourse units	0.00%
Trading rules satisfied?		Yes ✓

Unit Type	Target	Baseline Units	Units Required	Unit Deficit	
Habitat units	10.00%	255.24	280.76	0.00	Unit requirement met or surpassed ✓
Hedgerow units	10.00%	21.14	23.25	0.00	Unit requirement met or surpassed ✓
Watercourse units	10.00%	69.63	76.59	6.96	

6 References

Collins J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). The Bat Conservation Trust, London.

English Nature (2001). Great Crested Newt Mitigation Guidelines. English Nature.

JNCC (2010). Handbook for Phase 1 Habitat Survey – a Technique for Environmental Audit. Revised re-print. Joint Nature Conservation Committee.