

Cottam Solar Project

Outline Landscape and Ecological Management Plan Revision A

Prepared by: Prepared by Clarkson & Woods and Lanpro

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Issue Sheet

Report Prepared for: Cottam Solar Project Ltd.

Landscape and Ecological Management Plan Revision A

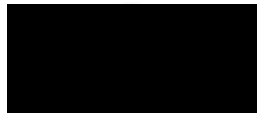
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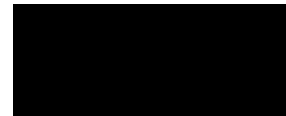
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1 Introduction

- 1.1.1 This outline Landscape and Ecological Management Plan (LEMP) sets out a framework for the planting, management and monitoring of landscaping and ecological mitigation and enhancement habitats for the proposed Cottam Solar Project (hereafter referred to as “the Scheme”). This LEMP concerns works which will be required during both construction and operation phases of the Scheme. This LEMP is to be read in conjunction with the following documents:
- Landscape and Ecology Mitigation and Enhancement Plans (Figures 8.16.1 - 8.16.10 **[EN010133/EX1/C6.4.8.16.1_A-C6.4.8.16.10_A]** of the Landscape Visual Impact Assessment (LVIA) **[APP-043]**) – Displays the location and specification of all habitats to be planted and managed.
 - Outline Ecological Protection and Mitigation Strategy (OEPMS **[APP-356]**) – Document setting out how valuable ecological features will be protected (e.g. through fencing or avoidance measures) and adverse impacts mitigated for (e.g. through seasonal timing of works or supervision by an Ecological Clerk of Works (ECoW)).
- 1.1.2 The purpose of the final LEMP document is to set out planting, management and monitoring prescriptions to be followed by, or on behalf of, the undertaker, and will be approved by the relevant planning authority pursuant to Requirement in the Development Consent Order (DCO) for the Scheme. While as much detail has been included in this outline LEMP as possible to accompany the DCO application, it is anticipated that it shall be revised and finalised following the DCO examination process and post consent, to include all final detail necessary to produce the final LEMP version. In some cases, in this report, several options are set out in order to leave some flexibility in specification, but all achieve the same ecological goals. However, the final LEMP must be substantially in accordance with this Outline LEMP.
- 1.1.3 This outline LEMP has been developed through consultation with Natural England, Lincolnshire and Nottinghamshire Wildlife Trust and the Greater Lincolnshire Nature Partnership (GLNP) as well as further ecological survey.
- 1.1.4 This document focusses on the four solar and battery storage Sites known as Cottam 1, 2, 3a and 3b, as shown in Figure 1 overleaf and in figures 8.16.1- 8.16.10 of the Landscape and Visual Impact Assessment, Chapter 8 of the Environmental Statement (ES). Ecological protection and remediation measures required in relation to the cable installation works are contained within the OEMPS **[APP-356]**.
- 1.1.5 Wherever feasible, the Scheme utilises existing access points to accommodate internal access between fields, land areas, solar panel areas, substation sites and battery storage areas. In certain locations where existing access points do not exist, some minor hedgerow works (pruning and removal) are necessary. These minor hedgerow works (pruning and removal) are required for the passage of vehicles during the construction, maintenance and operational phases or for any apparatus used in connection with the Scheme, as set out in **Appendix C - Hedgerow Removal Plans**. Indicative information about the exact nature and location of these minor hedgerow works (pruning and removal) associated with the Scheme

is shown on the **Appendix C - Hedgerow Removal Plans**. These plans differentiate between the temporary hedgerow removal for construction, such as indicative access and abnormal indivisible load (AIL) locations and the removal that will be in place during the full operational lifetime of the Scheme. The temporary hedgerow removal for construction will allow for the reinstatement of hedgerows following the construction period, whilst some hedgerows will be removed for the full operational lifetime of the Scheme. The extent of these minor hedgerow works (pruning and removal) will be confirmed post DCO consent and communicated to the relevant authority. No minor hedgerow works (pruning and removal) shall take place until a detailed Landscape and Ecological Management Plan has been approved by the relevant planning authority, as secured by Requirement 7 of Schedule 2 of **C3.1_B Draft Development Consent Order Revision B [EN010133/EX1/C3.1_B]**. All minor hedgerow works (pruning and removal) will be carried out in accordance with the final, approved versions of the detailed Outline Landscape and Ecological Management Plan, **C6.4.8.16.1_A to C6.4.8.16.10_A Landscape and Ecology Mitigation and Enhancement Plans [EN010133/EX1/C6.4.8.16.1_A-C6.4.8.16.10_A]** and the **Hedgerow Removal Plans (Appendix C)** (the latter two documents both forming part of this Outline Landscape and Ecological Management Plan).

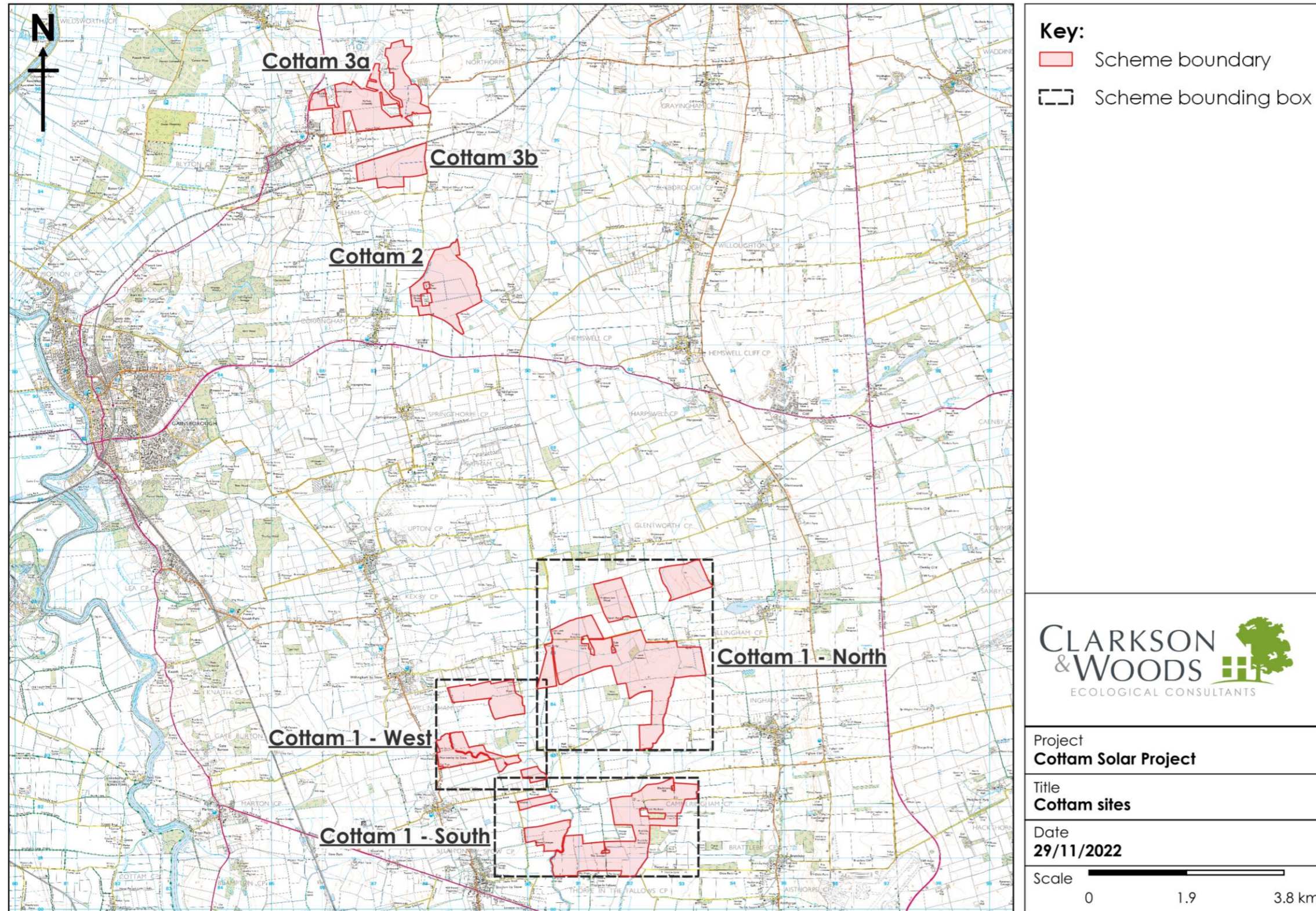


Figure 1: Cottam Sites

2 Aims

- 2.1.1 The overarching aim of this LEMP is to set out prescriptions for habitat creation and management in order to provide a significant ecological enhancement, strengthen the green infrastructure within the local area as well as to provide landscape and visual mitigation through screening of the Scheme where this has been identified as necessary in section 8.8 of the LVIA.
- 2.1.2 The document takes into account the habitats and species already recorded (Chapter 9: Ecology and Biodiversity of the Environmental Statement [APP-044]) as present in order to tailor management for the most optimal outcome. For example, where floodplain is present, grassland seeding/management may be selected to reflect the wetter conditions or where a certain bird species has been recorded, management of hedgerows may be tailored to suit specific nesting requirements. In addition, certain planting may be required in order to mitigate for visual impacts of the development, such as tree belts or new/taller hedgerows a minimum of 4m high and in a range of 4-5m high. Furthermore, this LEMP provides detail on the provision of additional species-specific mitigation and habitat creation identified as necessary within Chapter 9 of the Environmental Statement.
- 2.1.3 Local conservation priorities have been considered when designing the detailed habitat enhancements. This includes the Lincolnshire Biodiversity Action Plan as well as policies within the Central Lincolnshire Local Plan, in particular, Biodiversity Opportunities Mapping (BOM) produced by GLNP has been closely considered, as described in Section 2.2 below. The presence of locally and nationally designated sites for nature conservation has also been considered along with opportunities to enhance or extend these features.
- 2.1.4 Public amenity has also been considered when planning the location and type of habitats to establish, for example, diverse pollinator mixes which are flower rich and have a long flowering season are focussed near residential dwellings or Public Rights of Way (PRoW).
- 2.1.5 This document has been prepared following consultation with various relevant bodies including Natural England, Lincolnshire Wildlife Trust and the GLNP. Local community input has also been sought via public consultations undertaken as part of the DCO process.
- 2.1.6 In line with current best practice guidance¹, a preliminary financial table (for habitat creation and management over the lifetime of the array) has been set out in Appendix A of this document. This financial table contains estimates only as fine detail is not known at this stage, however, the aim would be to update this table upon finalisation of this document under a requirement of the DCO so that the costs relating to build and operation are transparent as contracts are drawn up.

¹ <https://solarenergyuk.org/wp-content/uploads/2022/05/Natural-Capital-Best-Practice-Guidance.pdf>

2.2 Biodiversity Opportunities Mapping

- 2.2.1 Central Lincolnshire Local Plan Policy S60 relates to the delivery of measurable net gains for biodiversity within the county. Biodiversity Opportunity Mapping (BOM) has been created by the GLNP to show which areas and habitats are of greatest potential strategic value for enhancement in order to achieve this goal. This study built on a previous Central Lincolnshire Green Infrastructure Study and factors in potential beneficial outcomes for the local economy and society as well as nature. Key drivers for the inclusion of land within the mapping included agri-environment scheme targeting, restoring, buffering and connecting Local Wildlife Sites, and targets under Lincolnshire's Biodiversity Action Plan.
- 2.2.2 The GLNP has been consulted as part of the preparation of this document and although local conservation priorities are currently being reviewed and a Local Nature Recovery Strategy not yet finalised, it has been confirmed that the focus will be on creating a mosaic of healthy ecological networks including both semi-natural and managed habitats. This document may be updated once the Greater Lincolnshire Local Nature Recovery Strategy has been published (likely November 2023) in order to reflect the local priorities in terms of habitat creation that are set out.
- 2.2.3 The Biodiversity Opportunities Mapping is shown in Figures 2 and 3 overleaf, with the Scheme overlaid.
- 2.2.4 Large areas of **Cottam 1**; approximately all of Cottam 1 West, half of Cottam 1 South and a third of Cottam 1 North (land north of the Willingham to Fillingham road) fall within land parcels designated as "Opportunity for Creation". Notably, no areas within the Site fall within land classed as "Ecological Network – High Quality". Only one small field of permanent pasture within the north west edge of Cottam 1 South is classed as "Ecological Network – Opportunity for Management". Consequently, the BOM presents extensive, LPA-recognised opportunities for ecologically favourable habitat management and very few constraints.
- 2.2.5 No part of **Cottam 2** falls within or lies within 1km of any land classed under the BOM. Approximately 2 km west of the Site lies an extensive area of land classed as "Opportunity for Creation".
- 2.2.6 No part of **Cottam 3a or 3b** falls within any land classed under the BOM, however the north eastern boundary is adjacent to a large extent of land classed as "Opportunity for Creation", contiguous with high quality ecological sites associated with Laughton and Cotton Commons.
- 2.2.7 Consequently, the habitat creation prescriptions for much of Cottam 1 have been prepared with the contribution to the objectives of the BOM in mind, and through consideration of GLNP's Practical Application Principles for development within land assigned as "Opportunity for Creation".

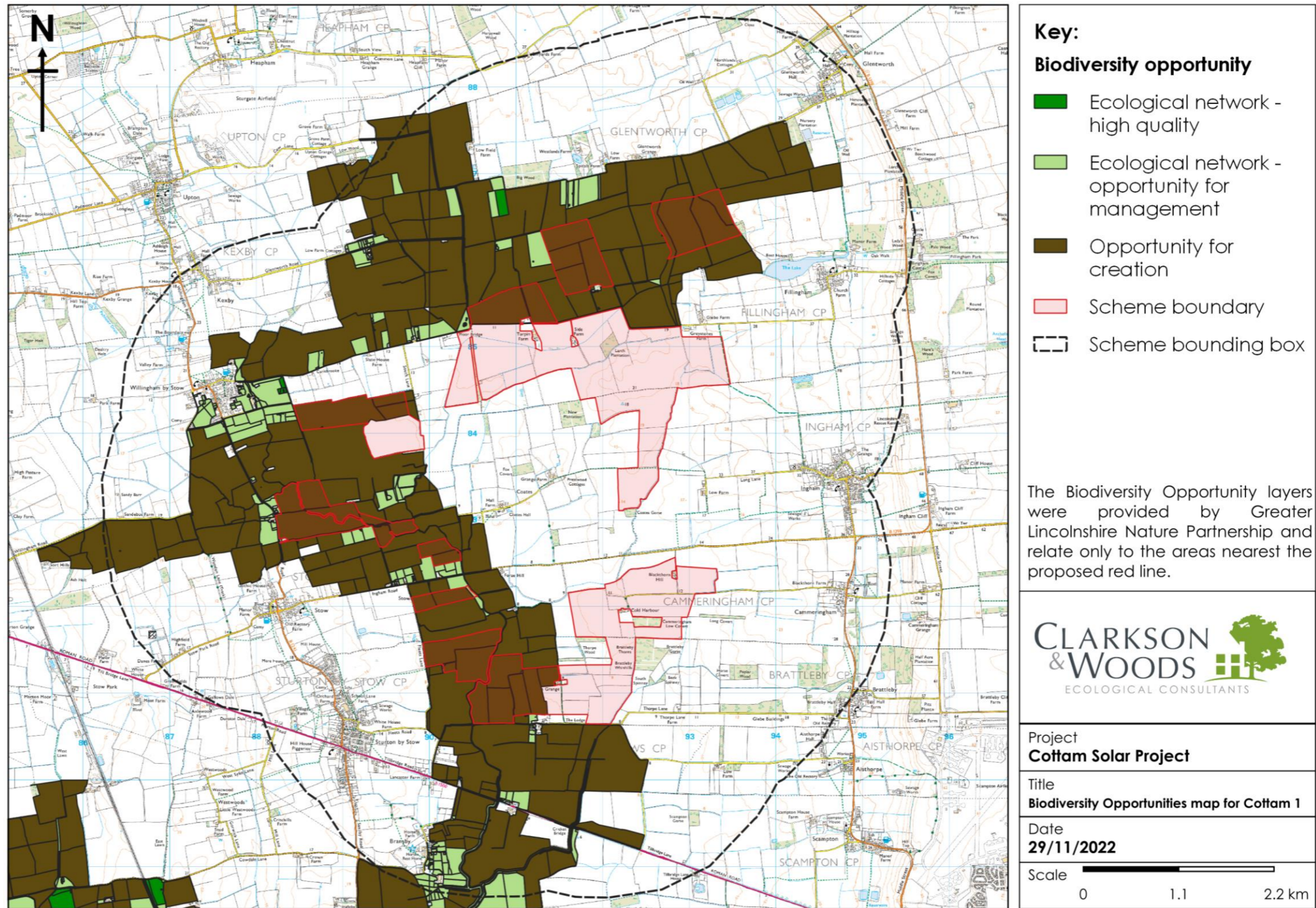
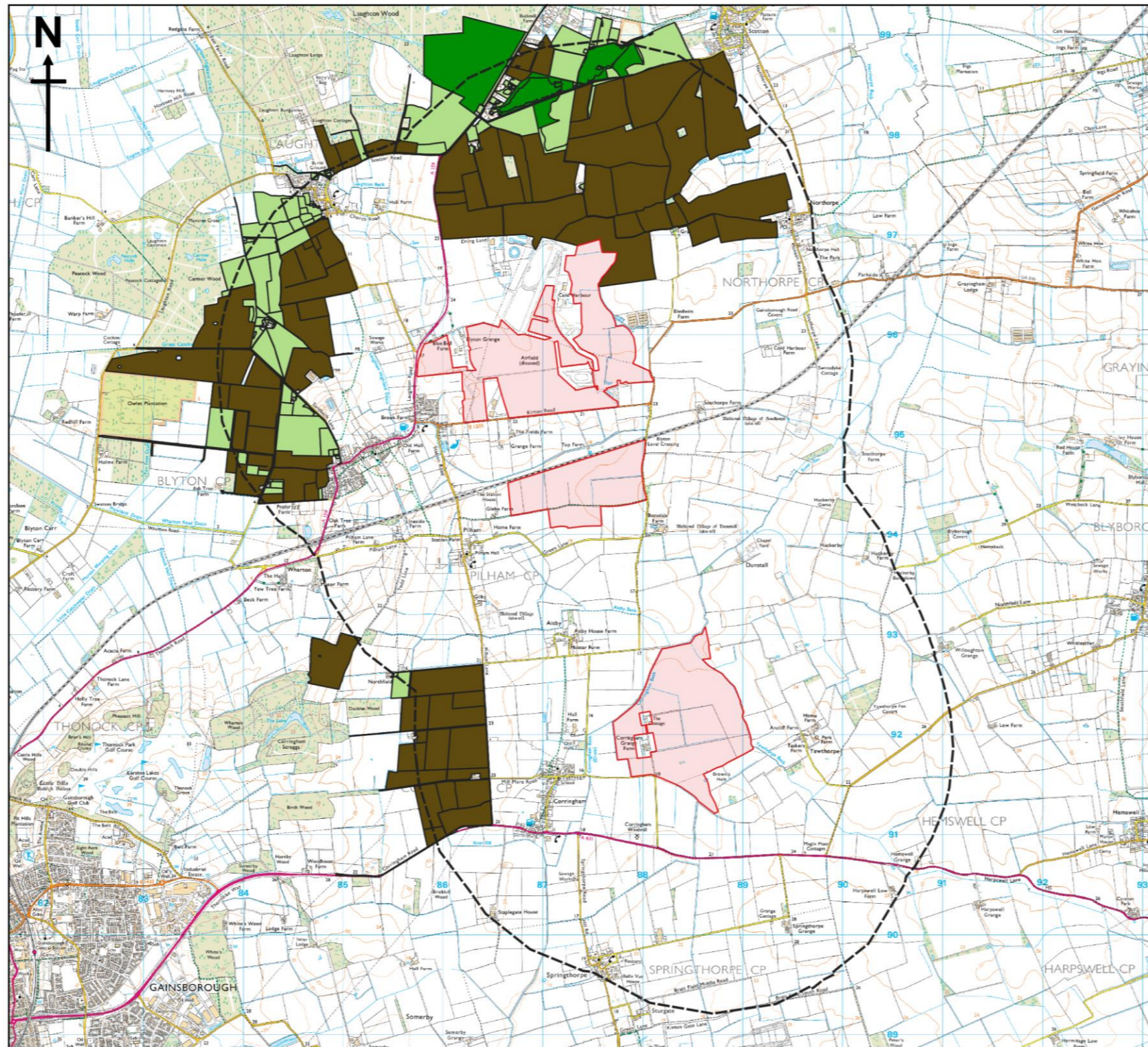


Figure 2: Biodiversity Opportunities Mapping Cottam 1



Key:

Biodiversity opportunity

- Ecological network - high quality
- Ecological network - opportunity for management
- Opportunity for creation
- Scheme boundary
- Scheme bounding box

The Biodiversity Opportunity layers were provided by Greater Lincolnshire Nature Partnership and relate only to the areas nearest the proposed red line.




Project	Cottam Solar Project
Title	Biodiversity Opportunities map for Cottam 2, 3a & 3b
Date	29/11/2022
Scale	

Figure 3: Biodiversity Opportunities Mapping Cottam 2, 3a & 3b

3 Key Personnel

- 3.1.1 The final LEMP will set out the roles and responsibilities of those involved in creating, managing and monitoring the prescriptions within this document. A suitably qualified person will be appointed to oversee the coordination of implementing the LEMP, including sourcing seed/plants, which will need to be considered at an early stage given the quantities required.

4 Creation and Management Prescriptions by Habitat Type

- 4.1.1 This section sets out the various principles and prescriptions for habitat creation and management which will drive the requirements for both landscape and ecological mitigation and enhancement which have been identified in the Environmental Statement (ES).
- 4.1.2 The enhancements and mitigation are illustrated within the relevant Landscape and Ecology Mitigation and Enhancement Plans, as referenced throughout this document.
- 4.1.3 This section should be read in conjunction with Appendix B which sets out management prescriptions which would be adopted for the duration of the Scheme.

4.2 General Planting Implementation and Management Prescriptions

General Implementation Prescriptions

- 4.2.1 Planting to be undertaken in the planting season between October and March during construction, or within the first available year/season post construction. Planting to be carried out during appropriate climatic conditions.
- 4.2.2 Where existing ground vegetation is retained or has re-established during the construction phase, the following clearance works should be undertaken prior to planting works:
- All grass and perennial vegetation should be cleared from site including epicormic and below ground growth.
 - All rubbish, debris and stones over 25mm diameter should be cleared; and
 - All arisings should be removed from site.
- 4.2.3 The handling of plants on Site must be in accordance with National Plant Specification 'Handling and Establishing Landscape Plants'².
- 4.2.4 All plants and planting operations are to comply with the requirements and recommendations of all current relevant British Standard specification including but not limited to:

² The National Plant Specification – Handling and Establishment (November 1995). Available at: <https://www.csdhub.com/wp-content/uploads/2014/12/The-National-Plant-Specification-Handling-and-Establishment.pdf> [Accessed August 2020].

- BS 8545. Trees: From Nursery to Independence in the Landscape;
- BS 3936-1:1992. Nursery stock. Specification for trees and shrubs;
- BS 4428:1989. Code of practice for general landscape operations (excluding hard surfaces) (AMD 6784);
- BS 5837: 2012 Trees in relation to design, demolition and construction – Recommendations; and
- BS 3998:2010: Tree Work - Recommendations

- 4.2.5 Topsoil within planting pits should be cultivated to a minimum depth of 400mm where tree/hedgerow/woodland planting is proposed to ensure sufficient room to accommodate new planting and to provide appropriate growing conditions for new planting is achieved.
- 4.2.6 Topsoil in areas to be seeded with wildflower and grass seed mixes to be cultivated using minimum tilling or direct drilling of seed straight into previous stubble *of the previous arable crop*. This retains some surface protection offered by the stubble and cuts the number of cultivator passes across the soil surface.
- 4.2.7 No cultivation should take place in wet/ waterlogged conditions and within the root protection areas of existing trees as defined by BS5837:2012 on land not previously subject to arable crop production. Drilling required within the root protection areas of existing trees are located within land not currently subject to arable production should include surface scarification only and of no more than 50mm depth to ensure roots are not damaged.
- 4.2.8 No topsoil to be imported or exported from Site and no grading of the topsoil should be undertaken.
- 4.2.9 In the interest of biodiversity protection, the use of herbicides should be kept to a minimum in the preparation or management of the planted or seeded areas.
- 4.2.10 All trees and shrubs to be planted with the appropriate biodegradable tree or shrub guards and removed subject to satisfactory establishment and growth within 2-3 years post construction or as required to ensure establishment.
- 4.2.11 All tree/hedgerow specimens will be native and of UK provenance. Trees will be locally sourced and of local provenance where possible. The “Local Seed Zone Provenance” (i.e., the region within which the Site lies) is region 402³.

General Management Prescriptions

3

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/797909/Regions_of_provenance_and_seed_zone_map.pdf

- 4.2.12 Any plants and trees which are found to be dying, damaged or diseased following planting will be replaced with the same species and specification for the duration of the Scheme.
- 4.2.13 Any maintenance works such as cutting of trees or flailing, should take place during September to February which is outside of the bird nesting season (March to August), for the duration of the development. These works should also be carried out when the ground is dry enough to allow machinery access.
- 4.2.14 All shelters, guards, rabbit spirals and stakes will be checked annually and secured or replaced where necessary. Shelters will be removed from all plants and will be disposed of off-site (subject to satisfactory establishment and growth) by year 5 post planting.
- 4.2.15 Autumn sowing is preferable, with the seed sown as soon as possible subsequent to construction of the array to avoid a flush of unwanted species such as annual plants and injurious and invasive weeds (as well as careful preparation of the land prior to seeding, as set out above). Following this, weeds and invasive non-native species will be controlled by hand pulling, if not too excessive or treated using a spot herbicide treatment if more widespread.

4.3 Native Hedgerows and Hedgerow Trees

- 4.3.1 Hedgerows and Hedgerow Trees are a Habitat of Principal Importance and listed on the Lincolnshire Biodiversity Action Plan (BAP).
- 4.3.2 The hedgerow network is extensive across the majority of the Sites and is generally annually managed and species-poor, although several sections of species-rich hedgerow are present (see Environmental Statement Chapter 9 and Appendix 9.2 - 9.3). It is also generally intact, with few gaps, however, there are opportunities to restore historic hedgerows where these have previously been removed. Roughly half of the hedgerows contained at least sporadic mature and semi-mature trees. Trees were predominantly restricted to outer boundary hedgerows, while minor internal hedgerows were normally devoid of trees. The ash (*Fraxinus excelsior*) trees showed extensive signs of ash die back.
- 4.3.3 The Scheme offers significant opportunities for tree and hedgerow planting, in line with local conservation priorities, national targets and to mitigate significant impacts created by the Scheme. Strengthening the local hedgerow network will significantly enhance the area for bat species, as well as birds and invertebrates.
- 4.3.4 All tree/hedgerow specimens will be native and of UK provenance. Trees will be locally sourced and of local provenance where possible; the "Local Seed Zone Provenance" (i.e., the region within which the Site lies) is region 402.

Hedgerow Planting

- 4.3.5 Proposed new hedgerows will provide additional linking habitat and reinforce the existing green network. Any gaps in existing hedgerows will be gapped up with new hedgerow and hedgerow tree planting.

- 4.3.6 All new and gapping mixed native hedgerows will comprise of a double staggered row of plants 400 mm apart within each row, overall 6 plants per linear metre. Species will be mixed throughout the hedge line in random groups of 3/5/7. A 500 mm wide trench will be excavated to take plants and topsoil cultivated to 450 mm depth prior to application of fertiliser. All species will be planted as bare root Whips.
- 4.3.7 Locally appropriate species will be used, based on those already found within the local area. The planting of blackthorn will provide habitat for rare species such as brown hairstreak butterfly *Thecla betulae* (a population is present approximately 30km away). Management of hedgerows will be key for species such as this. Tall thorny hedgerows are also suitable for nesting birds including turtle dove *Streptopelia turtur* and other declining farmland birds.
- 4.3.8 A list of locally appropriate species is given below in Table 1 (those which have been identified within the hedgerows on the Site).

Table 1: Hedgerow species for planting within the Scheme.

Scientific Name	Common Name	Size	Form
<i>Acer campestre</i>	Field maple	45-60 cm	Whip (Bare Root)
<i>Corylus avellana</i>	Hazel	45-60 cm	Whip (Bare Root)
<i>Crataegus monogyna</i>	Hawthorn	45-60 cm	Whip (Bare Root)
<i>Ilex aquifolium</i>	Holly	30-40 cm	Containerised
<i>Ligustrum ovalifolium</i>	Privet	45-60 cm	Whip (Bare Root)
<i>Lonicera periclymenum</i>	Honeysuckle	45-60 cm	Whip (Bare Root)
<i>Prunus spinosa</i>	Blackthorn	45-60 cm	Whip (Bare Root)
<i>Rosa arvensis</i>	Field rose	45-60 cm	Whip (Bare Root)
<i>Rosa canina</i>	Dog rose	45-60 cm	Whip (Bare Root)
<i>Viburnum lantana</i>	Guelder rose	45-60 cm	Whip (Bare Root)

- 4.3.9 The planting of new hedgerows adjacent to existing ones would provide a wildlife corridor and contribute to the green infrastructure policies in the local area. These “green lanes” provide important commuting and foraging resources for bats, birds and invertebrates.
- 4.3.10 A total length of 20.5km of new hedgerow is proposed within the Scheme.

Hedgerow Management

- 4.3.11 Poor management of hedgerows in the form of over-management, lack of management, damage due to narrow field margins or drift of herbicides/pesticides has led to degraded hedgerow habitats being common at present within the Scheme. This LEMP will seek to secure appropriate management of all hedgerows within the Site, with a focus on optimising this habitat for local wildlife.
- 4.3.12 The hedgerow should be regularly watered in its first summer and weeds should be controlled through the use of bark mulch. A 75 mm layer of bark mulch 0.5 m either side of the hedge will be spread along the length of the hedge immediately after planting to suppress weeds and retain soil moisture.
- 4.3.13 Newly planted hedgerows should be trimmed in at least the first 2 years to encourage bushy growth, allowing the hedge to become taller and wider at each cut.

4.3.14 Hedgerows will be enhanced through less regular mechanical cutting, for example, every 2-3 years and on rotation (either by rotating hedgerows or cutting each side of the hedgerow on rotation). This will benefit species such as brown hairstreak which rely on uncut blackthorn to lay eggs (and has significantly declined due to the practice of annual cutting).

4.3.15 Cutting should take place outside the bird nesting season, and ideally in January/February where the ground is dry enough to allow machinery access. This will provide an important food source, such as nuts and berries, for bird species over the winter. This may be focussed on hedgerows adjacent to roads and tracks where a tractor will be able to access in wet conditions without damaging the ground.

4.3.16 Hedgerows will be maintained to an optimum height of 4 – 5m tall.

Hedgerow Tree Planting

4.3.17 All newly planted hedgerows will include Select Standard trees randomly spaced between 5 – 9 m centres. On occasions where visual receptors are likely to see visual effects in close proximity, denser tree planting of between 2-3m centres may be adopted to provide more instant screening effects. Where this occurs species will be appropriately mixed to ensure large species trees are intermittently mixed with smaller species trees to ensure suitable growing conditions in perpetuity.

4.3.18 All hedgerow trees will be planted as Select Standard trees between 1.75m – 3.5 m tall. Select Standard trees to be planted in pits 800mm deep x 800mm wide x 700 mm deep or dimensions of the rootball, whichever is greater.

4.3.19 All trees should be planted with a 75 mm depth of bark mulch, 0.5 m in diameter around each tree/shrub to suppress weeds and retain soil moisture.

4.3.20 Any trees planted in or alongside hedgerows as part of the proposed hedgerows enhancements, are to be planted with a 1.5m tall white tipped marker post. This will allow locations of newly planted trees to be noticeable to operators of flails during maintenance periods.

4.3.21 Planting will focus on long-lived trees in order to replace the many ash trees noted to be present within the hedgerow network, the majority of which can be expected to be lost in the next five years due to ash dieback.

4.3.22 The tree species selected will reflect the species identified within the Sites to ensure they are locally appropriate. Tree planting locations will require an appropriate offset from solar panels to ensure shading will not occur once the tree has matured, or leaf fall become a problem on the panel structures. Lower growing species to be planted adjacent to the proposed solar array to avoid overshadowing.

4.3.23 It may be desirable to plant trees not identified in the local area which are ecologically similar to ash or are resistant to both disease and climate change impacts. A list of locally appropriate and resistant trees are listed in Table 2 below.

Table 2: Hedgerow Tree species for planting within the Scheme.

Scientific Name	Common Name	Size	Form
<i>Acer campestre</i>	Field maple	300-350 cm	Select Standard (Bare Root/Rootball)
<i>Crataegus monogyna</i>	Hawthorn	300-350 cm	Select Standard (Bare Root/Rootball)
<i>Malus sylvestris</i>	Crab apple	300-350 cm	Select Standard (Bare Root/Rootball)
<i>Prunus padus</i>	Cherry (bird)	300-350 cm	Select Standard (Bare Root/Rootball)
<i>Quercus robur</i>	Pedunculate oak	300-350 cm	Select Standard (Bare Root/Rootball)

Hedgerow Tree Management

- 4.3.24 An inspection and formative prune will be carried out annually in accordance with good arboricultural practice to BS 3998:2010. A clear stem of up to 2m will be maintained for all hedgerow trees in order to be distinguishable.
- 4.3.25 All trees and shrubs will be regularly watered in the first summer and thereafter as required to ensure successful establishment. Bark mulch is to be maintained at a depth of 75 mm, 0.5 m in diameter around each tree/shrub as required to suppress weeds and retain soil moisture.

4.4 Woodland Copses and Shelterbelts

- 4.4.1 Tree planting will mainly be required within the hedgerow network, but planting of copses and shelterbelts have also been incorporated into the proposals. Small copses and shelterbelts can provide 'stepping stones' between larger areas of woodland. Copses and shelterbelts comprising native species have been included at Cottam 1, 2 and 3b, with extensive shelterbelts designed to connect existing woodland blocks around Cottam 1 north.
- 4.4.2 Shelterbelts are typically 5 m wide and comprise of mixed native tree planting. Species to be include are shown in Table 3 (below).
- 4.4.3 The tree species selected will reflect the species identified within the Sites to ensure they are locally appropriate. Tree planting locations will require an appropriate offset from solar panels to ensure shading will not occur once the tree has matured, or to ensure leaf fall does not become a problem on the panel structures. Lower growing species to be planted adjacent to the proposed solar array to avoid overshadowing, details of which will be provided in Detailed Landscape Proposal plans which would be prepared prior to implementation of the Scheme. Detailed Landscape proposals plans would include detailed planting specification and schedule as well as locations of all proposed planting.
- 4.4.4 A total area of 0.4ha of woodland is proposed across the Scheme.

Woodland and Shelterbelt Planting

- 4.4.5 Trees within woodland copses and shelterbelts will be planted at 1m centres. Plant species will be a planted as a mix of sizes from 60-90cm Transplants, 125-150cm Whips and 200-250cm Feathered trees. Tree species will be planted in groups of 1, 3, 5 and 7 (of the same species) to reinforce a natural layout of species within the landscape.
- 4.4.6 Trees will be planted appropriately depending on size. Trees will be planted as Whips, Transplants and Feathered specimens in pits approximately 300mm deep x 300mm wide x 400mm deep, or the dimensions of the rootball, whichever is greater.
- 4.4.7 All trees should be planted with a 75 mm depth of bark mulch, 0.5 m in diameter around each tree/shrub to suppress weeds and retain soil moisture.
- 4.4.8 Planting will focus on long-lived trees in order to replace the many ash trees noted to be present within the hedgerow network, the majority of which can be expected to be lost in the next five years due to ash dieback.
- 4.4.9 It may be desirable to plant trees not identified in the local area which are ecologically similar to ash or are resistant to both disease and climate change impacts. A list of locally appropriate and resistant trees are listed in Table 3 below.

Table 3: Tree Species for Planting within the Scheme

Scientific Name	Common Name	Size	Form
<i>Acer campestre</i>	Field maple	125-150cm	Whip (Bare Root)
<i>Betula pendula</i>	Silver birch	60-80cm	Transplant (Bare Root)
<i>Corylus avellana</i>	Hazel	100-125cm	Transplant (Bare Root)
<i>Crataegus monogyna</i>	Hawthorn	125-150cm	Whip (Bare Root)
<i>Fagus sylvatica</i>	Beech	125-150cm	Feathered (Bare Root)
<i>Ilex aquifolium</i>	Holly	20-30cm	Containerised
<i>Ligustrum spp.</i>	Privet	60-80cm	Transplant (Bare Root)
<i>Lonicera periclymenum</i>	Honeysuckle	60-80cm	Containerised
<i>Malus sylvestris</i>	Crab apple	125-150cm	Whip (Bare Root)
<i>Prunus padus</i>	Bird cherry	100-125 cm	Transplant (Bare Root)
<i>Prunus avium</i>	Cherry	100-125cm	Transplant (Bare Root)
<i>Prunus spinosa</i>	Blackthorn	125-150cm	Whip (Bare Root)
<i>Quercus robur</i>	Pedunculate oak	125-150cm	Whip (Bare Root)
<i>Rosa arvensis</i>	Field rose	40-60cm	Transplant (Bare Root)
<i>Rosa canina</i>	Dog rose	60-80cm	Transplant (Bare Root)
<i>Salix cinerea</i>	Grey willow	60-80cm	Transplant (Bare Root)
<i>Salix fragilis</i>	Crack willow	60-80cm	Transplant (Bare Root)
<i>Sambucus nigra</i>	Elder	60-80cm	Transplant (Bare Root)
<i>Sorbus aucuparia</i>	Rowan	100-125 cm	Transplant (Bare Root)
<i>Viburnum lantana</i>	Wayfaring tree	60-80cm	Transplant (Bare Root)
<i>Viburnum opulus</i>	Guelder rose	100-125 cm	Transplant (Bare Root)
Resistant/Ash Replacement Tree Species			
<i>Alnus glutinosa</i>	Alder	60-80cm	Transplant (Bare Root)
<i>Betula pendula</i>	Birch	60-80cm	Transplant (Bare Root)
<i>Populus nigra subsp. betulifolia</i>	Black poplar	60-80cm	Transplant (Bare Root)

<i>Quercus patrea</i>	Sessile oak	125-150cm	Feathered (Bare Root)
<i>Tilia cordata</i>	Small Leaved lime	125-150cm	Feathered (Bare Root)
<i>Tilia x europaea</i>	Caucasian Lime	125-150cm	Feathered (Bare Root)
<i>Ulmus 'New Horizon'</i>	Elm (disease resistant cultivars)	125-150cm	Feathered (Bare Root)

- 4.4.10 Locally sourced native black poplar *Populus nigra subsp. Betulifolia* and Crack Willow, *Salix fragilis* are to be proposed within some of the riparian habitats along major water courses on the Sites and along the eastern boundaries of the Scheme. Local genetic stock is to be sourced where available ensuring that they are not hybridised and a mixture of male and female plants would be planted. Seed fall would be monitored and self-sown specimens that may negatively impact the solar panels or adjacent land would be removed.

Woodland and Shelterbelt Management

- 4.4.11 All trees and shrubs will be regularly watered in the first summer and as required thereafter to ensure successful establishment. Bark mulch will be maintained at a depth of 75 mm, 0.5 m in diameter around each tree/shrub as required to suppress weeds and retain soil moisture.
- 4.4.12 Hand pulling of persistent weeds will be undertaken, or treatment using a spot herbicide where weeds are more widespread.

4.5 Scattered Trees with a Native Shrub Mix

- 4.5.1 Bands of scattered trees with lower canopy shrub planting are also proposed throughout Cottam 1, 2, 3a and 3b. This planting typology has been specified along water courses and to provide additional vegetative layering within the landscape. The mix of shrub and scattered tree planting is to provide effective screening of up to 3-12m without compromising the open aspects of particular views.
- 4.5.2 The tree species selected will reflect the species identified within the Sites to ensure they are locally appropriate. Tree planting locations will require an appropriate offset from solar panels to ensure shading will not occur once the tree has matured, or leaf fall become a problem on the panel structures.
- 4.5.3 An area of 0.5ha of scrub habitat will be established across the Site, with wide strips at **Cottam 3a** (Figure 8.16.10), **Cottam 1** North (Figures 8.16.1/2/3) and **Cottam 1** South (Figure C6.4.8.16.4) adjacent to the woodland blocks.

Scattered Trees a with Native Shrub Planting

- 4.5.4 Shrub planting will be planted at 1m centres to form a dense lower canopy. Scattered trees will be planted at 5-11m centres. All tree and native shrub species will be planted in groups of 1, 3, 5 and 7 (of the same species) to reinforce a natural layout of species within the landscape.

- 4.5.5 Plant species will be a planted as a mix of sizes from 60-90cm Transplants, 125-150cm Whips and 200-250cm Feathered trees.
- 4.5.6 Trees will be planted appropriately depending on size. Trees will be planted as Whips, Transplants and Feathered specimens in pits approximately 300mm deep x 300mm wide x 400mm deep, or the dimensions of the rootball, whichever is greater.
- 4.5.7 All trees should be planted with a 75 mm depth of bark mulch, 0.5 m in diameter around each tree/shrub to suppress weeds and retain soil moisture.
- 4.5.8 A list of locally appropriate species is given below in Table 4 (those which have been identified on the Site).

Table 4: Tree Species for Planting within the Scheme.

Scientific Name	Common Name	Size	Form
Scattered Trees			
<i>Acer campestre</i>	Field maple	125-150cm	Whip (Bare Root)
<i>Betula pendula</i>	Silver birch	100-125cm	Transplant (Bare Root)
<i>Malus sylvestris</i>	Crab apple	125-150cm	Whip (Bare Root)
<i>Prunus padus</i>	Bird cherry	100-125cm	Transplant (Bare Root)
<i>Prunus avium</i>	Cherry	100-125cm	Transplant (Bare Root)
<i>Quercus robur</i>	Pedunculate oak	125-150cm	Whip (Bare Root)
<i>Salix caprea</i>	Goat willow	100-125cm	Transplant (Bare Root)
<i>Sorbus aucuparia</i>	Rowan	100-125cm	Transplant (Bare Root)
Resistant/Ash Replacement Tree Species			
<i>Alnus glutinosa</i>	Alder	60-80cm	Transplant (Bare Root)
<i>Betula pendula</i>	Birch	60-80cm	Transplant (Bare Root)
<i>Populus nigra subsp. betulifolia</i>	Black poplar	60-80cm	Transplant (Bare Root)
<i>Salix fragilis</i>	Crack willow	60-80cm	Transplant (Bare Root)
Understorey shrub/trees			
<i>Corylus avellana</i>	Hazel	60-80cm	Whip (Bare Root)
<i>Crataegus monogyna</i>	Hawthorn	60-80cm	Whip (Bare Root)
<i>Ilex aquifolium</i>	Holly	60-80cm	Containerised
<i>Prunus spinosa</i>	Blackthorn	60-80cm	Whip (Bare Root)
<i>Salix cinerea</i>	Grey willow	60-80cm	Transplant (Bare Root)

- 4.5.9 Locally sourced native black poplar *Populus nigra subsp. Betulifolia* and Crack Willow, *Salix fragilis* are proposed within some of the riparian habitats along major water courses on the Site, and along the eastern boundaries of the Scheme. Local genetic stock is to be sourced where available, ensuring that they are not hybridised, and a mixture of male and female plants would be planted. Seed fall would be monitored and self-sown specimens that may negatively impact the solar panels or adjacent land would be removed.

Scattered Trees a with Native Shrub Management

- 4.5.10 Due to the naturalised appearance of the shrub and scattered trees, this particular planting typology will require little maintenance once established.
- 4.5.11 All trees and shrubs will be regularly watered in the first summer and as required thereafter to ensure successful establishment. Bark mulch will be maintained at a depth of 75 mm, 0.5 m in diameter around each tree/shrub as required to suppress weeds and retain soil moisture.
- 4.5.12 Hand pulling of persistent weeds will be undertaken if they are not too excessive, or they will be treated using a spot herbicide treatment if more widespread.

4.6 Buffer Areas

- 4.6.1 Buffer areas have been incorporated into the design of the Scheme to ensure an appropriately sized offset free from development between the various valued habitats typically located at field boundaries (hedgerows, watercourses and woodland etc.). Buffer zones are located between the retained field boundary habitats and the perimeter security fence in the case of the 'outermost' fields within a Site, and between field boundary habitats and the panels in other fields.
- 4.6.2 Chapter 9 [APP-044] and Appendix 9.10 [APP-087] of the Environmental Statement contain detail on the layout of these buffers. The criteria on which buffers have been applied are as follows in Table 5 overleaf.

Table 5: Buffer Size Criteria

Buffer Size	Criteria Where Buffer Applied
5m	Species poor hedgerows with no ditch
8m	At least one of: <ul style="list-style-type: none"> • Species rich hedgerow • A ditch or water course of any kind • Any hedgerow with a tree with low potential for roosting bats
10m	At least one of: <ul style="list-style-type: none"> • Signs of otter or water vole in the ditch/watercourse • Any hedgerow with a tree with moderate potential for roosting bats • Outlier badger setts
12m	Any hedgerow with a tree with high potential for roosting bats
15m	Some minor watercourses (depending on ecological value)
20m	At least one of: <ul style="list-style-type: none"> • Woodland edge • Some minor-moderately large watercourses (depending on ecological value) • Subsidiary or annexe badger setts
30m	At least one of: <ul style="list-style-type: none"> • Ancient woodland • Major watercourses (depending on ecological value) • Main badger setts
50m	Ponds containing great crested newts
Case-by-case	Bat roosts Schedule 1 bird nests (barn owl, hobby etc)

- 4.6.3 The above table shows that the ecological buffer areas, when applied across the entire Scheme, will comprise a large amount of land outside the footprint of the solar array which can be ecologically enhanced, and a range of habitats have been proposed below to create a mosaic within the landscape. Diversification of grassland management maximises the available niches for invertebrates to lay eggs, overwinter and feed and in turn drive opportunities for diversification up the food chain. Extensive, low-input and higher species diversity grassland types have been chosen for the buffer areas (as well as within the footprint of the array) as these represent a locally appropriate habitat type, as opposed to extensive woodland, scrub or wetland creation, which are proportionately less well represented in the local landscape.
- 4.6.4 As conservation management of grassland will be applied throughout all grassland habitats within the Scheme (i.e., no management during the flowering season), differing seed mixes and creation prescriptions have been specified between different, adjacent buffer zones, as well as the array footprint.
- 4.6.5 Widening of existing arable field margins (typically 1-5m at present) into these larger ecological buffer zones has the beneficial effect of enhancing the neighbouring hedgerows and ditches they frequently run parallel with. This in turn increases the interconnectedness of habitats within the Scheme and within the neighbouring landscape, a key tenet of the National Planning Policy Framework and local planning policy.
- 4.6.6 It has been assumed within this report that any grassland creation on previously arable land would require seeding given that the land has been under agricultural production for many years. However, Plantlife suggest that natural regeneration is preferable in order to maintain a local genestock and distinctiveness⁴. There may be opportunities to use a local donor site to provide green hay. This is particularly true for the northern part of Cottam 1, where several Local Wildlife Sites with diverse grasslands are present in the local area.
- 4.6.7 Where the above is not possible, wildflower and grass seed will be required. Given the size of the Scheme, it is likely that a large proportion of seed will need to be purchased from outside the local area. Whilst this is acceptable it is important that seed is sourced as locally as possible and as a minimum will be native to the UK and UK sourced.
- 4.6.8 The following principles will be used when considering seeding:
- If there is evidence that the land was previously grassland (as opposed to arable cropland) or there is a diverse grassland habitat nearby, soil inversion and natural regeneration will be considered in the first instance which would be specified in detailed landscape proposal plans.
 - Where possible, local donor sites will be used to source seed.
 - Where seed requires purchase from a supplier, the source will be as local as possible (e.g., Habitat Aid gives details of their donor sites).

⁴ Plantlife – Keeping the Wild in Wildflower

- Seed will be native to the UK and the supplier will have adopted the Flora Locale code of practice⁵ (unless otherwise specified in the LEMP).

4.6.9 It will be important to gain an understanding of soil conditions prior to any seeding being carried out – this will include an assessment of soil type and pH, as well as nutrient levels which may affect the species that will establish. Consequently, the information in this outline LEMP may be subject to revision following completion of such investigations, which would further tailor and refine the appropriate seed mixes and habitat establishment techniques to be adopted.

4.6.10 The following sections set out the grassland habitat types to be created within the different buffer areas.

Flower Rich Pollinator Strips

4.6.11 Within areas under this treatment, a floristically rich habitat will be created (see Figure 4) which will have a benefit for pollinating insects⁶, therefore boosting invertebrate numbers which are currently in decline and providing ecosystem services for the adjacent arable land. This would also benefit species such as farmland birds, amphibians and reptiles.

4.6.12 In order to create this habitat, a more flower rich seed mix will be utilised, such as Habitat Aid's Standard Pollen and Nectar Mix⁷ which includes a carefully selected range of nectar rich flowers to allow for a long flowering season.

4.6.13 This habitat would be cut once on an annual basis, in September to avoid impacts on nesting birds, with arisings removed.

⁵ Flora Locale – Code of Practice for Collectors, Growers and Suppliers of Native Flora. 2012.

⁶ Solar park management and design to boost bumble bee populations. / Blaydes, Hollie; Gardner, Emma; Whyatt, Duncan; Potts, Simon G; Armstrong, Alona. In: Environmental Research Letters, Vol. 17, No. 4, 044002, 30.04.2022.

⁷ <https://www.habitataid.co.uk/products/superior-pollen-and-nectar-seed-mix-1?variant=31994370621485>



Figure 4: Wide, Herb Rich Flowering Field Margin

- 4.6.14 The creation of this habitat is focussed on areas within the Sites where development is constrained for other reasons (i.e. overhead and underground utilities). This habitat will also be created within sunnier buffer areas, such as on the south side of hedgerows. This will create a network of pollinator strips running through the Site, being linked with other habitats as set out below. In addition, this habitat has been focussed on buffers near residential dwellings as the flower rich sward (with species selected to provide a long flowering season) will create a visually attractive habitat.
- 4.6.15 A wide strip of this habitat will be created close to the Public Right of Way at **Cottam 3b** (Figure 8.16.9) and within unpanelled areas close to residential properties at **Cottam 1** North (Figures 8.16.1/2), **Cottam 1** West (Figure 8.16.6) and **Cottam 2** (Figure 8.16.8).
- 4.6.16 There are wide field margins and easements at **Cottam 1** West (Figures 8.16.7, 8.16.7.1 and 8.16.6), **Cottam 1** South (Figures 8.16.4/5) and **Cottam 1** North (Figures 8.16.1/2/3), which form part of the Biodiversity Opportunities Mapping area and which will receive this treatment.
- 4.6.17 A total area of 73ha of herb rich pollinator mix has been identified within the Landscape and Ecology Mitigation and Enhancement Plans (Figures 8.16.1 - 8.16.10 [EN010133/EX1/C6.4.8.16.1_A-C6.4.8.16.10_A] of the Landscape Visual Impact Assessment (LVIA) [APP-043]).

[Tussock Grassland Margins](#)

- 4.6.18 Low intensity managed grassland can provide valuable tussocky habitat (see Figure 5) for a range of birds, providing a food source both during breeding and wintering, as well as nesting habitat for species such as corn bunting *Emberiza calandra*, reed bunting *Emberiza schoeniclus*, yellowhammer *Emberiza citrinella* and whitethroats *Sylvia communis*.
- 4.6.19 The tussocks also provide breeding and wintering habitat for a range of invertebrates and are also optimal habitat for small mammals (which in turn benefits species such as barn owl), amphibians and reptiles.
- 4.6.20 Tussocky field margins created on arable land will be seeded with an appropriate tussock forming seed mix such as Habitat Aid's Tussock Mix⁸ or similar. Where grassland margins already exist, management can be altered in order to encourage a tussocky sward to form.
- 4.6.21 Once established, the tussocky grassland should be cut (ideally) or grazed on a rotational basis once every 3 years in September, to allow plants to flower and set seed and also avoid impacts on nesting birds using the hedgerows/margins.



Figure 5: Tussocky Field Margin Created Between Security Fencing and Field Boundary

- 4.6.22 Tussock habitat has been focussed on more shaded areas such as on the northern side of hedgerows or adjacent to scrub and woodland where the tussocky grassland will form a

⁸ <https://www.habitataid.co.uk/products/tussock-seed-mix>

transitional habitat into the more regularly managed grassland within the solar farm. The Landscape Plans show this habitat being created extensively across the Scheme forming an important connected corridor for wildlife with a total area of 71ha.

Successional Scrub

- 4.6.23 Some field margins will be allowed to develop into scrub. Scrub is a valuable habitat as it provides shelter and food for invertebrates, birds and mammals. It can be a particularly valuable habitat to develop on woodland edges, as it provides an important transitional zone between the wooded area and grassland.
- 4.6.24 Scrub establishment has been focussed in areas on the edges of woodland and has been located on outermost fields and outside the security fencing only, to prevent encroachment into the solar farm itself (the annual cutting of the grassland inside the security fencing will prevent the scrub from spreading).
- 4.6.25 Where possible, scrub establishment will take the form of “rewilding”, with locally sourced tree seeds and berries being scattered within the areas to be established and allowing the habitat to grow without any specific planting. This will ensure local gene stock is used and the species which thrive will be those most suitable to the specific conditions in that area. Whip planting will be undertaken where this approach is not successful.
- 4.6.26 The following species are found locally and would be appropriate for the supplementary approach highlighted above:

Table 6: Scrub Species

Locally Appropriate Scrub Species	
Hawthorn	<i>Crataegus monogyna</i>
Blackthorn	<i>Prunus spinosa</i>
Field rose	<i>Rosa arvensis</i>
Bramble	<i>Rubus fruticosus agg.</i>
Hazel	<i>Corylus avellana</i>
Crab Apple	<i>Malus sylvestris</i>
Honeysuckle	<i>Lonicera periclymenum</i>

- 4.6.27 The scrub areas will require some management in the form of cutting; this may be through cutting of small areas each year. The management plan will aim to ensure the scrub areas are cut on rotation, with each area cut approximately 3 times over the lifespan of the array. This will create a mosaic within the scrub areas, with some cut and some mature patches which creates valuable habitat for wildlife. The frequency of cuts is prescribed in the Management Prescription timetable in Appendix B.
- 4.6.28 An area of 18.8ha of successional scrub habitat will be established across the Scheme, with wide strips at **Cottam 3a** (Figure 8.16.10), **Cottam 1** North (Figures 8.16.1/2/3) and **Cottam 1** South (Figure 8.16.4) adjacent to the woodland blocks.

4.7 Beneath Panel Habitat

- 4.7.1 Arable fields occupy the vast majority of the Site and are intensively farmed monocultures which are likely to receive periodic fertiliser and pesticide treatments, as well as being ploughed on a regular basis. The arable fields across all Sites are therefore generally botanically poor and contain little particular ecological interest, save for their value to a relatively small number of ground-nesting bird species and arable specialists including hunting raptors (several of which are notable species of conservation concern) and brown hare.
- 4.7.2 Considerable opportunities for the enhancement of these fields' ecological value compatible with a solar array, as well as their use by hunting raptors and mammals such as brown hare, are possible. The reversion from intensive agriculture to low (or no) input (fertiliser and soil improvers) grassland alone would be expected to provide a modest net gain in plant and invertebrate species diversity over time. The establishment of meadows within a predominately arable landscape will drive the diversification of local habitats toward that of historical land use patterns where agriculture in the region was characterised by a mix of arable and pasture farming, which supported a greater abundance of wildlife.

Diverse Meadow Creation and Management

- 4.7.3 It has been shown that diverse grassland can be created within a solar array, where managed appropriately⁹. This can have a significant benefit to biodiversity but can also benefit surrounding agricultural land through offering an increase in pollinator species. Other benefits in terms of ecosystem services include an increase in water quality as a result of the cessation of fertilisation and herbicide spraying as well as an increase in soil health as a result of the cessation of ploughing.
- 4.7.4 Lowland meadows are a Habitat of Principal Importance under the Natural Environment and Rural Communities (NERC) Act 2006 and are a Lincolnshire BAP priority.
- 4.7.5 Diverse grassland can take time to develop on previously arable land which has been fertilised and ploughed. However, with an appropriate seed mix selected and correct habitat management implemented, wildflower meadows have been created on many solar farms in the UK¹⁰. The preparation of the fields before reversion to grassland will be key and must aim to minimise the impact of competition between desirable, sown species and unsown agricultural weeds and cereals.¹¹
- 4.7.6 Prior to finalisation of this LEMP, soil investigations will be essential to ensure appropriateness of seed mix/establishment techniques and promote a high likelihood of success. The seed mix will be selected to reflect the soil type, pH and nutrient levels in order to ensure that it establishes successfully. A mix such as Habitat Aids Solar Farm Wildflower Meadow Seed Mix¹² would be appropriate as it contains a diversity of native wildflowers and non-vigorous grasses.
- 4.7.7 Autumn sowing is preferable, with the seed sown as soon as possible subsequent to construction of the array to avoid a flush of unwanted species such as annual plants and injurious weeds (as well as careful preparation of the land prior to seeding, as set out above).
- 4.7.8 Management during the first year is critical, with more regular cutting taking place to tackle annual or agricultural plants and injurious weeds. Herbicide application may be necessary should there be an abundance of injurious weeds. Subsequent to this, management would be in the form of a “haycut” between late July and September and/or grazing by sheep (aftermath grazing). The fields would be “shut up”, with no grazing or cutting between April and late July to allow the flowering species to grow, flower and set seed.
- 4.7.9 Where possible, cutting will be carried out using a cut-and-collect system so as to minimise nutrient build up in the soil which stifles species diversity. It will be necessary to balance the requirement for a late cut to allow plants to flower and set seed and ensuring that the cut is not taken so late that too much dead material is present, rendering the baled material unsuitable for agricultural applications. Careful monitoring and selection of seed mixes will

⁹ H. Montag, G Parker & T. Clarkson. 2016. The Effects of Solar Farms on Local Biodiversity; A Comparative Study. Clarkson and Woods and Wychwood Biodiversity

¹⁰ <https://solarenergyuk.org/resource/natural-capital/>

¹¹ Blakesley, D. and Buckley, G.P. (2016) *Grassland Restoration and Management*. Exeter: Pelagic Publishing, UK

¹² <https://www.habitataid.co.uk/products/wildflower-seed-solar-farms>

be required in order to achieve both a diverse meadow and a use for the arisings collected. Alternatively, there may be an opportunity to use the cuttings within local composting sites such as anaerobic digesters or open air windrows.

- 4.7.10 An alternative to use of arisings for feedstock or composting is to use hay collected from the established meadow as a source of seed for other sites in the vicinity. However, this would be more appropriate where the meadow has been established using local seed, which will be defined in the finalised version of this LEMP as a requirement under the DCO.
- 4.7.11 Cutting or mowing can be carried out relatively quickly and cost-effectively, particularly with single axis tracker panels (as is proposed to be the case for this Scheme, although flexibility is retained within the application for the use of fixed panels), which can be moved so that they are vertical to allow machinery to access.
- 4.7.12 Where grassland becomes too long and shading of panels is a problem, a “shade cut” may be taken along the leading edge of the panels (i.e., a strip no more than 1m wide) in order to reduce the sward height during the late summer months (as shown in Figure 6 below). However, careful selection of an appropriate seed mix may reduce the necessity of this type of management.



Figure 6: Sites where a “Shade Cut” has been employed during the growing season to prevent shading of panels, but allow flowering meadow elsewhere

- 4.7.13 Low intensity grazing throughout the year may be employed, with a low enough stocking density to ensure a varied sward establishes, however, this type of management will need to be carefully monitored as it can lead to a lower number of flowering species given sheep will preferentially graze flowers. However, a diverse grassland can still develop under this

management, which will benefit birds and invertebrates. Grazing too often or too densely carries the risk of depleting botanical diversity through the raising of nutrient levels, favouring of fewer vigorous species, and inhibition of flowering and seed-setting. Ideal grazing regimes would include the limiting of number of animals per hectare/acre to 'conservation grazing' or Higher Level Stewardship (agri-environment scheme) rates. If possible, sheep should be removed for at least 8 weeks between April and August to allow for plants to flower.

- 4.7.14 Diverse meadow creation has been focussed within the Biodiversity Opportunities Mapping zones in **Cottam 1**, in order to create a network of habitats of high ecological value within these priority areas. The total area of this habitat measures 88ha.

Floodplain Meadow Habitat

- 4.7.15 Floodplain meadow is now a rare habitat in the UK, with only 1% remaining. It is one of the most diverse grassland habitats and supports a wide range of species.
- 4.7.16 Several fields at **Cottam 1** West (Figure 8.16.6) have been identified which are lower lying, subject to flooding and as locations where key indicator species have been recorded in the past. These will be selected for floodplain meadow restoration.
- 4.7.17 There are several existing floodplain meadow sites close by to the Site¹³ which may act as donor sites for green hay collection. This will be explored further before purchasing seed from elsewhere. In addition, soil measurements in terms of nutrient levels and pH will also require assessment prior to seeding to ensure that the site is suitable.
- 4.7.18 Where green hay from local donor sites cannot be sourced, a suitable seed mix from a reputable supplier will be used (such as Habitat Aids Wet Wildflower Mix¹⁴).
- 4.7.19 In terms of management, the habitat will be subject to a hay cut as per the other wildflower areas, with the cut being taken in September to avoid ground nesting birds. Arisings will be collected and may be used as a source for seed once the meadow is established.
- 4.7.20 This habitat has been proposed within Cottam 1 West, which also lies within a Biodiversity Opportunity Mapping area. There are large unpanelled areas within this part of the Site and so creation of floodplain meadow will also provide opportunities for ground nesting birds. The total area of this proposed habitat is 34ha.

Longer Term Meadow Creation

- 4.7.21 The large remainder of the Scheme's panelled areas will be converted to a diverse grassland over a longer timespan. This approach has been chosen after consultation with a seed supplier, as it is likely that there would not be enough seed available in the UK to plant the entire Site with an appropriate mix immediately. The following approach leaves time to create the meadow over several years and allows more careful sourcing of seed from local

¹³ <https://www.floodplainmeadows.org.uk/about-meadows/meadow-map>

¹⁴ <https://www.habitataid.co.uk/products/wet-meadow-seed-mix>

sources where possible (or potentially from other parts of the Site which are more established and so could act as donor sites).

- 4.7.22 Given that seeding should be done as soon as possible post construction to prevent encroachment of injurious weeds, initial seeding of this large area will take a “nurse crop approach”. This will be discussed with the seed supplier to ensure the correct approach is taken and that non-native cultivars do not persist in the swards.
- 4.7.23 One approach to this may be that a seed mix is used containing 90-95% of short lived cultivar grasses and 5-10% wildflower seeds. The short lived grasses would comprise species such as annual ryegrasses or tetraploid ryegrasses that would not persist in the sward; as these grasses die out it is anticipated that local species would naturally colonise. A seed such as Westerwold ryegrass¹⁵ would be suitable for this purpose. This will be carefully monitored over the first few years and where required, extra seed may be added.
- 4.7.24 Another approach may be that a nurse crop is used which is then replaced with a wildflower mix over several years, depending on the quantities of seed available.
- 4.7.25 This flexibility has been built into the LEMP after consultation with a seed supplier that has been involved in habitat creation on other NSIP-scale solar projects. The approach ensures that there is time to select a locally appropriate seed mix, particularly given the uncertainty around seed supply which can vary year on year depending on climate and the requirements of other large scale projects.
- 4.7.26 The total area proposed for this longer term meadow creation is 338ha.

4.8 Bird Mitigation Habitats

- 4.8.1 As set out in Chapter 9 of the Environmental Statement, several areas will be managed specifically to mitigate for the potential adverse impacts of the Scheme on a small number of bird species.

Turtle Dove Area

- 4.8.2 An area the size of 4ha at **Cottam 3a** (Figure 8.16.10) will be managed for turtle doves, which have been recorded likely nesting near to, but not on, the Site and occasionally using the Site to forage.
- 4.8.3 The aim will be to create a short, weedy, seed rich habitat which is essential for turtle dove foraging. The optimal habitat would be either a set-aside type system, or a wild bird seed crop maintained as a low growing habitat (see Figure 7, overleaf).

¹⁵ <https://www.cotswoldseeds.com/species/74/westerwold-ryegrass>

- 4.8.4 Current guidance¹⁶ suggests a specific seed mix which is particularly suitable for this species. This contains:
- Early English vetch (25%)
 - Black medick (20%)
 - Birdsfoot trefoil (20%)
 - Early white clover (20%)
 - Early red clover (10%)
 - Fumitory (5%)
- 4.8.5 In the first year after sowing, the area would be topped to prevent the spread of unwanted weeds. In the subsequent years, half of each of the fields would be cut to 10-15cm between 15th June and 7th July, with arisings removed. The cut half of the field will be rotated so that a different half is cut each year.
- 4.8.6 In September each year, the entire field would be cut or scarified and arisings removed. The seed mix may need to be resown every 2-3 years. The requirement for resowing will be informed by monitoring visits.
- 4.8.7 An alternative approach to the above would be to allow natural regeneration. This will be dependent on the soil type and risk of injurious weeds. With this option, the fields would be cultivated between 1st August and 1st November each year. The weed growth is then sprayed with a non-selective herbicide before 15th February the following year. A second cultivation is then carried out before 15th March to allow spring seeds to germinate. The field is then left fallow until 31st August.
- 4.8.8 Nesting habitat will also be provided through strengthening the existing hedgerow network. The aim will be to create tall, wide, dense hedgerows at least 4m tall and 4m wide. Where gaps are present or hedgerows need widening, hawthorn and blackthorn Whips will be used with the addition of climbers such as clematis *Clematis vitalba* and dog rose *Rosa canina*.
- 4.8.9 A strip of new scrub planting is proposed as well as new hedgerows. These will be planted and managed to achieve the dimensions as set out above and will include dense, thorny species including hawthorn, blackthorn and dog rose.
- 4.8.10 One small pond per treatment field will be excavated to provide an important drinking and bathing resource for turtle doves. These can be small, measuring 4x4m wide and 0.75m deep, with a gently sloping side to provide access.
- 4.8.11 Habitats are shown in Figure 7 below.

¹⁶ <https://www.operationturtledove.org/wp-content/uploads/2020/01/OTD-Guidance-Helping-your-local-turtle-doves-jan20.pdf>



Figure 7: Turtle Dove Habitat Creation

Wetland Bird Mitigation Habitat

4.8.12 An area of approximately 28ha covering three fields at **Cottam 1** West (Figure C6.4.16.7), adjacent to the River Till, will be used to create a mosaic of habitats managed for lapwing and also curlew. The aim here would be to provide optimal habitat in order to encourage the use of the area for nesting by lapwing at a greater density than that which has been recorded within the moderately-suitable arable land within **Cottam 1**, which will likely no longer support nesting post-construction. In addition, the habitats created are also designed to support breeding skylark and yellow wagtail at a relatively higher density, and potentially curlew, one possible (unconfirmed) territory for which was recorded on Site. To do this, the area in question would receive a mix of low-input permanent grassland management to increase invertebrate prey abundance (crucial for feeding chicks), newly wetland created wetland features for further foraging opportunities, plus traditional fallow and spring-sown cereal cultivation with specific harvest timing to avoid nest interference and an organic approach to pest control and other inputs. Taken together with the large size of the fields, optimal conditions for high-density nesting by the target species should be created. A plan of the wetland bird habitat creation is shown in Figure 9 below.

- 4.8.13 A linear cluster of wader scrapes will be excavated close to the River Till, with a feeder ditch connecting these scrapes and supplying a source of water. Wader scrapes are shallow depressions and the aim would be to ensure they hold water until at least June. The scrapes would be up to 0.5m deep, with shallow margins and irregular outlines as well as a variety of depths to create as many niches as possible. The minimum size for each scrape would be 20m². A cluster of relatively small scrapes is more desirable than fewer larger ones.
- 4.8.14 The scrapes may be connected on a ditch line to ensure they remain wet into June. Where necessary, this may be connected into the River Till, however, this would be discussed with the Environment Agency and other experts. The feeder ditch would be excavated to have shallow, grassy banks to provide further wetland habitat. The sides would be no more than 30-40° and the banks subject to rotational cutting every 2-5 years.
- 4.8.15 Figure 8 shows an irregular edged scrape on a ditch line.



Figure 8: Scrape Connected to Ditch Line (RSPB Guidance)¹⁷

- 4.8.16 The habitat around the scrapes would be managed to be suitable for nesting and foraging lapwing, which require a sward height of around 5-15cm, with 5-10% bare ground. Ideally, short tussocks would be present, occupying less than 30% of the area (see Figure 9 below). The best way to achieve this sward would be through cattle grazing from mid-late summer onwards to ensure the sward remains short over the winter period. Alternatively, the area could be cut and chain harrowed to create this sward. Rushes would need to be topped annually to prevent spread, after the nesting season (end of July).

¹⁷ RSPB Farming for Wildlife Advice Note – Scrape Creation for Wildlife
https://www.rspb.org.uk/globalassets/downloads/documents/farming-advice/scrapecreationforwildlife_tcm9-255102.pdf

- 4.8.17 The existing wet/rank grassland adjacent to the River Till within the uncultivated space between meanders will be retained and the aim would be to ensure this is managed as damp grassland, with prescriptions as set out above applied.
- 4.8.18 In addition to this grassland habitat, spring sown cereal crops will be established which provide nesting opportunities for both lapwing and other ground nesting birds such as skylarks and yellow wagtail. The cereal will contain undrilled 'skylark plots' measuring at least 16m² which will remain unsown and uncultivated to provide low growing weedy areas for nesting and foraging. A total of 2 plots per ha will be established within the fields.
- 4.8.19 The spring sown cereal crop will be rotated between the two arable fields, so that one field remains as fallow for two years. The fallow field will have the cereal crop removed, then the stubble will remain over winter and the field will remain uncultivated for two years following this harvest. After two years of the field remaining fallow, it will be sown with a spring cereal crop and the other field subject to the two years of no cultivation.
- 4.8.20 By ensuring one field is fallow each year, this will provide valuable seed rich habitat for foraging birds and optimal nesting habitat for all species concerned. A two-year fallow period is particularly important for invertebrates.
- 4.8.21 The existing hedgerows not required for landscape and visual mitigation and where they are located adjacent to the bird habitat will be managed as short (less than 1.5m) to provide an open habitat with long sightlines and dissuade predators. In addition, a 5m wide strip of tussocky grassland will be established adjacent to the hedgerows in order to provide an optimal habitat for small mammals as a displacement food source for predators in order to reduce nest predation.
- 4.8.22 The total area proposed to be managed in this way measures 28ha and the design is shown in Figure 9.

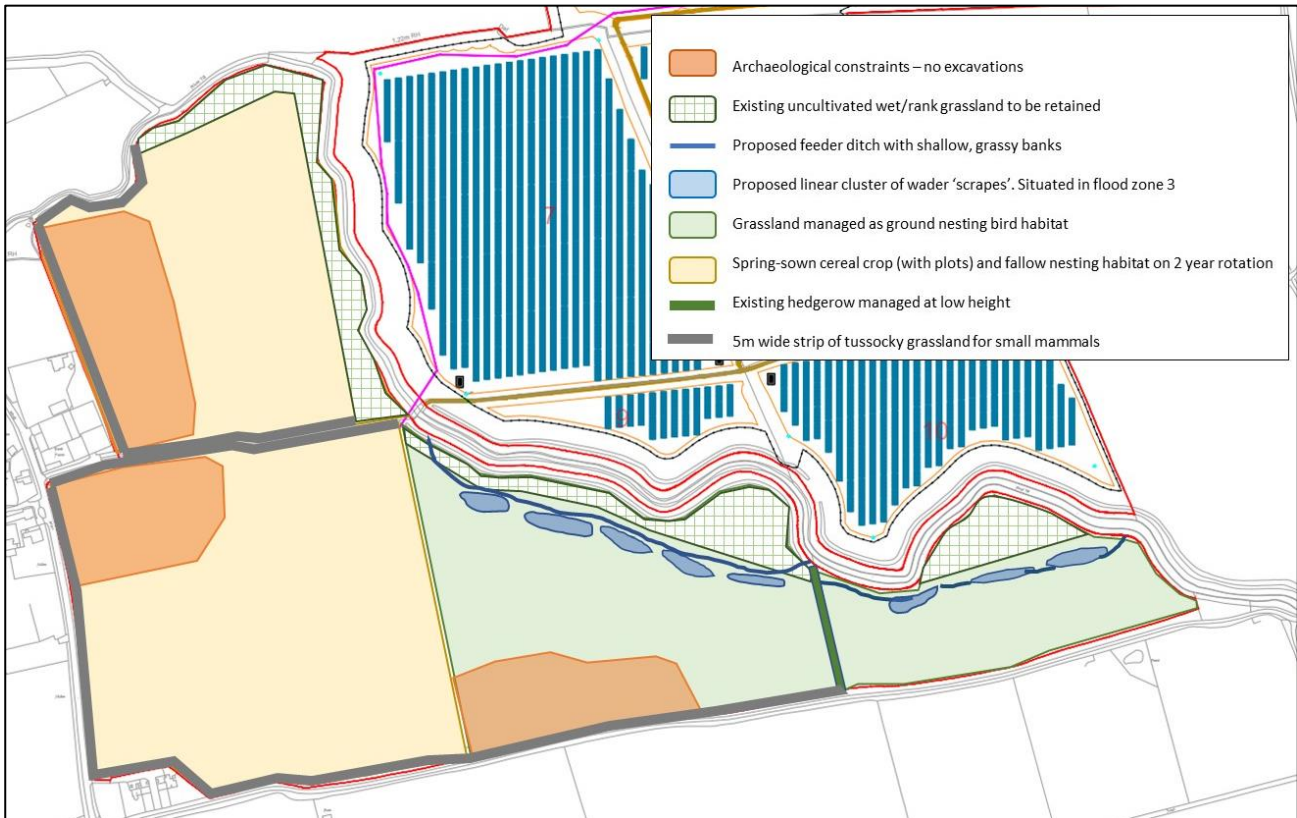


Figure 9: Wetland Bird Nesting Area

Set-Aside Habitat

- 4.8.23 Numerous areas of previously arable land which are outside of the footprint of the array but retained within the Order Limits will be managed as set-aside, which is a habitat which benefits ground nesting birds such as skylarks (this habitat has been shown to support high numbers of nesting skylark). As set out in the Environmental Statement Chapter 9 (Section 9.7), skylark will likely be displaced from the footprint of the arrays and so it is the intention to mitigate for this as far as possible by replacing the existing moderately-suitable arable habitat (which supports skylark nesting at a low to moderate density) with optimal habitat enabling a greater number of territories to occupy a smaller space.
- 4.8.24 The aim would be to create a short weedy sward which is suitable both for foraging and nesting. This may be done through rotational fallow or non-rotational set aside.
- 4.8.25 For non-rotational set aside, the fields will be lightly disced in March to a depth of no more than 7cm. A cut will then be taken between September and February inclusive to avoid the bird nesting season.
- 4.8.26 For rotational fallow, the same management would be applied as set out in the Wetland Bird Habitat above, with half of the field being planted with a spring sown cereal crop (with undrilled plots) and the other half being left as fallow for two years. After two years, this would be swapped.

4.8.27 Monitoring will focus on these habitats in order to check for the spread of undesirable plants, which may proliferate on clay and nutrient rich soils. Remedial action will need to be taken should the spreads of these species be identified.

4.8.28 A total area of 43ha of this habitat is set out within Landscaping and Ecology Mitigation and Enhancement Plans (Figures 8.16.1 - 8.16.10 [EN010133/EX1/C6.4.8.16.1_A-C6.4.8.16.10_A] of the Landscape Visual Impact Assessment (LVIA) [APP-043]), with large areas in **Cottam 1 North** (Figures 8.16.1 and 8.16.3).

4.9 Other Habitats

Willingham to Fillingham Local Wildlife Site

4.9.1 The Willingham to Fillingham Road Verges Local Wildlife Site (LWS) lies adjacent to the Site boundary in Cottam 1 North. This habitat will be extended into the Site boundary through seeding. Where possible, this will be through a donor hay cut from the LWS, however, it is likely that this will not be possible and so seed characteristic of this habitat type will be utilised (such as Habitat Aids Road Verge Wildflower and Grass Seed Mix). This habitat is shown in Figure 8.16.2.

Ditches/Rivers

4.9.2 Rivers are a Habitat of Principal Importance while rivers, canals and drains are listed on the Lincolnshire BAP.

4.9.3 The ditch quality was often poor due to agricultural impacts such as runoff; the cessation of intensive agricultural will lead to better water quality within this habitat. In addition, wide buffers of at least 8m will enhance the ditch and river habitats for birds and invertebrates as well as otters and water vole, where present.

4.9.4 Adjacent to rivers and ditches, a tall herb community will be established through seeding. This marginal habitat is important for species such as water vole, as well as aquatic invertebrates. A suitable seed mix for this habitat would be Habitat Aid's Low Maintenance Wildflower and Grasses Seed Mix¹⁸ or a bespoke mix suitable for wetter situations. A total area of 39ha of this habitat will be created within the Scheme.

4.9.5 Planting of trees may also be undertaken adjacent to ditches and rivers, with sufficient distance from the ditch to prevent damage and on the northern side where possible to prevent shading.

4.9.6 Ditch management will follow an ecologically sensitive approach which will include the following principles:

- Ditch management will be undertaken on a 2-5yr rotational basis so that undisturbed areas remain annually, with the objective of ensuring a mosaic of habitat maturity across the Order Limits at all times. This will include a

¹⁸ <https://www.habitataid.co.uk/products/low-maintenance-wildflower-and-grasses-seed-mix>

proportion of bare ground and tussocky grassland on banks and banktops, together with intervening successional habitats.

- An ecologist will collaborate with the management contractor to prepare a plan and timetable of management operations. This will involve the identification of ditches most in need of vegetation clearance or re-profiling as well as the identification of protected species constraints as appropriate. In addition, priority ditches in terms of enhancement of wetland corridors for water voles and otters will be identified. Measures to protect any adjacent newly-created habitat within the Order Limits will also be identified.
- Management practices would avoid the bird nesting season and so **not** take place between March and August inclusive.
- Ditch cleaning will be undertaken using excavators equipped with weed-clearing buckets to remove choking vegetation.
- The efficacy of the ditch management operations would be periodically reviewed and incorporated into the LEMP monitoring timetable.

Ponds

- 4.9.7 Ponds are a Habitat of Principal Importance and listed on the Lincolnshire BAP.
- 4.9.8 Ponds are of significant ecological value, and as a strong, high-quality pond network is absent within the local landscape, any creation of such features would be beneficial. Ponds could be created within field margin buffer zones (see Figure 10) and have a role to play in flood risk alleviation and water attenuation. These could take the form of linear ponds such as deepened swales, where this type of drainage is required for the development.
- 4.9.9 Creation of wetland habitats such as ponds will benefit a range of species that have been recorded within the Site, including birds such as snipe *Gallinago gallinago*, lapwing *Vanellus vanellus*, mallard *Anas platyrhynchos* and reed bunting *Emberiza schoeniclus*. Ponds will also provide habitat for newts, which are all listed as Lincolnshire BAP priority species.
- 4.9.10 Ponds will be created within areas outside the footprint of the array.



Figure 10: Pond Creation In Margin of Solar Farm

- 4.9.11 The ponds will allow for the widest variety of habitats possible, with shallow margins (some wide and some narrow) and a deeper area of at least 1.5m. They will be designed to provide shallower pools of water, as well as a larger, deeper area (so creating a complex of ponds), as recommended by the Million Ponds Project¹⁹.
- 4.9.12 Principles for pond construction are as follows:
- No planting will be introduced so as to allow species which use early successional stages of ponds to establish
 - At every location where a pond to be created is shown on the Landscaping Plans, this will comprise one deep pond and three shallower ponds as show in Figure 11 below.
 - Pond slopes will be shallow: less than 1:5 (12°), and preferably 1:20 (3°)
- 4.9.13 Spoil will be used to create south facing bunds and spread on adjacent land, then seeded with a suitable native diverse mix (such as the mixes set out in previous sections).
- 4.9.14 A suitable design for the ponds is shown in Figure 11 below.

¹⁹ <https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/>

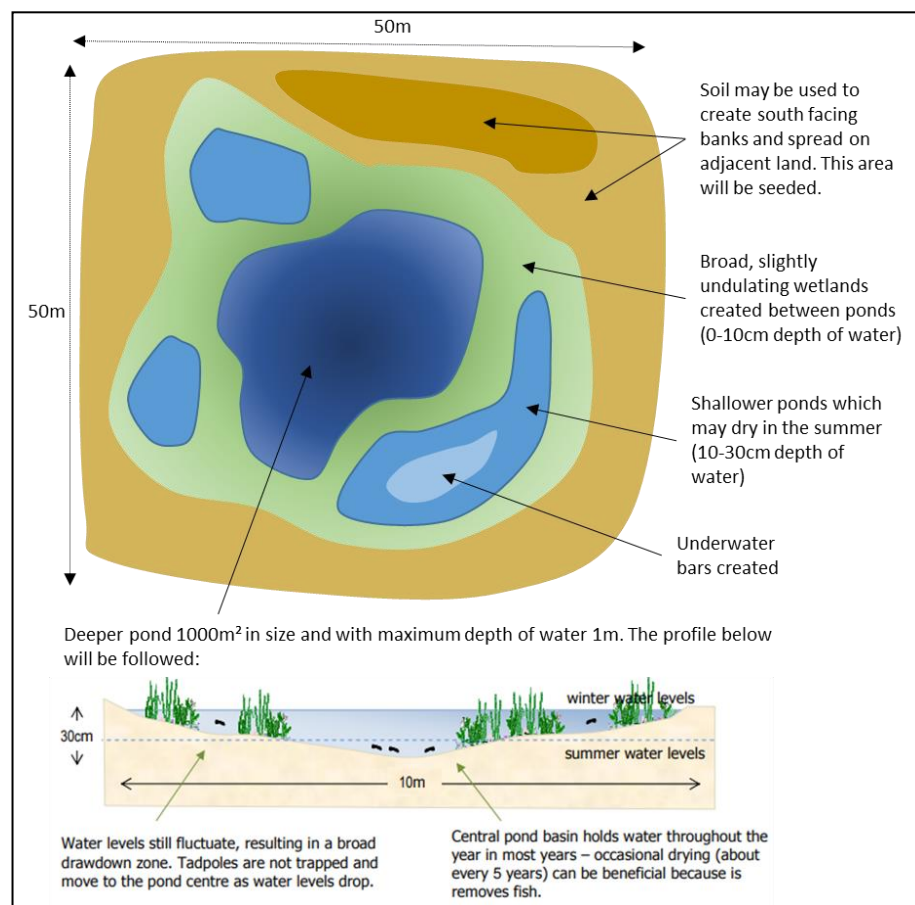


Figure 11: Suitable Pond Design

- 4.9.15 The design of the pond ensures suitability for great crested newts, but also for other amphibians. The areas of marshy wetland will create a mosaic of habitats and will increase the diversity of the area as a variety of plants will be able to establish. This will attract a greater diversity of invertebrates.
- 4.9.16 The ponds will be checked during monitoring visits to ensure they are establishing without any problems.
- 4.9.17 Some management will be required, depending on the establishment of scrub, trees and prolific species such as bulrush (although the variety of pond depths will ensure that some open water will be available). An ecologist will advise on the correct timing of any management required subsequent to the monitoring visits. Anticipated management will be as follows:
- Every 5 years: a cut of vegetation surrounding the ponds to prevent tree growth and shading. This will be carried out in the winter months using hand-tools. Some patches of scrub can be left to develop on the northern side of the pond. Arisings will be left in a pile close to the pond area (but over 20m from open water to prevent nutrients entering the pond system).

- Every 10 years: Some hand pulling or mechanical dredging may be required if there is a build-up of vegetation within the ponds. This will only be carried out where there is a risk of all open water being covered and will be carried out under the direction of an ecologist as great crested newts may be present.

4.9.18 A total of 3 new ponds are proposed; one pond at **Cottam 1** North (Figure 8.16.1) and two ponds at **Cottam 3a** (Figure 8.16.10).

4.9.19 Several ponds are also overgrown and could be enhanced by applying management as set out above. One pond at **Cottam 3a** (Figure 8.16.10) will be enhanced as well as one ponds at **Cottam 2** (Figure 8.16.8) and one pond at **Cottam 3b** (Figure 8.16.9).

Habitat Boxes

4.9.20 Habitat boxes can be a useful tool for monitoring and can provide nesting/roosting opportunities where there is a lack of natural features within the landscape. For this outline LEMP, exact locations and plans for bat and bird boxes have not been produced owing to the likely refinement of these specifications during the examination of the DCO Application. It is anticipated that a finalised location and specification plan will be produced as part of the final LEMP.

Bird Boxes

4.9.21 Bird boxes that mimic cavities can be installed on the Sites where there is a lack of mature trees which may naturally provide these features. Boxes can be installed according to the species and their distribution (which has been identified during the breeding bird surveys) and so are known to be present within the local area.

4.9.22 Barn owl boxes are known to be particularly successful on solar sites²⁰, especially when placed close to areas of rough grassland where there will be an abundance of small mammals. Where no mature trees are present, barn owl boxes can be post mounted (although trees are preferable).

4.9.23 Table 7 gives outline details of which boxes will be installed together with numbers, distribution and siting recommendations. Where the exact boxes cannot be sourced, a similar model will be secured and all boxes will be constructed from long-lasting materials such as woodcrete, where possible. All bird boxes will be installed out of direct sunlight, facing away from prevailing wind (northerly, easterly or south-easterly preferably). Boxes should also be placed clear of vegetation and away from ivy growth. All boxes will be placed 3m off the ground unless otherwise specified.

4.9.24 The numbers of boxes proposed for the Scheme have been calculated as approximately 1 box for every 100m of hedgerow (based on an estimate of 52km of hedgerow). This gives a total of 520 boxes which have been split between various target species depending on what has been recorded within the surveys.

²⁰ <https://www.clarksonwoods.co.uk/wp-content/uploads/PDF/Solarview2019.pdf>

- 4.9.25 Opportunities for installing bird boxes on buildings such as the structures associated with the battery storage site will be explored and if feasible, boxes for species such as swifts, house sparrows and house martins will also be included within the final LEMP.

Table 7: Bird Box Specifications

Box Type	No.	Description	Placement	Location
Schwegler 2GR (32mm entrance)	105	Suitable for tree sparrow, with a specially designed predator protection entrance	Installed in clusters of 15 placed over a group of trees	Clusters will be located close to records: 4 x 15 - Cottam 1 2 x 15 - Cottam 2 1 x 15 - Cottam 3b
Schwegler 1b (26mm entrance)	200	Suitable for tit species and wrens	On mature trees, half placed at a lower height (1.5m) within the hedgerow network and within vegetation to attract wrens	Across Sites
Schwegler 3S (45mm hole)	100	Suitable for nesting starlings and roosting woodpeckers	On suitable trees	Across Sites
Schwegler 28 Kestrel box	20	Nest box with perch	On a solitary tree on the edge of woodland	Across Sites where woodland is present
Barn Owl Trust nest box	45	Nest box with platform for young	At least 1km from a motorway/fast unscreened main road. Placed on a solitary tree with a high canopy and few/no lower branches, with the entrance clearly visible.	Across Cottam 1, 2 and 3a.
Schwegler 5 Tawny owl box	50	Suitable for tawny owls and stock doves	On suitable trees	5 boxes placed in Cottam 1 South and 5 in Cottam 1 North adjacent to woodland (where tawny owl have been recorded). The rest dispersed across the site

Bat Boxes

- 4.9.26 As with bird boxes, bat boxes can be particularly useful where natural cavities are limited. The installation of boxes suitable for common pipistrelle *Pipistrellus pipistrellus* (a Lincolnshire BAP species) may act as an enhancement for this species but could also provide an important monitoring tool.
- 4.9.27 Boxes could be installed in a variety of places including hedgerow trees, woodland or post mounted. Within marshy or riparian areas, post mounted boxes can be used, which may attract soprano pipistrelle *Pipistrellus pygmaeus* or Nathusius' pipistrelle *Pipistrellus nathusii*, which has been recorded on the Site. Boxes may form a useful monitoring tool, given that some notable bat species have been recorded in the area, Nathusius pipistrelle and barbastelle *Barbastella barbastellus*). Double panel bat boxes may be more desirable in some cases, as these prevent birds from nesting within the boxes.

4.9.28 Table 8 gives outline details of which boxes will be installed together with numbers, distribution and siting recommendations. Where the exact boxes cannot be sourced, a similar model will be secured and all boxes will be constructed from long-lasting materials such as woodcrete, where possible. Bat boxes will be placed in sunny locations without obscuring vegetation and away from ivy growth. Boxes will be placed approximately 3m from the ground and preferably on south facing mature tree trunks.

4.9.29 The numbers of bat boxes installed are based on one box every 200m stretch of hedgerow.

Table 8: Bat Box Specifications

Box Type	No.	Description	Placement	Location
Schwegler 2F (with front panel)	100	Especially suitable for pipistrelle species	On suitable trees	Across Sites
Schwegler 1FF	100	Suitable for pipistrelle species	On suitable trees	Across Sites
Schwegler 1FS Large colony box	30	Suitable for groups of breeding bats including noctule, Nathusius' pipistrelle and long-eared bats	On suitable trees	Across Sites
Schwegler 1FW Hibernation box	26	Suitable internal insulation for hibernating bats	On suitable trees	Across Sites
Schwegler 1FF	4	Suitable for installation under a bridge for Daubentons bats	To be placed under bridge in a hidden position as high as possible	2 x under road bridge over River Till at Cottam 1 west and Cottam 1 south

Other Habitats

4.9.30 Hibernacula and log piles will be created, particularly close to ponds and tussocky or scrub mosaic grassland. These provide shelter and hibernation opportunities for reptiles and amphibians, but also house invertebrates.

4.9.31 A total of two hibernacula per pond will be created (in total 30 adjacent to 15 ponds) as well as an additional 20 within suitable tussocky or mosaic habitats.

4.10 Ecological Monitoring

4.10.1 An outline ecological monitoring strategy is set out below, however, the final details for essential regular monitoring of the developing habitats will be set out within the final LEMP, based on a standardised approach²¹. This monitoring will be carried out more regularly during the first five years of operation, when habitats are in the early stages of developing. This regular monitoring will identify issues early on so that remediation measures or changes in management can be applied.

²¹ <https://solarenergyuk.org/resource/solar-energy-uk-guidance-a-standardised-approach-to-monitoring-biodiversity/>

4.10.2 Habitat specific monitoring will be required as part of Biodiversity Net Gain delivery/progress reporting and is included as a 'UKHab' survey along with Condition Assessments of the habitats recorded.

UKHab Survey

4.10.3 A habitat survey as well as Condition Assessments of the establishing habitats will be requirement under the Biodiversity Net Gain Assessment prepared for the Scheme **[APP-089]**. As rough guidance, it is suggested that this assessment is undertaken every 2 years for the first 8 years, then every 5 years until the proposed habitats and conditions are achieved. The requirements for monitoring under Biodiversity Net Gain are currently not established as this topic is still at consultation stage with Defra, however, it is likely that monitoring requirements will be finalised as part of the examination process and so this section will be expanded on within the full LEMP.

Botanical Quadrats

4.10.4 Fixed point quadrats will be recorded at selected locations, with quadrats focussing on each habitat type to be established. As rough guidance, it is estimated that approximately 200 quadrats will be recorded, ensuring that each habitat is sampled. The number of quadrats is based on the size of the area and estimated species diversity of the proposed habitat.

- Flower Rich Pollinator – 30 quadrats
- Tussock Grass Margins – 20 quadrats
- Diverse Meadow (BOMS areas) – 40 quadrats (including 10 directly under panels)
- Tall Herb – 40 quadrats
- Floodplain Meadow – 20 quadrats (including 5 directly under panels)
- Longer Term Meadow Creation – 50 quadrats (including 20 directly under panels)

4.10.5 This will help to track establishment and identify any problems should the habitat not be forming as required. Where these quadrats are undertaken within panelled fields, locations will ensure that all habitats are sampled, including directly beneath and between the strings of panels, as well as within the field edges, outside of the array.

4.10.6 Botany surveys should be undertaken regularly within the first few years as habitats are establishing; a suitable schedule would be years 1, 2, 3, 5, 10, 20, 30, 40.

Nectar Production Potential

4.10.7 From the above data, nectar production potential can be extrapolated for each habitat. This is a calculation that can be made from the species present and their cover using an

established data set of nectar sugar values²². This is a relatively easy way to ascertain the Sites' value for pollinating species without undertaking extensive pollinator surveys.

4.10.8 This calculation can be made subsequent to the botanical surveys as set out above.

Soil Survey

4.10.9 A soil survey would provide a helpful measurement, particularly within an area that had previously been subject to intensive agricultural production for many years. It is therefore proposed that such a survey is carried out prior to seeding and habitat establishment across the Scheme, although this could be targeted or sampled according to needs identified during the finalisation of this document for a DCO requirement. Basic measurements may include pH, soil type, soil organic matter, bulk density, soil moisture, infiltration capacity, and texture. Additional measurements may include soil carbon, nitrogen, phosphorous, potassium and magnesium.

4.10.10 There may also be opportunities to monitor other indicators such as fungal:bacterial ratio or fungal DNA.

Bird Survey

4.10.11 Given that robust baseline data on the use of the Scheme by birds has been obtained, this can be compared to similar surveys undertaken post construction. Surveys should focus on areas where high numbers of notable birds have been identified, as well as the mitigation habitats to be established. Species of particular interest due to the identification of potential residual adverse effects requiring mitigation would be skylark, lapwing, curlew, and yellow wagtail.

4.10.12 The surveys should be undertaken using the same methodology as employed for the baseline surveys and a suitable schedule may be year 2, 4, 10, 20, 30, 40 (although this may need to be adjusted should remedial measures be required where bird mitigation habitat is not establishing as desired).

Bat Survey

4.10.13 Again, given that baseline information of bat activity has been obtained, monitoring should seek to replicate this (i.e., with the same static bat detector locations used) in order to assess how bat activity changes post construction.

4.10.14 As with the birds, a suitable schedule may be year 2, 4, 10, 20, 30, 40.

Great Crested Newt Survey

4.10.15 An eDNA survey of existing and newly created ponds on the Scheme would be a simple way to assess if the great crested newt range has expanded from the baseline extent. Given that

²² <https://catalogue.ceh.ac.uk/documents/69402002-1676-4de9-a04e-d17e827db93c>

it will take time for this species to find new ponds, a survey could be undertaken in years 5, 10, 20, 30, 40.

Additional Monitoring

- 4.10.16 Given the extensive baseline survey information, the range of habitats to be created and the size of the Scheme, there may be opportunities to link up with academic research either through supplying the collected baseline data to an academic body to analyse or through establishment of research plots within the Scheme. There may also be opportunities to link up with NGOs such as the BTO or Bumblebee Trust (who have been involved in monitoring bumblebees on solar sites).

Appendix A – Financial Table

Overleaf is a draft Financial Table which sets out the estimated costs of the prescriptions within this LEMP. It should be noted that these costs are indicative only and the purpose to is to give a rough idea of finances which can then be passed on within a contract to any future parties involved in this project. The table will be updated as this LEMP progresses, and both should be viewed as live documents. Ecological monitoring costs have not been included at this stage but should also be considered.

Habitat type							Product			Implementation			I+P	Management in year 1				Management costs (annual thereafter)			
Habitat	Type	Description	Location	Area (Ha)	Length (km)	No. of units	Type	Cost per Ha / km / unit	Product cost	Type	Cost per Ha / km / unit	Implement Cost	Total Product + Implement Cost	Timing	Activity	Cost per Ha / km / unit	Cost	Activity	Activities no. p.a.	Cost per Ha / km / unit	Cost
Grassland / Sward / Seed mixes	Flower Rich Pollinator Mix	Sown within buffer areas	Margins and easements	73			Standard Pollen and Nectar Seed Mix or similar (https://www.habitataid.co.uk/products/superior-pollen-and-nectar-seed-mix-1)	£245.50/kg. Sow at 20kg per ha	£357,700	Twice cultivation, sowing, rolling, seeding	£800.00	£58,400	£416,100	Assume 3 times in a year	Cut and collect.	£300.00	£65,700	Cut and collect.	1	£300.00	£21,900
	Tall Herb Mix	Sown within buffer areas	Margins near watercourses	39			Pond Edge Seed Mix (https://www.habitataid.co.uk/products/pond-edge-seed-mix) or similar	£75.50/kg. Sow at 20kg per ha	£58,890	Twice cultivation, sowing, rolling, seeding	£800.00	£31,200	£90,090	Assume 3 times in a year	Cut and collect.	£300.00	£35,100	Cut and collect.	1	£300.00	£11,700
	Tussock Mix	Sown within buffer areas	Margins	71			Tussock Seed Mix (https://www.habitataid.co.uk/products/tussock-seed-mix) or similar	£45.00/kg	£63,900	Twice cultivation, sowing, rolling, seeding	£800.00	£56,800	£120,700	Assume 3 times in a year	Cut and collect.	£300.00	£63,900	Cut and collect every 3 years	0.3	£300.00	£6,390
	Array Grassland (all wildflower mix) BOMS Areas	Wildflower mix sown within BOMS area subsequent to construction	BOMS areas	88			Solar Farm Wildflower Meadow Seed Mix (https://www.habitataid.co.uk/products/wildflower-seed-solar-farms) or similar	variable - assume £75/kg	£132,000	Twice cultivation, sowing, rolling, seeding	£800.00	£70,400	£202,400	Assume 3 times in a year	Cut and collect.	£300.00	£79,200	Cut and collect.	1	£300.00	£26,400
	Floodplain Meadow	Created in flooded BOMS area	BOMS areas	34			Wet Wildflower Meadow Seed Mix (https://www.habitataid.co.uk/products/wet-meadow-seed-mix) or similar	£67.50/kg	£45,900	Twice cultivation, sowing, rolling, seeding	£800.00	£27,200	£73,100	Assume 3 times in a year	Cut and collect.	£300.00	£30,600	Cut and collect.	1	£300.00	£10,200
	Array Grassland (5% wildflower)	Majority of development to be seeded with mix of short lived cultivar grasses and wildflower for establishment over time	Majority of site	338			Assume short term ley mix (https://www.cotswoldseeds.com/products/75fast-and-vast-high-clover-one-two-year-ley) with 5% wildflower mix (eg. Solar farm wildflower meadow as above)	£21.73/ha Plus wildflower	£32,328	Twice cultivation, sowing, rolling, seeding	£800.00	£270,400	£302,728	Assume single cut required	Cut and collect.	£300.00	£101,400	Cut and collect annually. May require oversowing of wildflower seed once annual plants have reduced in density - not included	1	£300.00	£101,400

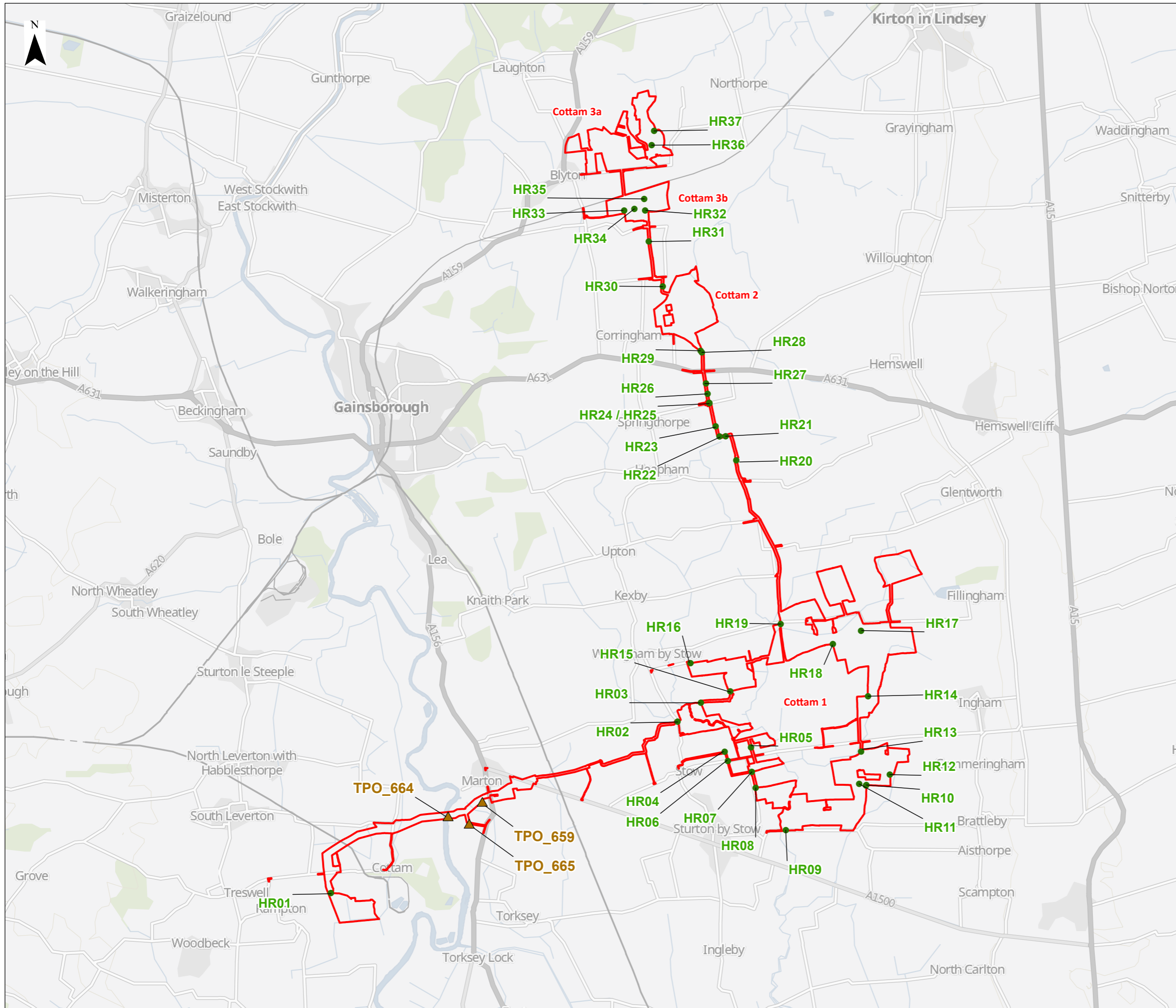
Woody plants, scrub & screening plants	Scrub	Small patches of successional scrub planted with whips or seeds	Discrete areas	0.5	500	Mixed species	£1.50 per unit	£750	Spirals, slot planting, mulching	£3.36	£1,680	£2,430	November	Check of planting, topping up mulch, spot treatment of herbicide	£1,000.00	£500	Mechanical cut after year 15 on rotation	0.05	£50.00	£1,250	
	Hedgerows	New native hedgerow planting with standard trees	Across site		20.5	61,500	Mixed species whips	£1.50 per unit	£92,250	Spirals, slot planting, mulching	£15/m	£307,500	£399,750	November	Check of planting, topping up mulch, spot treatment of herbicide	£200.00	£4,100	Trim whole site with flail (2-3 year rotation) - 81km	0.3	£65.00	£1,580
	Trees	Shelterbelt woodland	Discrete areas	0.4	500	Mixed species	£8.40	£4,200	Spirals, slot planting, mulching	£4.00	£2,000	£6,200	November	Check of planting, topping up mulch, spot treatment of herbicide	£1,000.00	£400	Thin & coppice every 5 years plus annual check	0.2	£50.00	£5,000	
Wetland features / Ponds & scrapes	Ponds	Construction of new ponds	•X1 at Cottam 1 North •X2 at Cottam 3a		3				Excavation	£2,500.00	£7,500	£7,500	September - October	Weed pulling around pond	£450.00	£1,350	Clear 50% of vegetation from pond every 3 years using a small excavator	0.3	£300.00	£270	
	Ponds	Enhancement of existing ponds	•X1 at Cottam 3b •X1 at Cottam 3a •X2 at Cottam 2		4				Deepening and removal of scrub	£1,000.00	£4,000	£4,000	September - October	Weed pulling around pond	£450.00	£1,800	Clear 50% of vegetation from pond every 3 years using a small excavator	0.3	£300.00	£360	
	Scrapes	Creation of wader scrapes and feeder ditches	At Cottam 1 West		8				Excavation	£1,000.00	£8,000	£8,000	September - October	Weed pulling around scrape	£450.00	£3,600	Clear 50% of vegetation from scrape every 3 years using a small excavator	0.3	£300.00	£720	
Bird Mitigation Areas	Turtle Dove Area	Areas managed for turtle doves	At Cottam 3a	4		Turtle dove seed mix (10 acres is £960.00)	£99/acre	£960	Twice cultivation, sowing, rolling, seeding	£800.00	£3,200	£4,160	Topped	Cut and collect.	£300.00	£3,600	Half area topped and collected. Then cut with seeding every 2-3 years	1	£300.00	£1,848	
	Wetland Bird Habitat	Scrapes and mosaic of habitat for ground nesting birds including lapwing	At Cottam 1 West	28	8				Creation of scrapes	£1,000.00	£8,000	£8,000									
Animal and insect habitat creation	Hibernacula	Pile of logs and stone	Near ponds and other locations		50	Use on site materials	£0.00	£0	Minor machine time	£22.20	£1,110	£1,110									
	Bat boxes	Variety of boxes	Across site		260	Average price per box estimated	£100.00	£26,000				£26,000			£0.00	£0	Replacement of some nesting and roosting structures after five years	0.2	£2.46	£640	
	Bird boxes	Variety of boxes	Across site		520	Average price per box estimated	£70.00	£36,400				£36,400			£0.00	£0	Replacement of some nesting and roosting structures after five years	0.2	£0.92	£480	
Total Landscaping and Biodiversity Expenses (excl General Provisions)							£851,278	Implementation total	£857,390	£1,708,668	1st year subtotal	£391,250	£190,138								

Appendix B – Management Prescription Timetable

Operation Management Prescription	Frequency per Annum	Season	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 onwards
Hedgerow								
Maintain weed free planting area through herbicide spot treatment and topping up bark mulch	Biannually	April - August						
Mechanical cut	2-3 years on rotation	September- January						Ongoing
Replace dead plants	Check annually	Next available planting season						
Hedgerow Trees								
Maintain weed free planting area through herbicide spot treatment and topping up bark mulch	Biannually	April - August						
Inspection and formative prune carried out annually in accordance with good arboricultural practice to BS 3998:2010. A clear stem will be maintained for all hedgerow trees in order to be distinguishable.	Annually	September- January						Ongoing
Replace dead plants	Check annually	Next available planting season						
Woodland Copse & Shelter belts								
Maintain weed free planting area through herbicide spot treatment and topping up bark mulch	Biannually	April - August						
Thinning / Coppicing	Every 5 years, after year 10 once planting has established	Nov- March						From Year 10
Replace dead plants	Check annually	Next available planting season						
Scattered Trees & Shrub Planting								
Maintain weed free planting area through herbicide spot treatment and topping up bark mulch	Biannually	April - August						
Mechanical cut on a rotation basis after year 15, once scrub has established.	Mechanically cut rotational areas once every 10 years	February						Ongoing
Replace dead plants	Check annually	Next available planting season						
Flower Rich Pollinator Strips								
Annual hay cut	1	September						Ongoing
Tussock Grassland Margins								
Spot herbicide application	Where required	April - August						Ongoing
Hay cut / Grazed	On a rotation basis. Once every 3 years	September						Ongoing

Operation Management Prescription	Frequency per Annum	Season	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 onwards
Successional Scrub								
Mechanical cut on a rotation basis after year 15, once scrub has established.	Mechanically cut rotational areas once every 10 years	February						Ongoing
Mechanical cut along internal edges to keep fence line clear	Annually	February						Ongoing
Spot herbicide application	Where required	April - August						Ongoing
Diverse Meadow Creation and Management								
Year 1 only - regular cutting after seeding	3 times in the year	Spread through year						
Option 1 - Hay Cut	Annually after year 1	Late July - September						Ongoing
Option 2 - Grazing at a low stocking density	Annually after year 1	Ideally with sheep removed for 8 weeks in summer						Ongoing
Spot herbicide application	Where required	April - August						Ongoing
Floodplain Meadow								
Year 1 only - regular cutting after seeding	3 times in the year	Spread through year						
Annual hay cut	1	Late July - September						Ongoing
Turtle Dove Area								
Topped	Whole field once	15th June and 7th July						
Cut to 10-15cm	Half field rotational cut annually	15th June and 7th July						Ongoing
Scarified	Annually	September						Ongoing
Reseeding as needed	Every 2-3 years							Ongoing
Wetland Bird Mitigation Habitat								
Option 1 - Cattle grazing	Annually	August - February						Ongoing
Option 2 - Chain harrowed to create varied sward	Annually	August - February						Ongoing
Rushes to be topped	Annually	end of July						Ongoing
Set-Aside Habitat								
Option 1 - non-rotational Set Aside:								
Lightly disced to a depth of no more than 7cm	Annually	March						Ongoing
Mechanical cut	Annually	September and February						Ongoing
Option 2: Rotational Set Aside:								
Spring sown cereal crop planted in half of area containing skylark plots	Annually for 2 years							Ongoing
Half of area left fallow once crop removed	Fallow for 2 years							Ongoing

Appendix C – Hedgerow Removal Plans

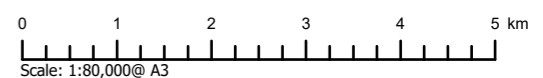


Key

- Order Limits
- Location of hedgerow to be removed
- ▲ Tree Preservation Order (TPO)

Notes:
i) Drawing/s to be read in conjunction with ES figures 8.16.1 [APP-305] to 8.16.10 [APP-315] Landscape and Ecology Mitigation and Enhancement Plans.

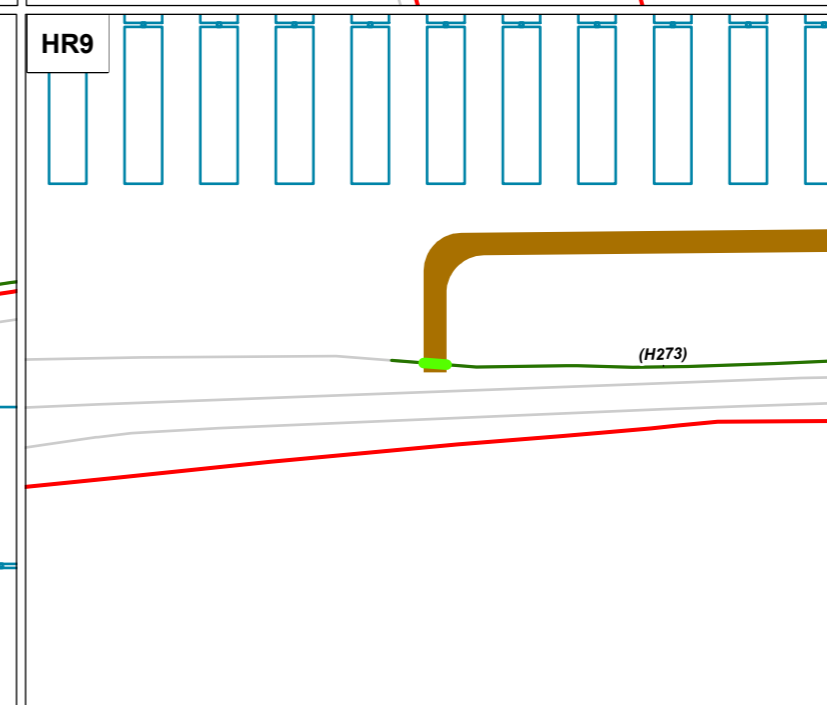
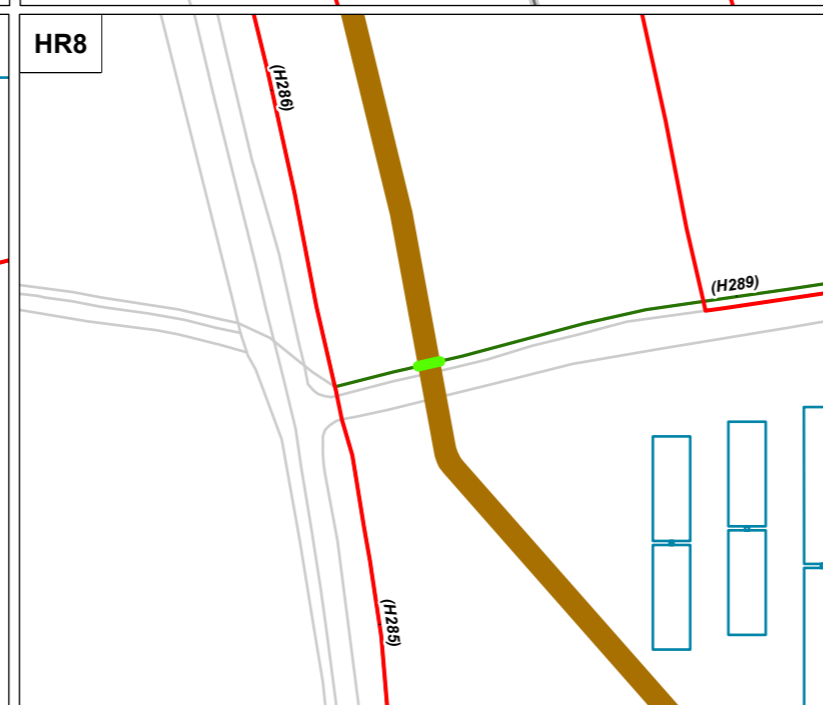
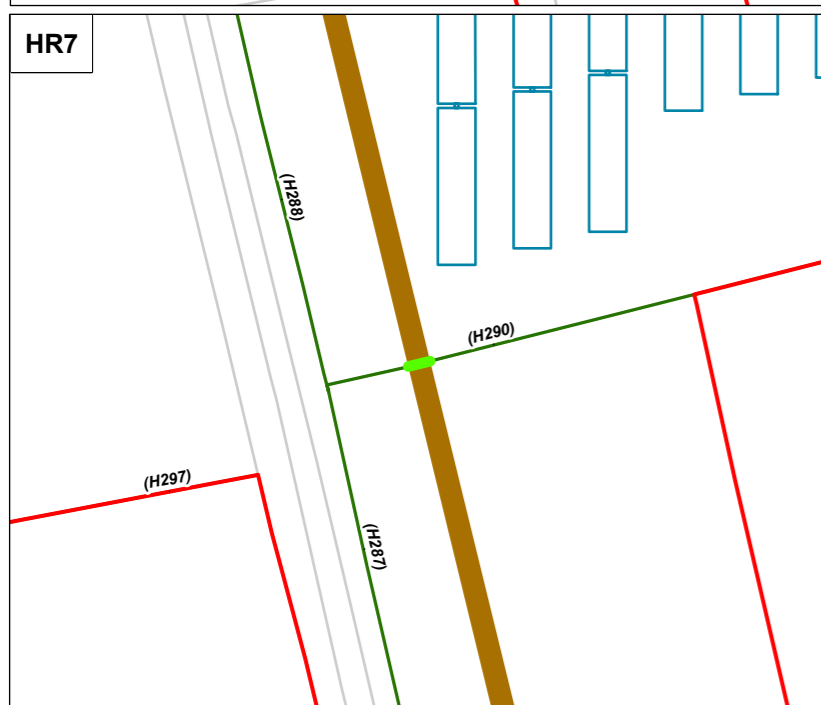
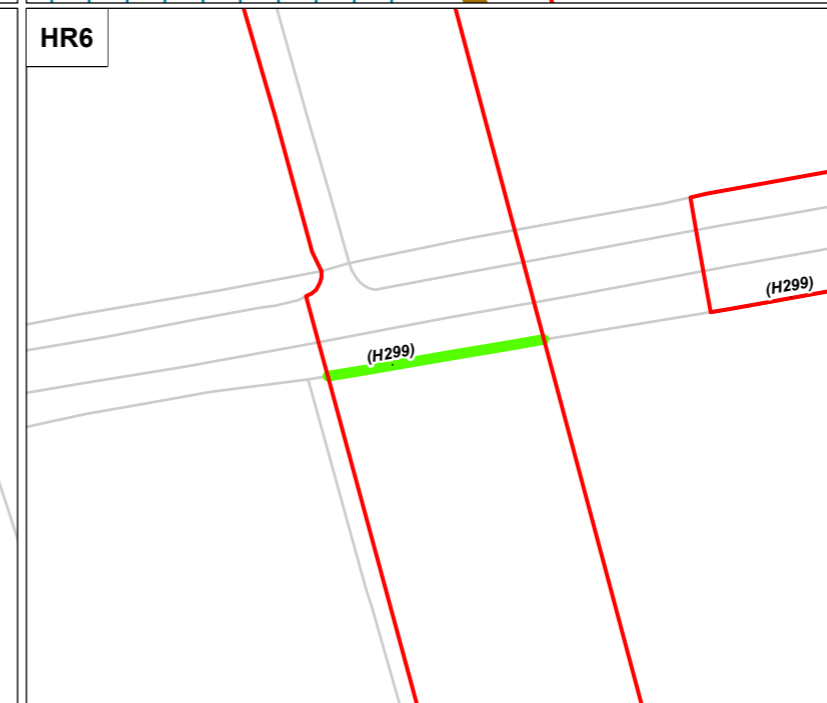
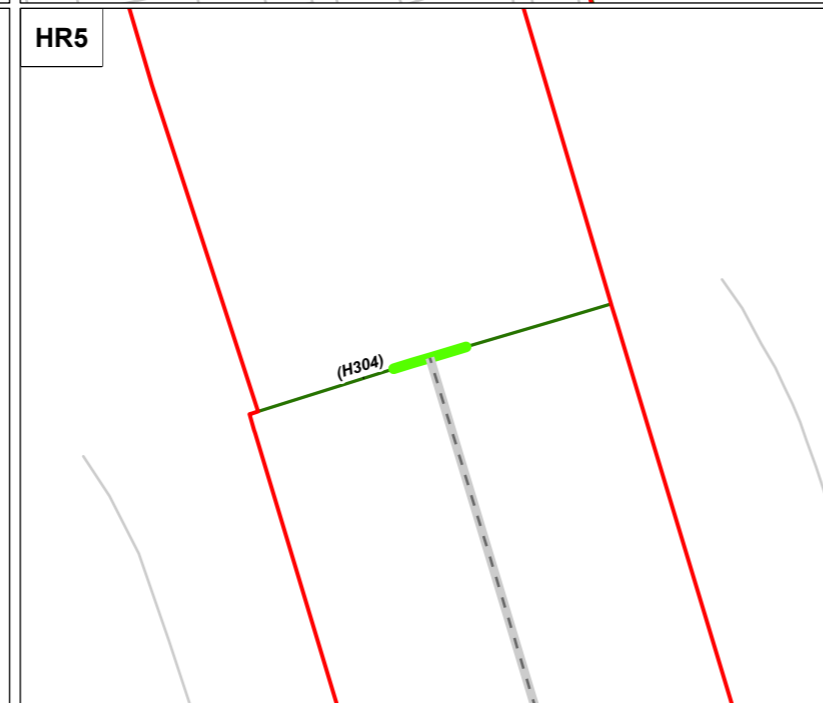
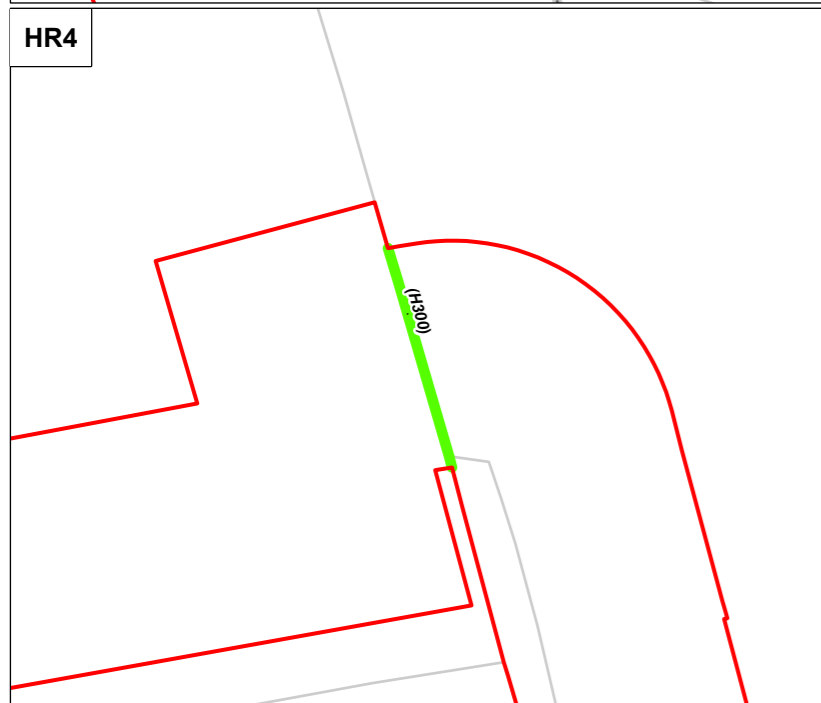
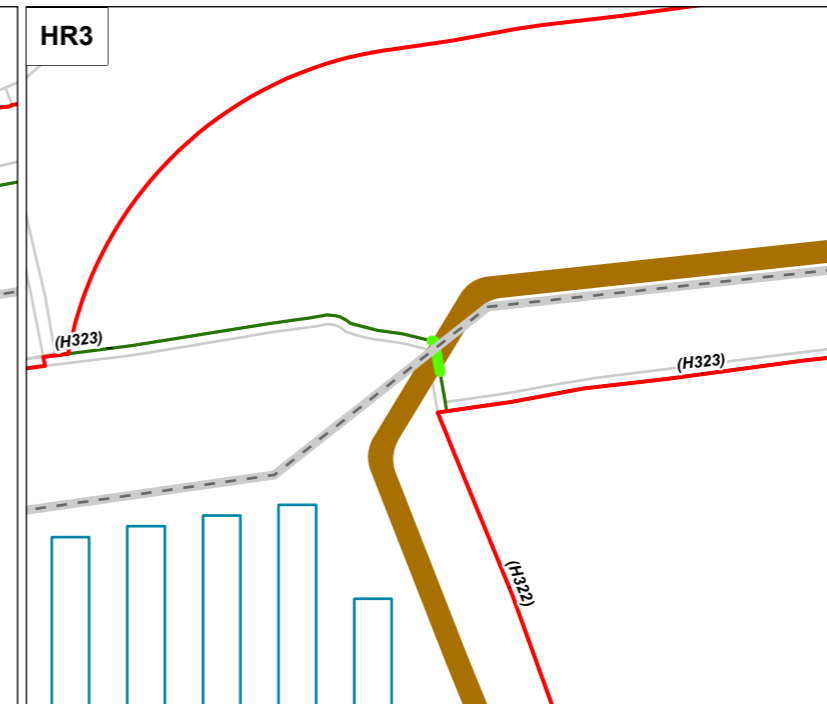
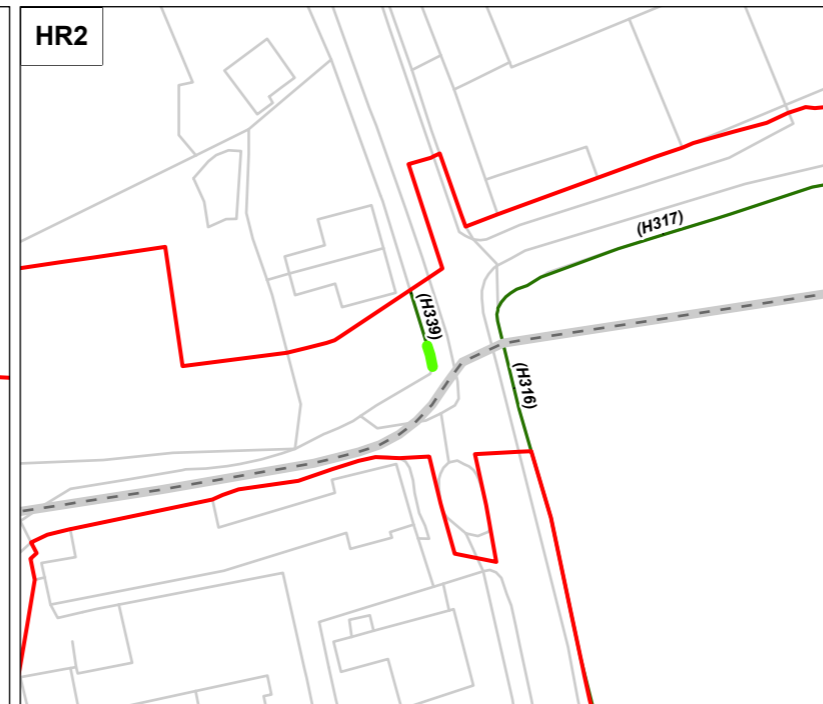
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Base map: Contains OS data © Crown Copyright and database right 2023
Contains data from OS Zoomstack



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Hedgerows to be removed and
Tree Preservation Orders (TPO) - Index Plan

COTTAM SOLAR PROJECT
Landscape and Visual Impact Assessment
Environmental Statement (ES)



- Key**
- Order Limits
 - Solar panel module
 - Access track
 - Cable Route
 - Section of hedgerow to be removed
 - Hedgerow

Notes:

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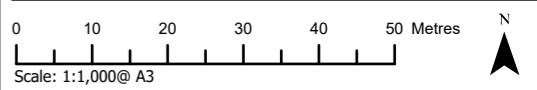
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iii) Buffers between field boundary habitats and the nearest array/battery hardware have been utilised according to a set of ecological importance criteria. Buffers are measured from the outer edge of the hedgerow, root protection area of the tree canopy (in the case of woodland or individual trees) or the banktop of the watercourse. Buffers over 5m may contain perimeter fencing or simple tracks for maintenance vehicle access although this will only be where essential. Protected construction-phase fencing will also observe these buffer distances. The layout of ecological buffers is mapped in ES Appendix 9.11 [APP-088].

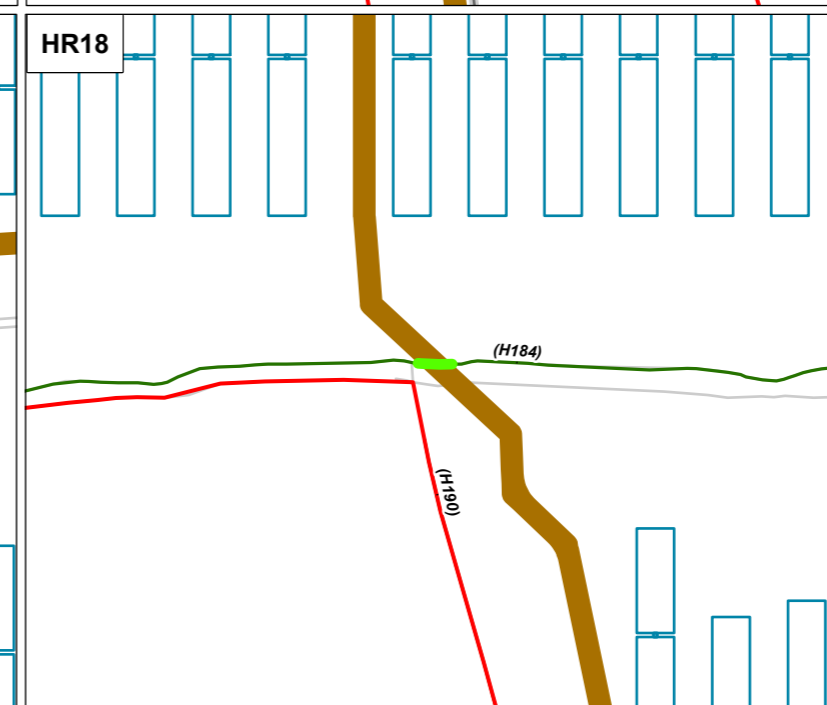
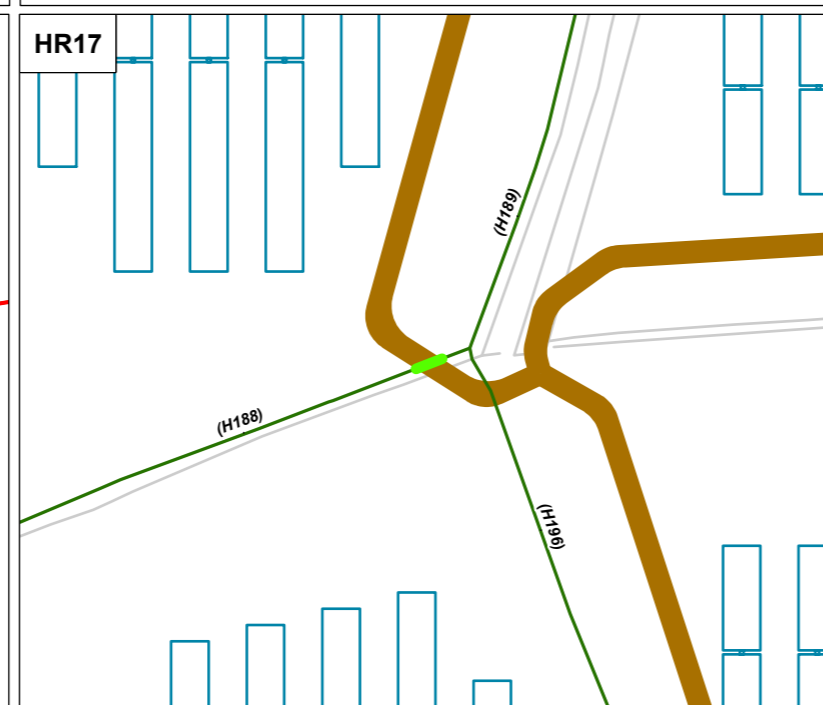
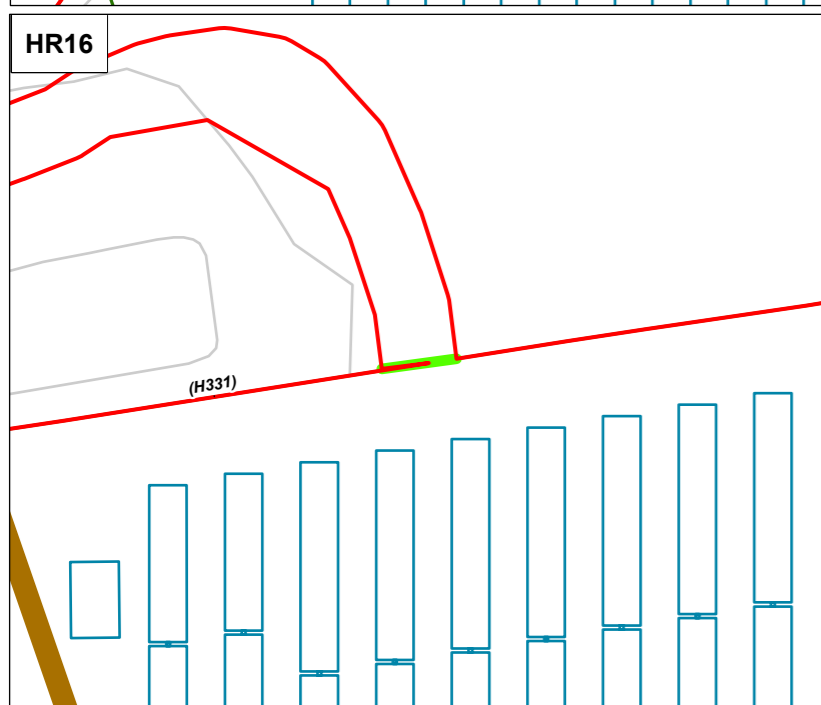
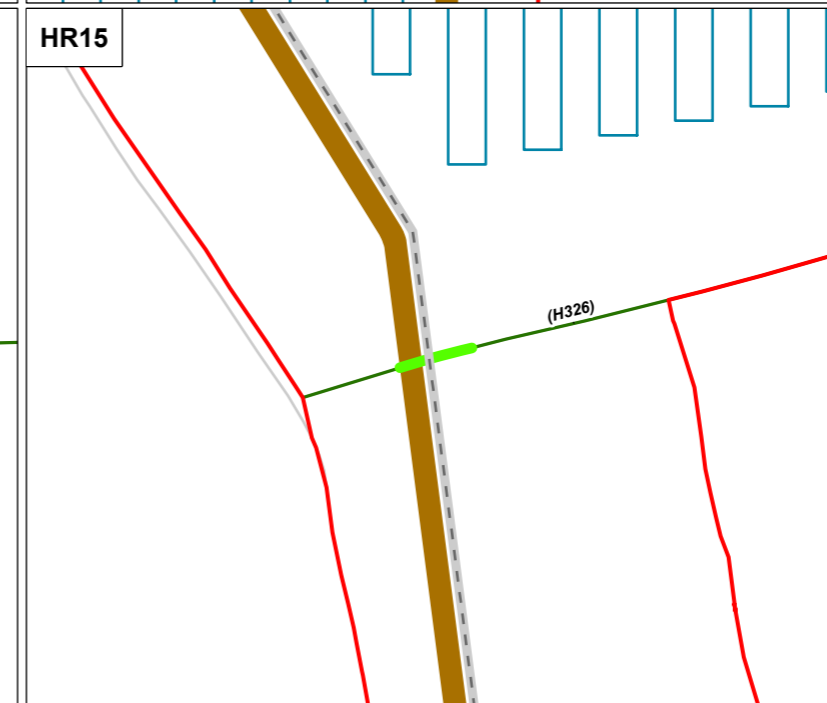
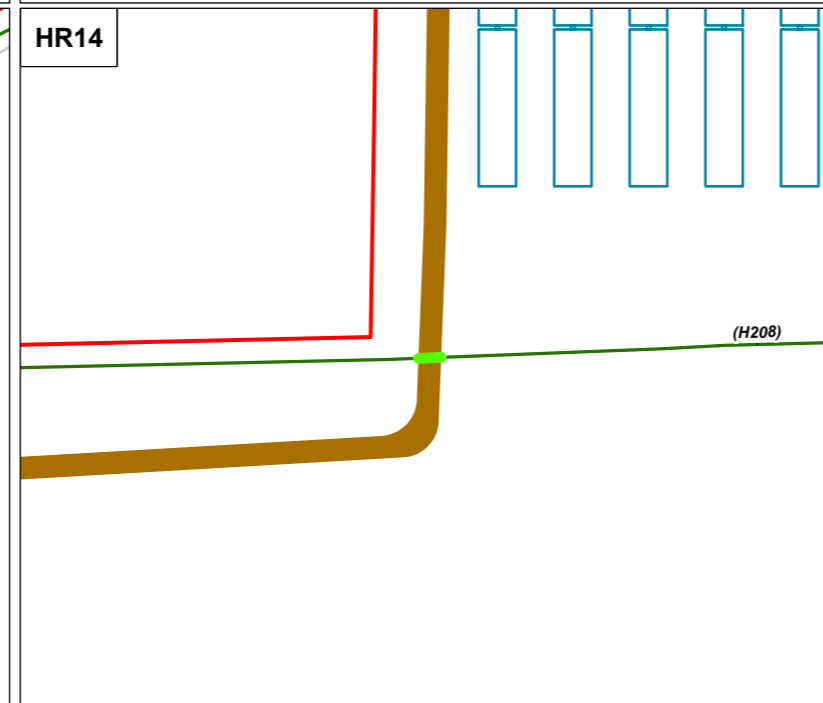
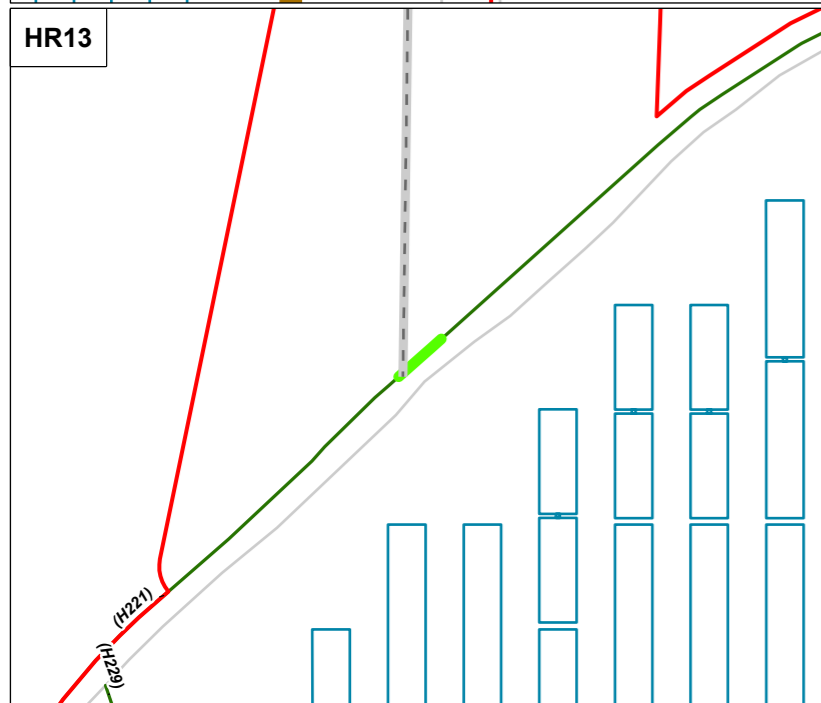
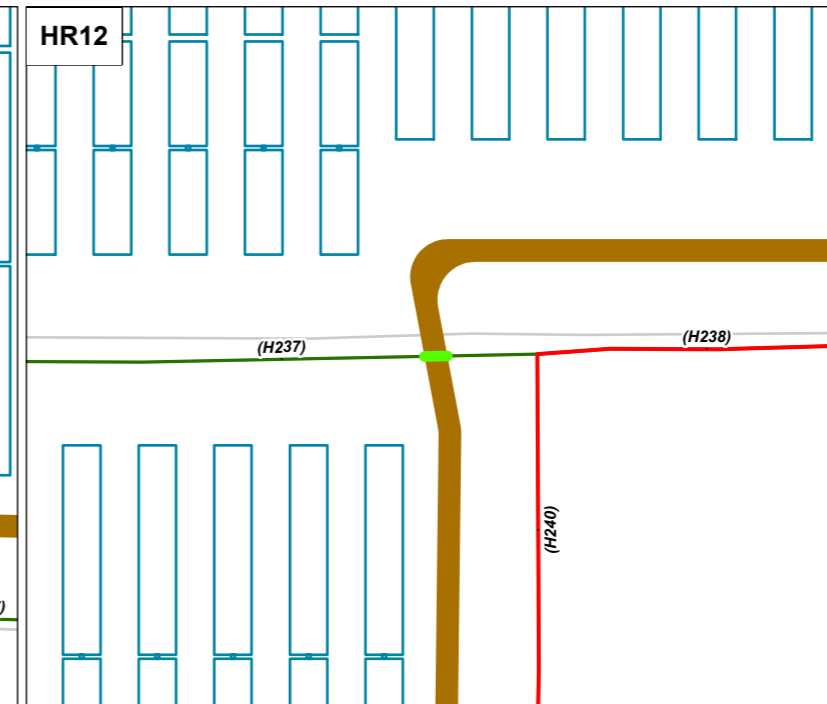
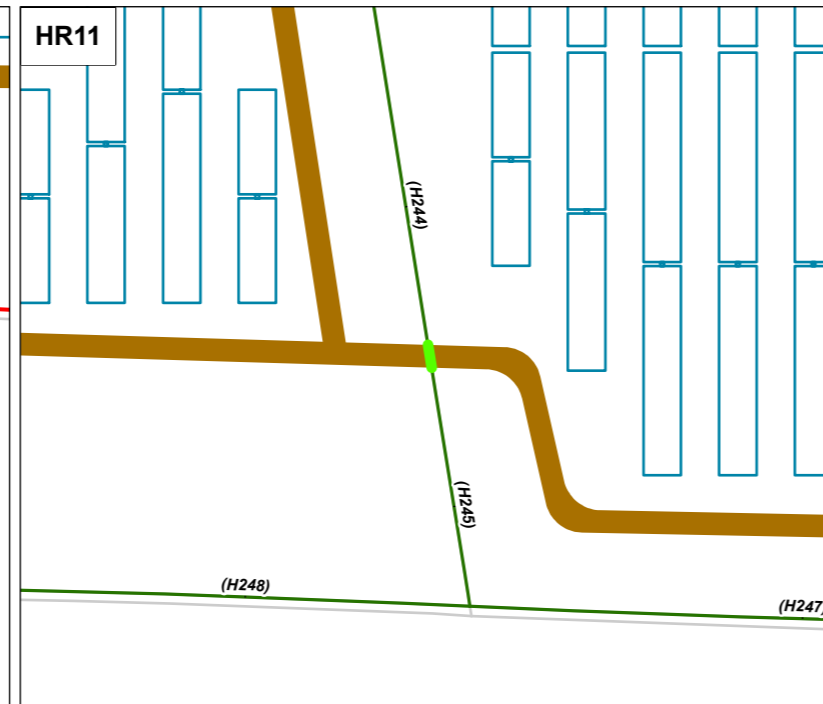
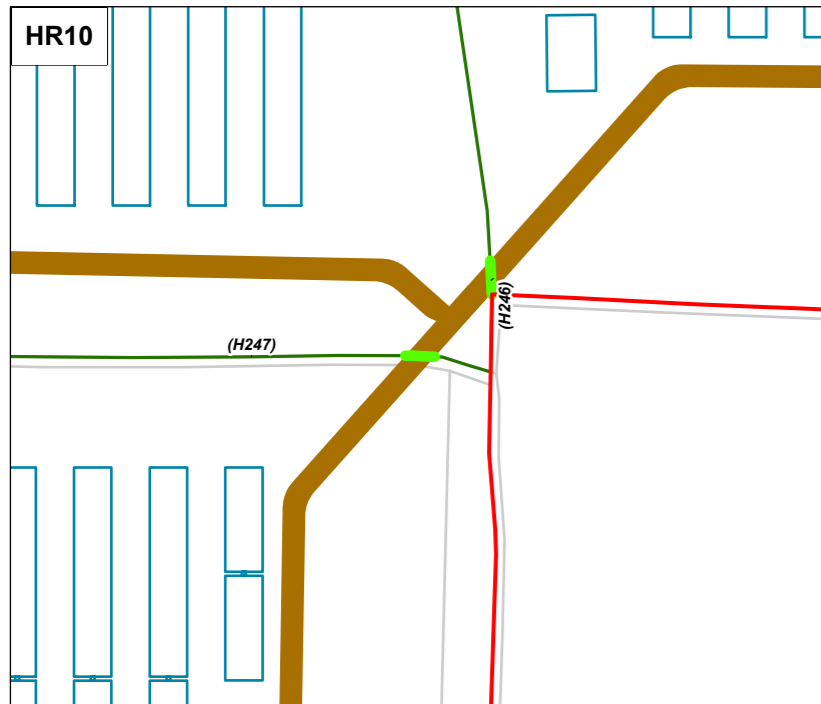
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- 50m minimum from ponds testing positive for GCN eDNA

iii) A Tree Survey Report and Arboriculture Impact Assessment in line with BS 5837:2012 would be undertaken concurrently with detailed design of the Scheme, to identify where trees are likely to be affected by the construction works and to inform the development of the detailed design. Such pre construction surveys and assessment work would be undertaken in accordance with the Outline Landscape and Ecological Management Plan, (See Table 3.5: Landscape and Visual, of Outline CEMP Revision A [EN010133/EX1/C7.1_A])



APFP Regulation: 5(2)(a)	Application Doc No. C7.3_A
Ref: P2981_LPR_ZZ_ON_DR_Z_0272	Date: 16/10/2023
Drawn by: AZ	Checked by: WW



- Key**
- Order Limits
 - Solar panel module
 - Access track
 - Cable Route
 - Section of hedgerow to be removed
 - Hedgerow

Notes:

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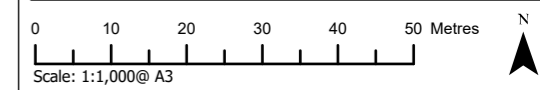
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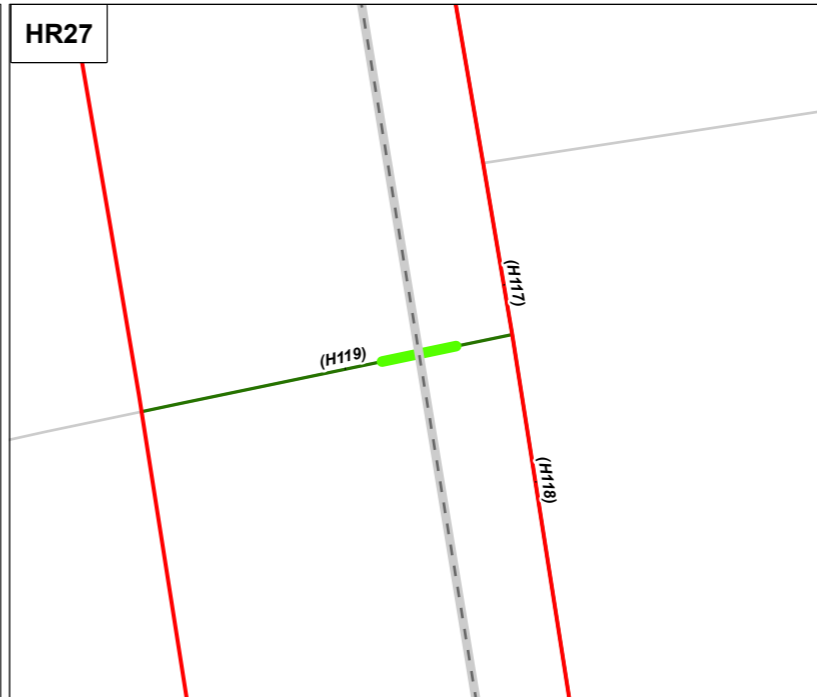
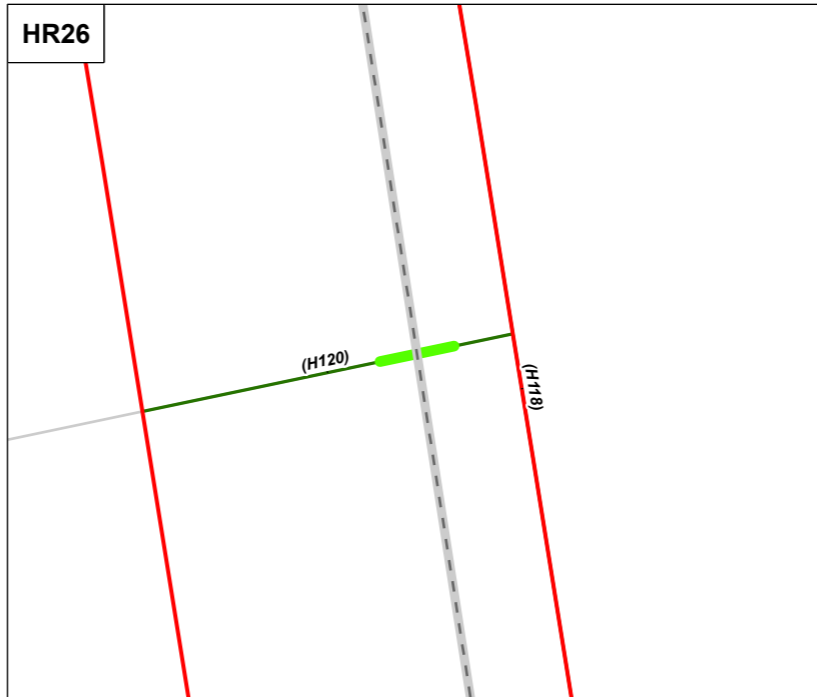
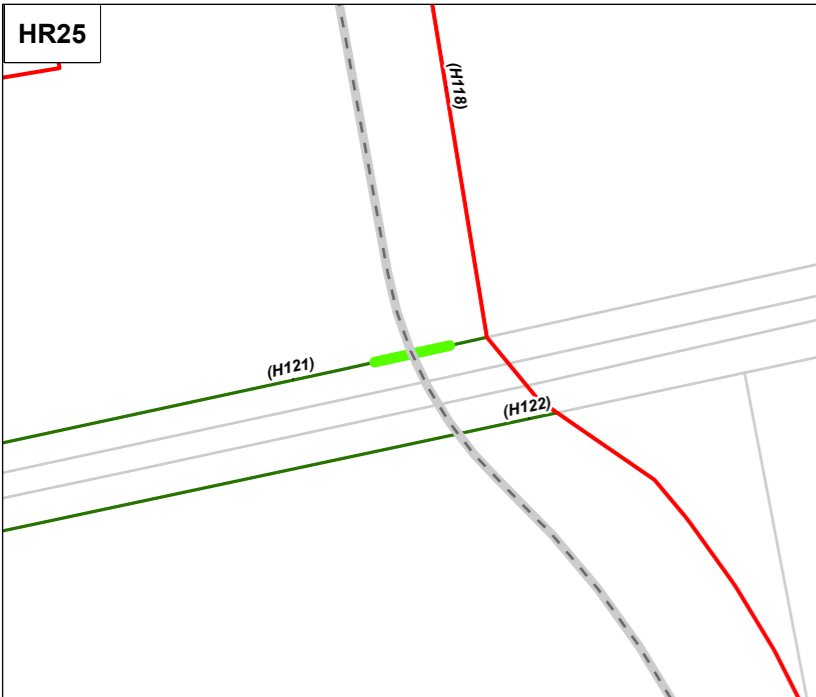
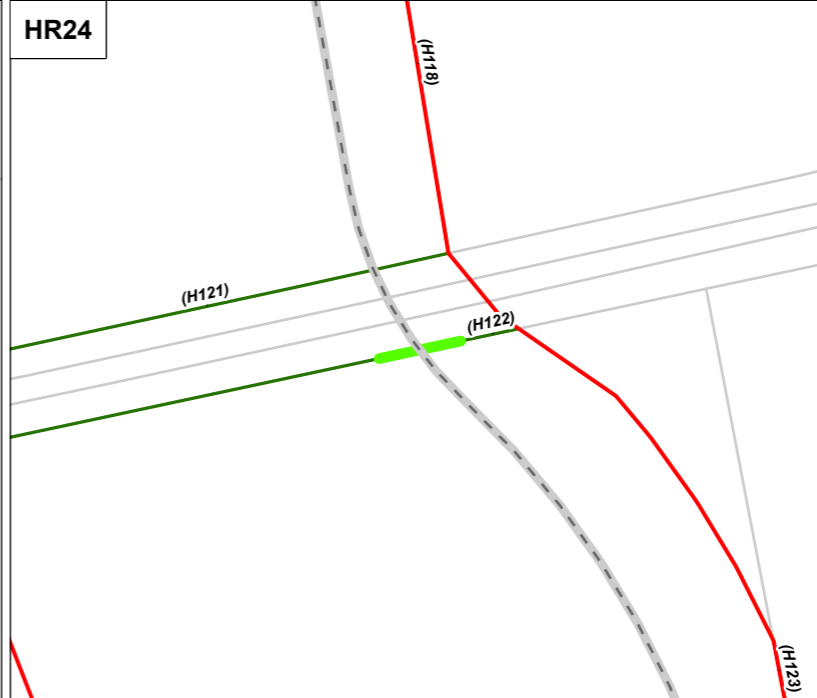
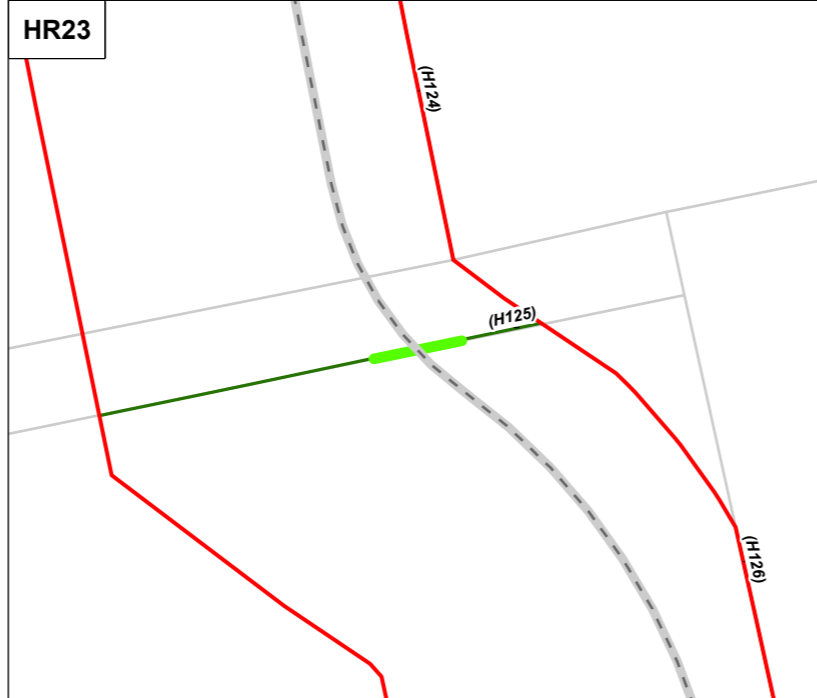
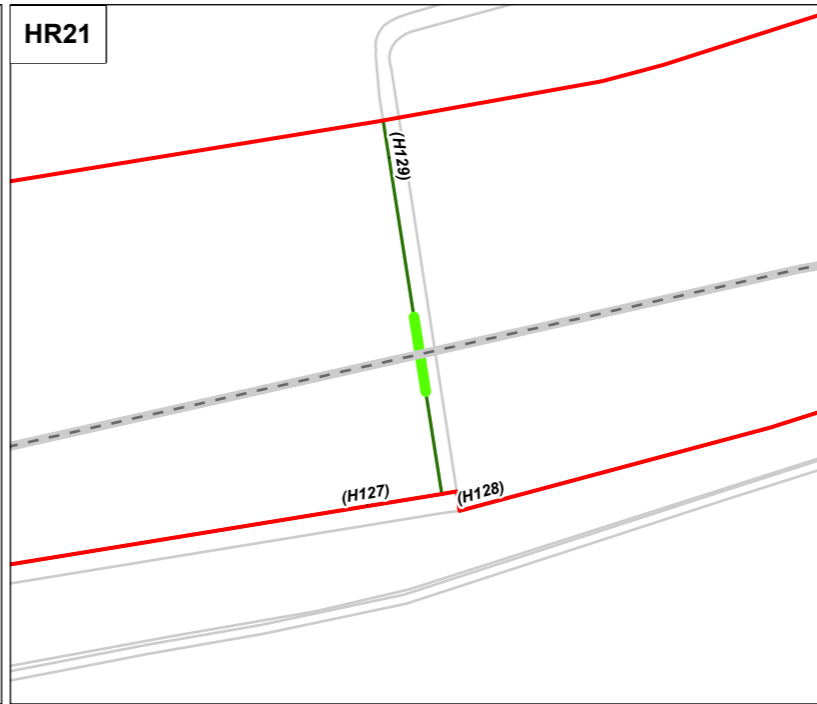
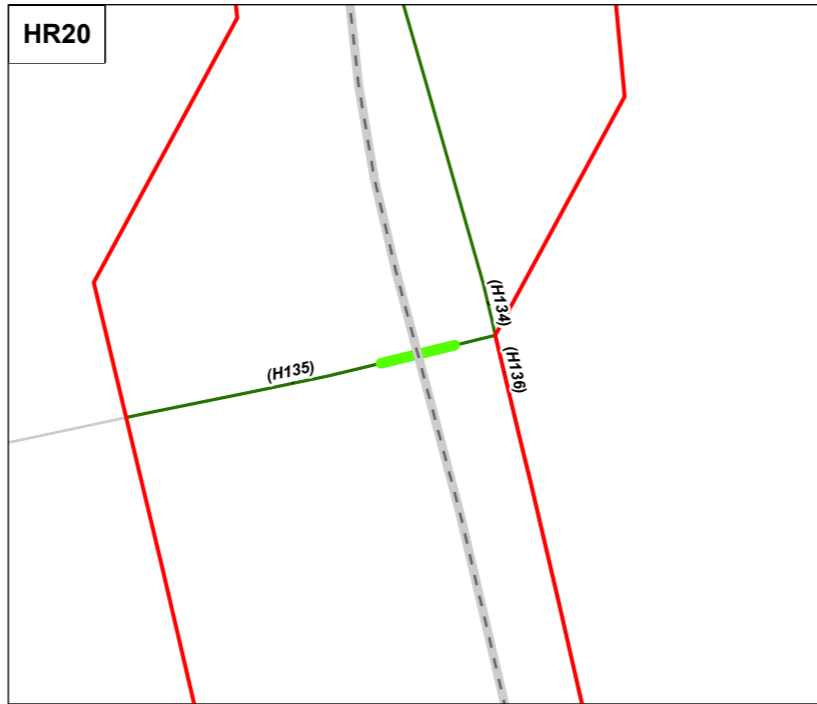
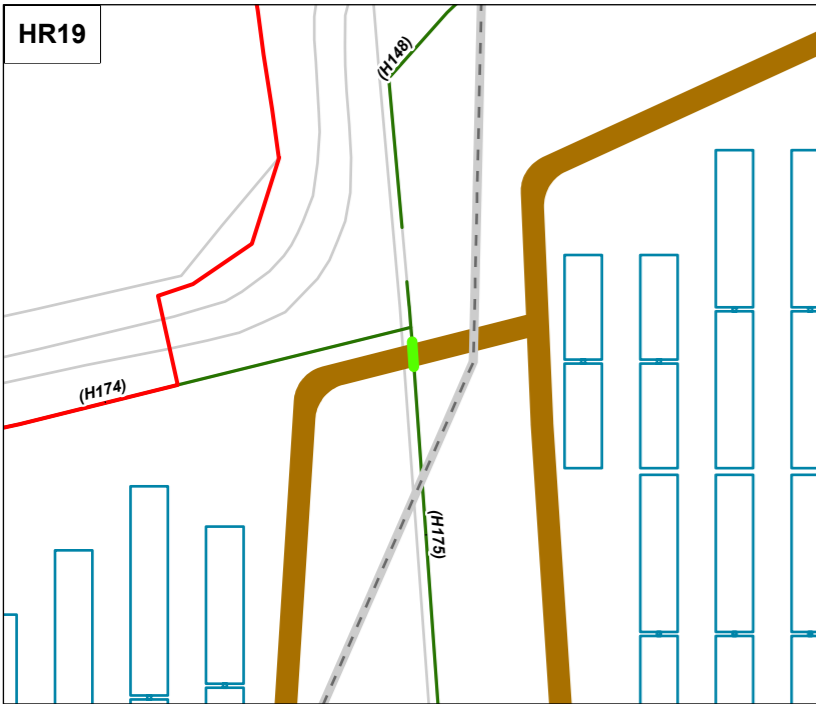
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Hedgerows to be removed - Sheet 2 of 5

COTTAM SOLAR PROJECT
Landscape and Visual Impact Assessment
Environmental Statement (ES)



Key

- Order Limits
- Solar panel module
- Access track
- Cable Route
- Section of hedgerow to be removed
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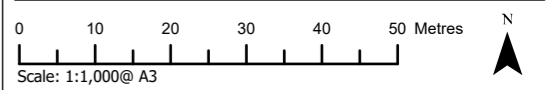
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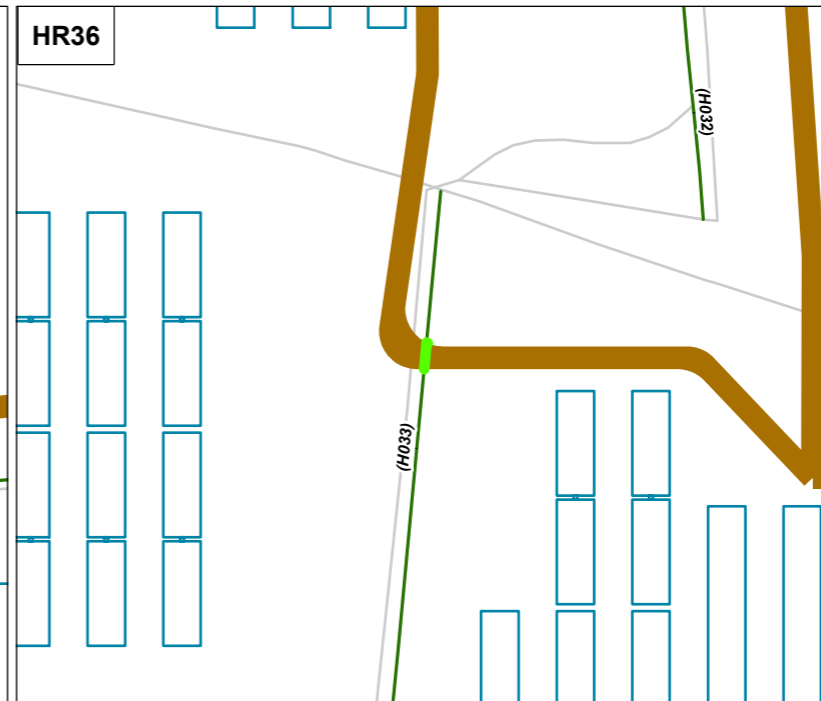
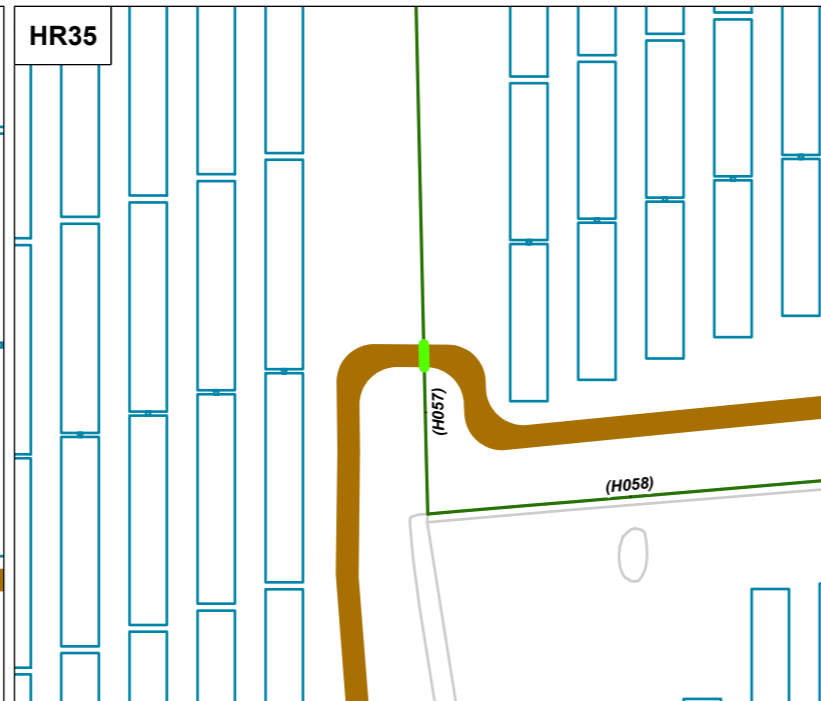
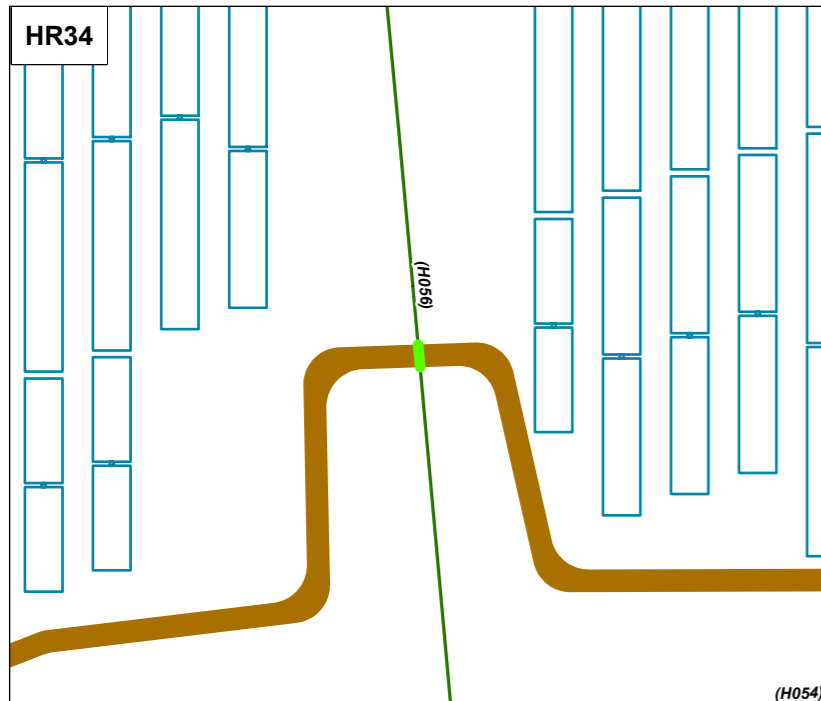
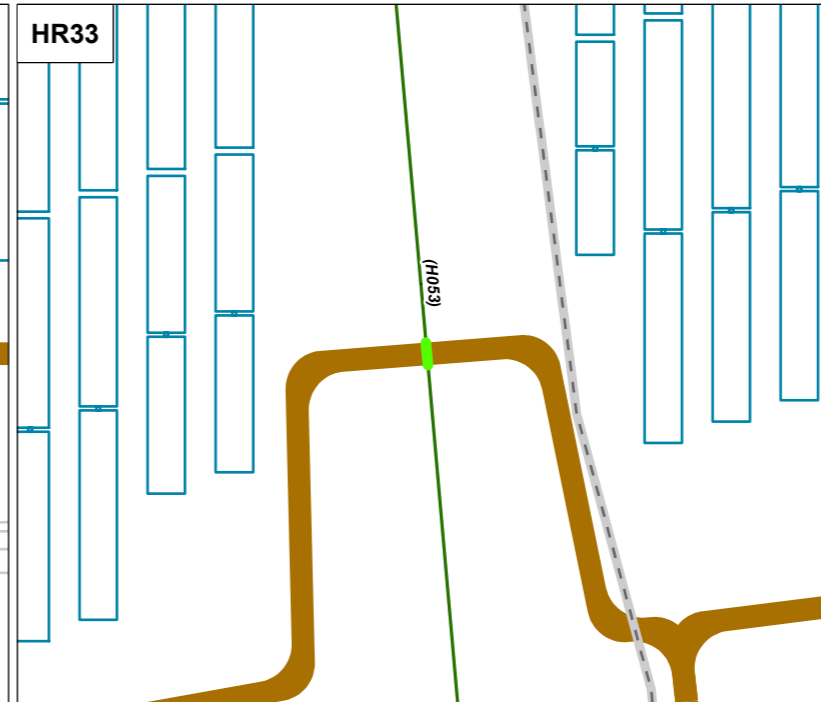
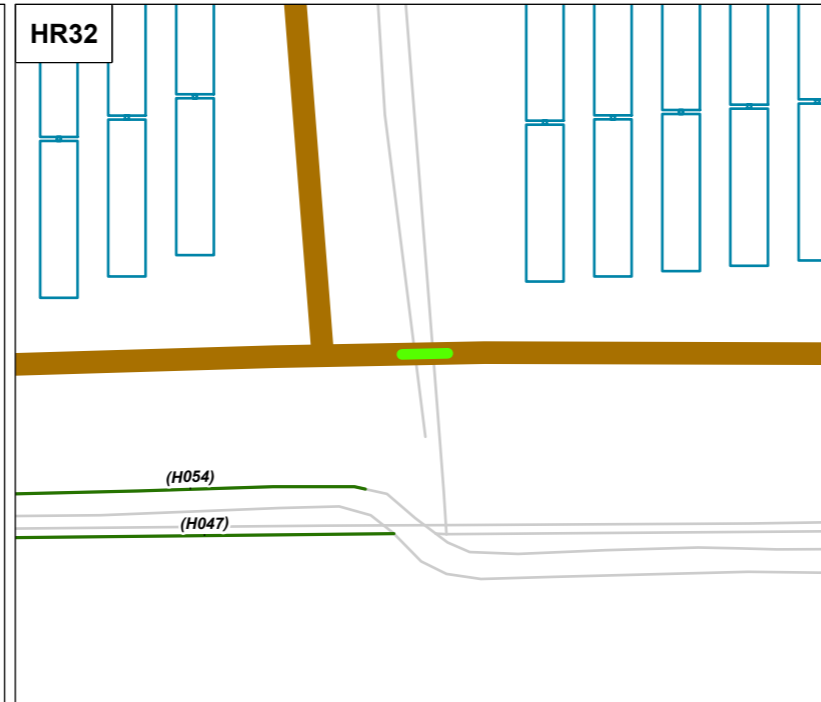
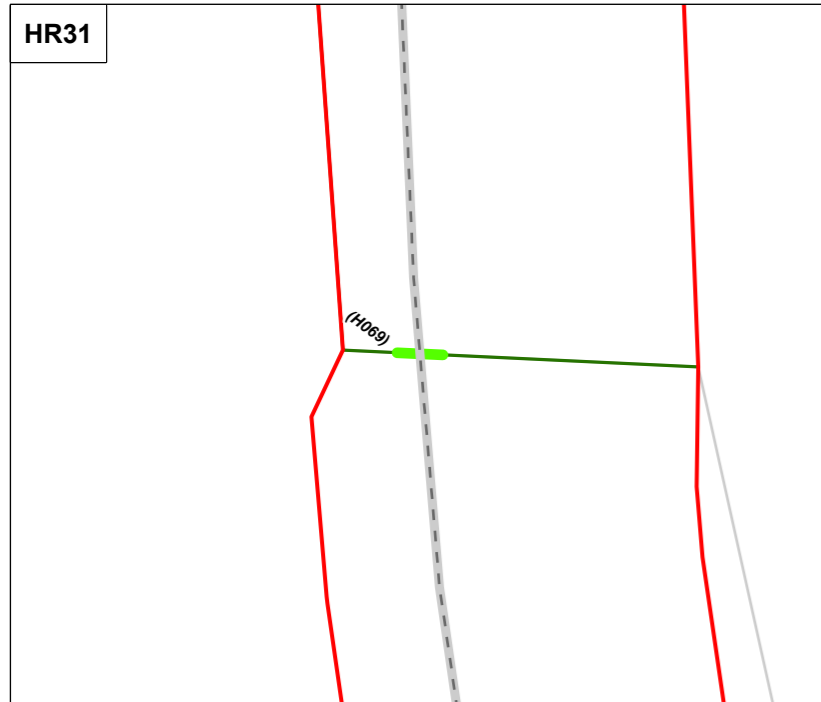
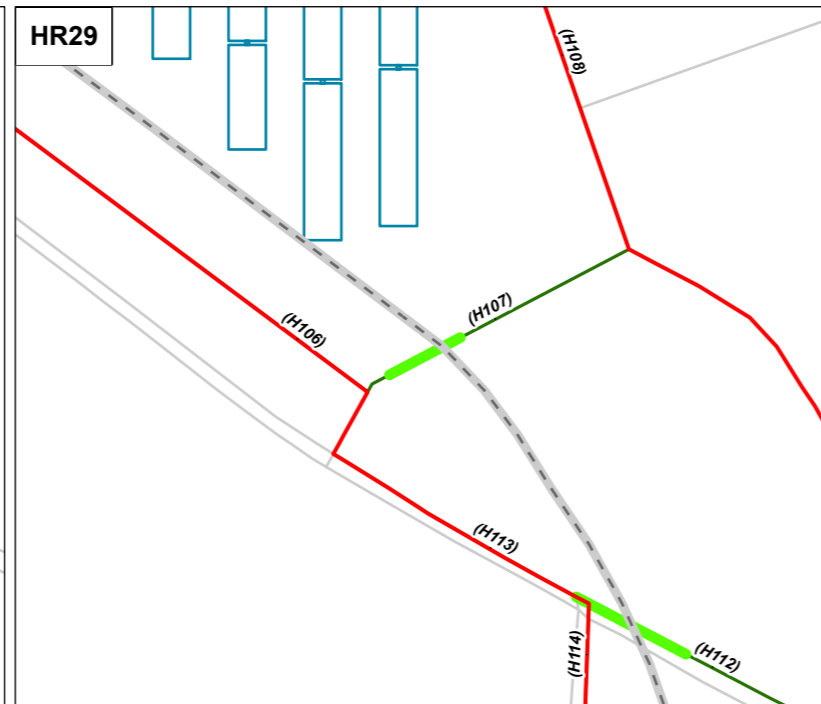
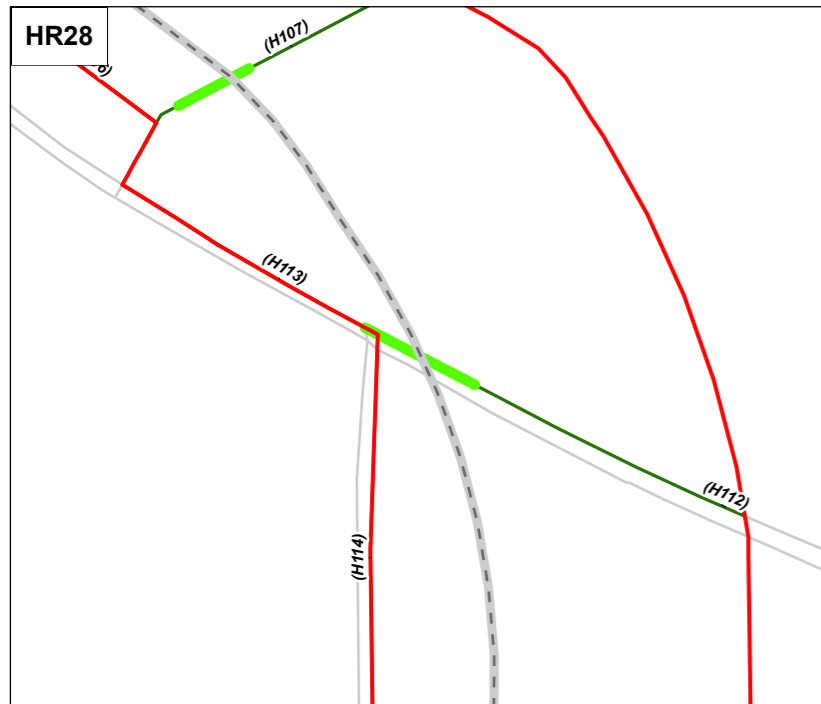
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 - Hedgerow

Notes:

i) Drawing/s to be read in conjunction with ES figures 8.16.1 [APP-305] to 8.16.10 [APP-315] Landscape and Ecology Mitigation and Enhancement Plans.

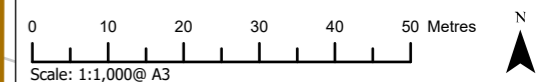
ii) Any potential vegetation removal or vegetation works associated with the Indicative Access and Abnormal Indivisible Load (AIL) locations is shown on the additional ES plan [C8.2.3] Indicative Access Location/Abnormal Indivisible Loads and Potential Vegetation Works/Removal – Index Plan.

iii) Buffers between field boundary habitats and the nearest array/battery hardware have been utilised according to a set of ecological importance criteria. Buffers are measured from the outer edge of the hedgerow, root protection area of the tree canopy (in the case of woodland or individual trees) or the banktop of the watercourse. Buffers over 5m may contain perimeter fencing or simple tracks for maintenance vehicle access although this will only be where essential. Protected construction-phase fencing will also observe these buffer distances. The layout of ecological buffers is mapped in ES Appendix 9.11 [APP-088].

The measurement criteria are as follows:

- 5m minimum from species-poor hedgerows with no associated ditch.
- 8m minimum from either a species-rich hedgerow, a field boundary containing a tree with 'low' potential for roosting bats, or a field boundary/hedgerow with a ditch of any kind.
- 10m minimum from an 'outlier' badger sett, any field boundary with a ditch/watercourse with signs of either otters or water vole, or a boundary containing a tree with 'moderate' potential for roosting bats.
- 12m minimum from any boundary containing a tree with 'high' potential for roosting bats.
- 20m minimum from a 'subsidiary' or 'annexe' badger sett, moderate[1] sized watercourses (e.g. becks, dykes and streams), ponds (not positive for GCN eDNA) or woodland.
- 30m minimum from a 'main' badger sett, ancient woodland or major watercourses (e.g. rivers).
- 50m minimum from ponds testing positive for GCN eDNA

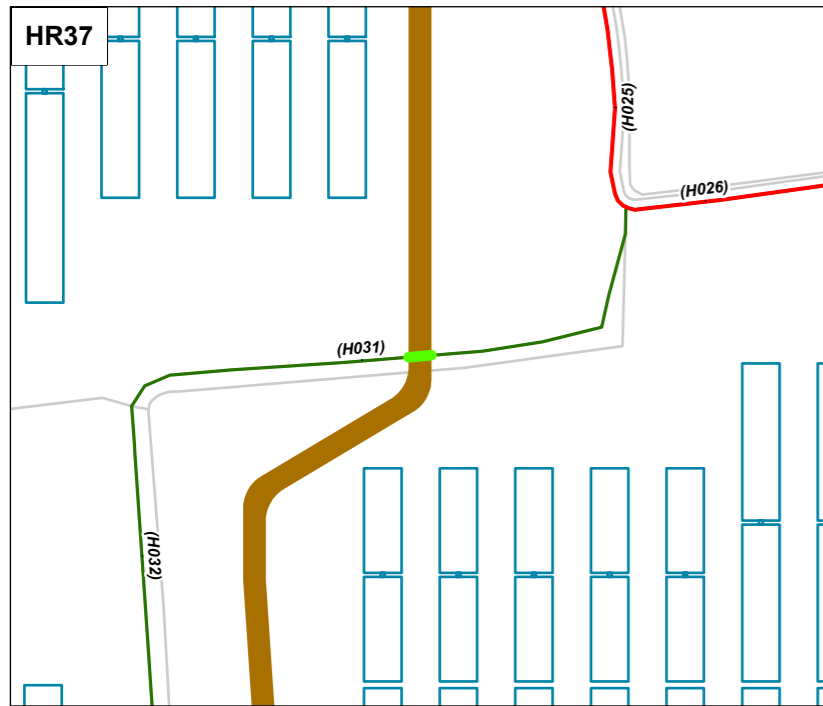
iii) A Tree Survey Report and Arboriculture Impact Assessment in line with BS 5837:2012 would be undertaken concurrently with detailed design of the Scheme, to identify where trees are likely to be affected by the construction works and to inform the development of the detailed design. Such pre construction surveys and assessment work would be undertaken in accordance with the Outline Landscape and Ecological Management Plan, (See Table 3.5: Landscape and Visual, of Outline CEMP Revision A [EN010133/EX1/C7.1_A])



APFP Regulation: 5(2)(a)	Application Doc No. C7.3_A
Ref: P2981_LPR_ZZ_ON_DR_Z_0272	Date: 16/10/2023
Drawn by: AZ	Checked by: WW

Hedgerows to be removed - Sheet 4 of 5

COTTAM SOLAR PROJECT
Landscape and Visual Impact Assessment
Environmental Statement (ES)



- Key**
- Order Limits
 - Solar panel module
 - Access track
 - Cable Route
 - Section of hedgerow to be removed
 - Hedgerow

Notes:

i) Drawing/s to be read in conjunction with ES figures 8.16.1 [APP-305] to 8.16.10 [APP-315] Landscape and Ecology Mitigation and Enhancement Plans.

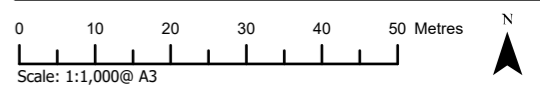
ii) Any potential vegetation removal or vegetation works associated with the Indicative Access and Abnormal Indivisible Load (AIL) locations is shown on the additional ES plan [C8.2.3] Indicative Access Location/Abnormal Indivisible Loads and Potential Vegetation Works/Removal – Index Plan.

iii) Buffers between field boundary habitats and the nearest array/battery hardware have been utilised according to a set of ecological importance criteria. Buffers are measured from the outer edge of the hedgerow, root protection area of the tree canopy (in the case of woodland or individual trees) or the banktop of the watercourse. Buffers over 5m may contain perimeter fencing or simple tracks for maintenance vehicle access although this will only be where essential. Protected construction-phase fencing will also observe these buffer distances. The layout of ecological buffers is mapped in ES Appendix 9.11 [APP-088].

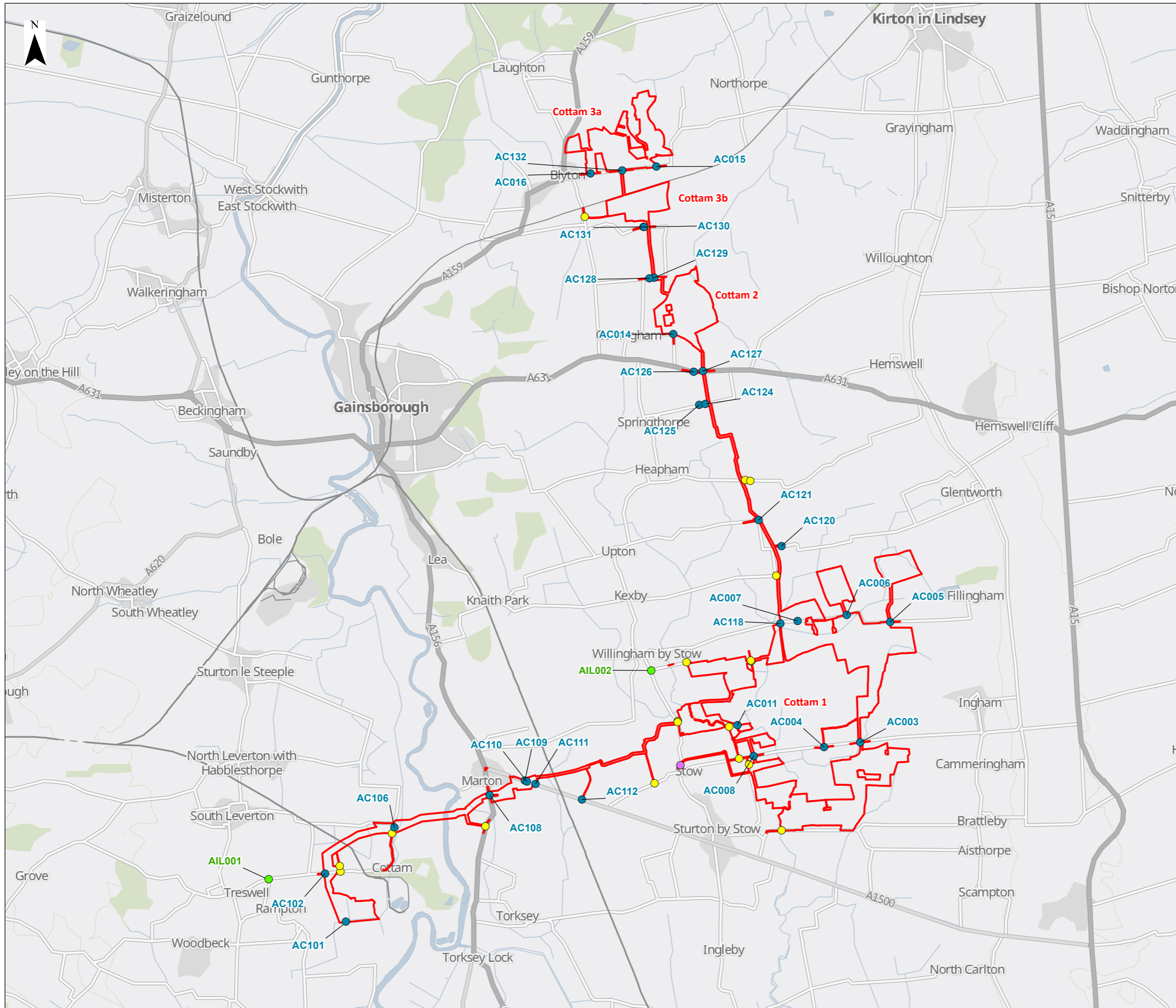
The measurement criteria are as follows:

- 5m minimum from species-poor hedgerows with no associated ditch.
- 8m minimum from either a species-rich hedgerow, a field boundary containing a tree with 'low' potential for roosting bats, or a field boundary/hedgerow with a ditch of any kind.
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- 12m minimum from any boundary containing a tree with 'high' potential for roosting bats.
- 20m minimum from a 'subsidiary' or 'annexe' badger sett, moderate[1]sized watercourses (e.g. becks, dykes and streams), ponds (not positive for GCN eDNA) or woodland.
- 30m minimum from a 'main' badger sett, ancient woodland or major watercourses (e.g. rivers).
- 50m minimum from ponds testing positive for GCN eDNA

iii) A Tree Survey Report and Arboriculture Impact Assessment in line with BS 5837:2012 would be undertaken concurrently with detailed design of the Scheme, to identify where trees are likely to be affected by the construction works and to inform the development of the detailed design. Such pre construction surveys and assessment work would be undertaken in accordance with the Outline Landscape and Ecological Management Plan, (See Table 3.5: Landscape and Visual, of Outline CEMP Revision A [EN010133/EX1/C7.1_A])



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Key

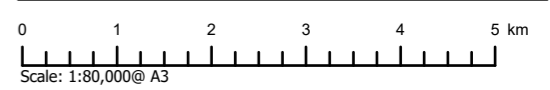
- Order Limits
- Indicative access location with potential hedgerow works / removal
- Indicative access location with no potential hedgerow works / removal
- Abnormal Indivisible Load (AIL) access location with potential hedgerow works / removal
- Abnormal Indivisible Load (AIL) access location with no potential hedgerow works / removal

Notes:

i) 1. Drawing/s to be read in conjunction with ES figures 8.16.1 [APP-305] to 8.16.10 [APP-315] Landscape and Ecology Mitigation and Enhancement Plans.

ii) Any potential hedgerow removal associated the proposed Cable Route Corridor is shown on the additional ES plans [C8.2.3] Hedgerows to be Removed and Tree Preservation Orders (TPO) - Index Plan.

Layers: Lanpro, 2023
Base map: Contains OS data © Crown Copyright and database right 2023
Contains data from OS Zoomstack



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