



Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

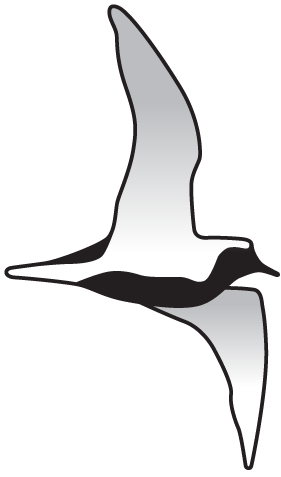
Preliminary Environmental Information Report

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Appendix 22.1 - Extended Phase 1 Habitat

April 2021

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WILD FRONTIER ECOLOGY

Sheringham Shoal and Dudgeon Extension Projects



2020 Extended Phase 1 Habitat Survey Report

March 2021

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<p>Written by: William Riddett BA ACIEEM</p> <p>Checked by: Robert Yaxley BSc CEcol CEnv MCIEEM</p> <p>Authorised by: Robert Yaxley BSc CEcol CEnv MCIEEM November 2020</p>	<p>Equinor New Energy Limited Forusbeen 50 4035 Stavanger Norway</p>
<p>Wild Frontier Ecology Ltd. Unit 2, Cold Blow Farm Great Snoring, Fakenham Norfolk, NR21 0HF Tel: 01328 864633 will@wildfrontier-ecology.co.uk</p>	

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Company Registered in England and Wales No 4942219.

VAT Reg No. 887 4692 54

Registered Office: Saxon House, Hellesdon Park Road, Drayton High Road, Norwich NR6 5DR

Director: Robert Yaxley BSc (Hons) CEcol CEnv MCIEEM.

The data which we have prepared and provided is accurate, and has been prepared and provided in accordance with the CIEEM's Code of Professional Conduct. We confirm that any opinions expressed are our best and professional bona fide opinions.



This report conforms to the British Standard 42020:2013 Biodiversity - Code of practice for planning and development.

CONTENTS

1. NON-TECHNICAL SUMMARY	6
2. BACKGROUND	8
3. RELEVANT LEGISLATION AND POLICY.....	9
4. SURVEY METHODS	12
5. RESULTS.....	16
6. Target Notes	43
7. Further Survey Requirements	44
8. Survey Validity.....	47
9. CONCLUSIONS	48

GLOSSARY OF ABBREVIATIONS

BCT	Bat Conservation Trust
BNG	Biodiversity Net Gain
CP	Civil Parish
DCO	Development Consent Order
DEP	Dudgeon Extension Project
EP1HS	Extended Phase 1 Habitat Survey
GIS	Geographic Information System
INNS	Invasive Non-Native Species
IRZ	Impact Risk Zones
JNCC	Joint Nature Conservation Committee
Km	Kilometre
MAGIC	Multi-Agency Geographic Information for the Countryside
NBIS	Norfolk Biodiversity Information Service
PEIR	Preliminary Environmental Information Report
PHI	Priority Habitat Inventory
SEP	Sheringham Shoal Extension Project
UKHab	United Kingdom Habitat Classification

UKHPI	UK Habitats of Principal Importance
WFE	Wild Frontier Ecology Ltd.

1. NON-TECHNICAL SUMMARY

Wild Frontier Ecology Ltd. (WFE) was commissioned by Equinor New Energy Ltd. to complete an Extended Phase 1 Habitat Survey (EP1HS) of the Preliminary Environmental Information Report (PEIR) boundary for Dudgeon Offshore Wind Farm Extension Project (hereafter DEP) and Sheringham Shoal Offshore Wind Farm Extension Project (hereafter SEP). The EP1HS involved walkover surveys by ecologists to identify and map habitats within accessible parts of the PEIR boundary. The survey was extended to include an appraisal of the suitability of habitats for protected or notable species; field signs of such species were also recorded where observed. The survey also aimed to record any occurrence of invasive non-native species (INNS).

The majority of the survey was completed between March and September 2020. A small number of landholdings which had not been accessible in 2020 were subsequently surveyed in January 2021.

The surveys recorded a range of habitats, identified numerous habitats suitable for protected species (and found some signs thereof), and found some occurrences of INNS, mostly along watercourses.

The PEIR boundary passes through a predominantly arable landscape with field boundaries comprised of hedgerows (many of which have trees) and occasional ditches. There are also occasional grasslands within the PEIR boundary, most of which are small, improved or poor semi-improved grassland fields used for grazing livestock. There are occasional ponds within the boundary, with higher densities in the south and far north. The PEIR boundary passes through a small number of woodlands including semi-natural broad-leaved woodlands and various (deciduous, conifer and mixed) plantations. Between Bodham/Weybourne and the landfall location, the PEIR boundary passes through a swathe of woodland habitat including Bodham Wood, Weybourne Wood and Hundred Acre Wood. There are also some coastal habitats (intertidal shingle, soft cliffs, coastal grassland and semi-improved neutral grassland) at the landfall location.

The PEIR boundary passes through five river corridors, bisecting the river channels and/or tributaries of the rivers Yare, Tiffey, Tud, Wensum and Bure (listed from south to north). The PEIR boundary also runs very close to the headwaters of the River Glaven at Bodham. The Wensum and Glaven are both chalk rivers, a rare and ecologically sensitive ecosystem. All rivers and the riparian habitats around them have relatively (compared to much of the rest of the PEIR boundary) high potential for protected species presence. The INNS Himalayan balsam is present along the banks of some of these watercourses or their tributaries.

The appraisal of the suitability of habitats for protected species identified extensive suitable habitat for nesting birds throughout the majority of the PEIR boundary. The survey also identified hundreds of trees with bat roost potential within the PEIR boundary. The survey also found signs of badgers (including setts) within the boundary. There are some small areas and features which are suitable for other protected species including reptiles, otters, water voles and white-clawed crayfish (the latter three are confined to watercourses, mostly the aforementioned rivers). There were incidental observations of signs of some of these protected species, such as reptiles. Dedicated surveys for great crested newts have been completed in 2020 and a separate report is provided outlining the results. Small areas also have potential to support notable invertebrate assemblages.

The results of this EP1HS will inform the habitats impact assessment. The scope has also incorporated Biodiversity Net Gain (BNG) baseline calculations which will be used separately to calculate the change in 'Biodiversity Units' across the PEIR boundary and help determine the type and location of appropriate ecological enhancements. The results of the EP1HS will also inform the scope of forthcoming surveys for protected and notable species, with surveys for relevant protected species due to take place in the appropriate seasons in 2021. This will also be informed by the final refinement of the PEIR boundary which will then become the Development Consent Order (DCO) application boundary.

The EP1HS was constrained by restricted landowner access. In total, approximately 65-70% of the area of the PEIR boundary has been surveyed. Habitats within the remaining 30-35% have not been surveyed. However, a data search with the Norfolk Biodiversity Information Service (NBIS) obtained habitat classifications for the un-surveyed areas via the Norfolk Living Map; this data has been used to classify inaccessible and un-surveyed parts of the PEIR boundary. This habitat classification data does not include any details on protected or valued species signs, the suitability of habitat for such species, or on the presence of INNS. Attempts to arrange access to survey these parts of the PEIR boundary are ongoing, and if access is obtained, they will be subject to EP1HS in 2021.

2. BACKGROUND

In August 2019, WFE was commissioned by Equinor New Energy Ltd. (herein the Applicant) to undertake an Extended Phase 1 Habitat Survey (EP1HS) of the PEIR boundary associated with the onshore grid connection for the Dudgeon Offshore Wind Farm Extension Project (hereafter DEP) and Sheringham Shoal Offshore Wind Farm Extension Project (hereafter SEP). The onshore proposals comprise a c.60 kilometre (km) onshore cable corridor with landfall location around Weybourne on the North Norfolk coast, with the onshore cable corridor then running southwards and eventually eastwards around the west and south sides of Norwich, where it is to connect with a proposed onshore substation, feeding into the National Grid at Norwich Main near Dunston.

At the far southern end of the PEIR boundary is the onshore substation area where there are two potential sites under consideration for the new substation. This area and a surrounding 250 metre buffer (but excluding areas to the east of the Norwich-Diss railway line) were included in the scope of the EP1HS.

At the time of writing the onshore cable corridor is typically 200m wide, with some wider sections such as the landfall area and the A47 crossing. The current onshore cable corridor reflects a wider search area within which the final onshore cable corridor will be located. Although the field surveys for the EP1HS covered a wider iteration of the PEIR boundary, it is only the areas relevant to the refined, narrower boundary which are included in this report. The final onshore cable corridor that will be the subject of the DCO application will be up to 60m wide (for the DEP and SEP together scenarios), increasing to a width of 100m for trenchless crossing zones.

Maps showing the PEIR boundary are provided in Figures 1-16, below.

This report outlines the aims, methods and results of the EP1HS which was completed between March and September 2020, and in January 2021.

3. RELEVANT LEGISLATION AND POLICY

3.1 Plants

Schedule 8 of the Wildlife and Countryside Act (WCA), 1981, lists plant species which are afforded special protection. It is an offence to pick, uproot or destroy any species listed on Schedule 8 without prior authorisation, and all plants are protected from unauthorised uprooting (i.e. without the landowner's permission) under Schedule 13 of the WCA 1981.

A Vascular Plant Red List for England¹ provides a measure of the current state of England's flora measured against standardised IUCN criteria. Any taxon that is Threatened (Critically Endangered [CR], Endangered [EN], Vulnerable [VU]) or Near Threatened (NT) does not have statutory protection but should be regarded as a priority for conservation in England. It should be noted that 'threat' is not synonymous with 'rarity'; some of the species concerned are relatively common and widespread.

It is an offence to plant or cause to spread in the wild of certain plant species under Schedule 9 of the WCA 1981. Plant species relevant to the East of England are as follows:

Himalayan balsam *Impatiens glandulifera*
 Variegated yellow archangel *Lamiastrum galeobdolon* ssp. *argentatum*
 Virginia creeper *Parthenocissus quinquefolia*
 False acacia *Robinia pseudoacacia*
 Water fern *Azolla filiculoides*
 Giant hogweed *Heracleum mantegazzianum*
 Knotweed species including Japanese knotweed *Fallopia japonica*
 Parrot's feather *Myriophyllum aquaticum*
 Floating pennywort *Hydrocotyle ranunculoides*
 Rhododendron *Rhododendron ponticum*
 Giant rhubarb *Gunnera tinctoria*
 New Zealand pigmyweed *Crassula helmsii*
 Waterweeds *Elodea* spp.

All waste containing Japanese knotweed comes under the control of Part II of the Environmental Protection Act 1990, and is classified as controlled waste.

3.2 Priority Species and Habitats

Other priority species and habitats are a consideration under the National Planning Policy Framework (NPPF) 2019, placing responsibility on Local Planning Authorities to aim to conserve and enhance biodiversity and to encourage biodiversity in and around developments. There is a general biodiversity duty in the Natural Environment and Rural Communities (NERC) Act 2006 (Section 40) which requires every public body in the exercising of its functions to 'have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity'. Biodiversity, as covered by

¹ Stroh P.A., Leach S.J., August T.A., Walker K.J., Pearman D.A., Rumsey F.J., Harrower C.A., Fay M.F., Martin J.P., Pankhurst T., Preston C.D. & Taylor I. (2014). *A Vascular Plant Red List for England*. Botanical Society of Britain and Ireland, Bristol.

the Section 40 duty, includes all biodiversity, not just the Habitats and Species of Principal Importance.

Section 41 of the NERC Act lists a number of species and habitats as being Species/Habitats of Principal Importance. These are species/habitats in England (commonly known as Priority Habitats/Species) which had been identified as requiring action under the UK BAP, and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework. The protection of either Priority Species or Habitats is not statutory, but “specific consideration”² should be afforded by Local Planning Authorities when dealing with them in relation to planning and development control. Also, there is an expectation that public bodies would refer to the Section 41 list when complying with the Section 40 duty.

Widespread Priority Habitats in East Anglia include:

- Arable field margins
- Traditional orchards
- Hedgerows
- Eutrophic standing waters
- Ponds
- Rivers
- Lowland calcareous grassland
- Lowland dry acid grassland
- Lowland meadows
- Lowland fen
- Coastal and floodplain grazing marsh
- Reedbeds
- Lowland mixed deciduous woodland
- Wet woodland
- Wood-pasture and parkland

Widespread Priority Species in East Anglia (which have no specific legal protection) include:

- Common toad *Bufo bufo*
- Hedgehog *Erinaceus europaeus*
- Brown hare *Lepus europaeus*
- Harvest mouse *Micromys minutus*
- Small heath butterfly *Coenonympha pamphilus*
- Wall butterfly *Lasiommata megera*
- Cinnabar moth *Tyria jacobaeae*

Many red-listed bird species are also Priority Species.

² JNCC (2015) UK BAP priority species and habitats

<http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx>

3.3 Local Species and Habitat Designations

The Norfolk Biodiversity Partnership (NBP) has published Habitat and Species Action Plans for selected species occurring within Norfolk. Each Action Plan lists current actions and defines objectives and targets.

The NBP has also published a Biodiversity Supplementary Planning Guidance for Norfolk. This document sets out the key considerations relating to wildlife and biodiversity that should be taken into account for all Norfolk development proposals.

3.4 Policy

The overarching policy guidance for biodiversity is included within the National Planning Policy Framework (NPPF³). Section 15 of this document (Conserving and Enhancing the Natural Environment) outlines the approach that Local Authorities should adopt when considering ecological issues within the planning framework, including the principles of the Mitigation Hierarchy. This espouses that in addressing impacts on valued features, avoidance should be the first option considered, followed by mitigation (minimising negative impacts). Where avoidance and mitigation are not possible, compensation for loss of features can be used as a last resort. Paragraphs 170, 174 and 175 of the NPPF give policy support to the provision of measurable **net gains** in biodiversity. Paragraph 174 specifies that plans should identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including locally designated sites (such as CWS), and promote the conservation, restoration and enhancement of priority habitats and ecological networks and the protection and recovery of priority species.

³ MHCLG (2019). National Planning Policy Framework. UK Government.

4. SURVEY METHODS

4.1 Background

During the Terrestrial Ecology and Ornithology Expert Topic Group (ETG) meeting on 28th January 2020, attended by Natural England, the Environment Agency, Broadland District Council, North Norfolk District Council and South Norfolk Council, it was discussed and agreed that an EP1HS of the area within the PEIR boundary (as defined at that time) would be undertaken.

In February and March 2020, the Applicants land agent commenced arranging access for various surveys, including the EP1HS, with relevant landowners along the PEIR boundary. Access agreements were gradually obtained, and surveys of accessible land parcels were subsequently completed. At the time of writing, access has not been agreed/permitted to all landholdings within the PEIR boundary. The Applicants land agent has continued to seek access agreements with landowners since February/March 2020, and remains engaged in this process. Therefore, it is possible that some of the currently inaccessible and non-surveyed land parcels within the PEIR boundary may become available for survey in the future, once landowner agreements have been reached.

Study Area

The study area for onshore ecological receptors are provided in Table 1. Different study areas have been used for different receptors depending on their sensitivity and their habitat preferences. These study areas were selected according to standard industry guidance (CIEEM, 2018) as well as using professional judgement and experience.

The study areas include the onshore PEIR boundary, including the associated onshore infrastructure, alongside an additional ‘buffer’ as highlighted in Table 1.

Table 1: Study areas relevant to the EP1HS

Data/Survey	Study Area
Protected and notable species (excluding great crested newts and bats)	Within and up to 2km from the PEIR boundaries
Great crested newts	Within and up to 250m from the PEIR boundaries
Bats	Within and up to 2km from the PEIR boundaries
Statutory and non-statutory designated sites	Within and up to 2km from the PEIR boundaries
UK Habitats of Principal Importance	Within and up to 2km from the PEIR

Data/Survey	Study Area
(UKHPI) and Forestry habitats	boundaries
Statutory Sites and Associate Impact Risk Zones (IRZ)	Within and up to 2km from the PEIR boundaries
Extended Phase 1 Habitat Survey	Within the PEIR boundary

4.2.1 Desk-based Review

The Multi-Agency Geographic Information for the Countryside (MAGIC) website⁴ was reviewed in January 2020 for information on statutory sites and Priority Habitats within the PEIR boundary, which lists habitats included on the Priority Habitats Inventory (PHI).

A search for water bodies using 1:25,000 Ordnance Survey (OS) maps was also undertaken to identify the potential aquatic habitats used by Great crested newt (GCN) *Triturus cristatus*. A 250m buffer is considered appropriate having considered the habitats within and around the PEIR boundaries. Although GCN can use suitable terrestrial habitat up to 500m from a breeding pond (English Nature, 2001), research suggests that newts are likely to travel no more than 250m from ponds where suitable habitats for foraging and hibernation exist close to their breeding ponds (Cresswell and Whitworth, 2004).

This approach was agreed with relevant stakeholders (i.e. Natural England, Environment Agency, Broadland District Council, North Norfolk District Council and South Norfolk Council) as part of the ETG meeting held on the 28th January 2020.

The water body information derived from the OS maps was then used to identify the potential presence of GCN and other aquatic and semi-aquatic protected species including otters *Lutra lutra* and water voles *Arvicola amphibius*.

The 'Norfolk Living Map' data was received from NBIS for which NBIS held for the PEIR boundary.

4.2.2 Extended Phase 1 Habitat Survey

Each accessible land parcel within the PEIR boundary was surveyed by a team of WFE ecologists. These surveyors walked-over accessible parts of the land parcels and categorised all observed habitats and features to prescribed Phase 1 Habitat classifications⁵, recording these onto paper maps of the land parcel. For certain habitats such as hedgerows, grasslands and woodlands, the survey involved recording plant species and noting structural conditions to refine habitat classifications; for example, hedgerows are classified according to whether they are species-rich (containing five or more 'woody' species), whether they contain distinct trees and whether they are intact or defunct (for

⁴ <https://magic.defra.gov.uk/magicmap.aspx>

⁵ Joint Nature Conservation Committee (2010.) *Handbook for Phase 1 Habitat Survey - A Technique for Environmental Audit*. JNCC

the purposes of this survey, a defunct hedgerow was one in which gaps amounted to 10% or more of the length of the hedgerow). This information was recorded on paper forms.

The ecological surveyors photographed each habitat, other than arable fields or built features (roads, buildings etc.).

Any features of ecological note were 'target-noted'. Surveyors recorded relevant ecological information and plotted the location of the target note on the relevant map(s).

The survey was extended to include an evaluation of the suitability of the observed habitats for use by protected species. This information included specific sections on any observed habitats or features suitable for badgers, bats, breeding birds, great crested newts, reptiles, riparian mammals (otters and water voles) and white-clawed crayfish. The survey also recorded any signs of such species observed during the walk-over survey. This included (but was not limited to) direct sightings of animals, badger setts, sloughed reptile skins, footprints, droppings/latrines, dead animals/remains, feeding remains, features in trees or building which are suitable for use by roosting bats, and birds' nests or signs of nesting/breeding birds. As with target-notes, the location of any signs of, or suitable habitat for protected species was recorded and subsequently mapped on the relevant map(s). Photographs were taken of such features wherever possible.

The appraisal of the suitability of trees and buildings for roosting bats was based on Bat Conservation Trust (BCT) guidelines⁶. From a ground-level appraisal, surveyors looked for features such as rot-holes, hazard beams, tear-outs and dense ivy *Hedera helix* cladding, which can provide suitable niches for roosting bats. Depending on the number and apparent suitability of these features, the bat roost potential of each tree was then classified per the BCT guidelines into one of four categories; High, Moderate, Low or Negligible. Any clear signs of roosting bat presence (such as droppings, urine/body-oil stains, audible bat noise/squeaking or direct sightings) were noted if observed; this would not necessarily have a bearing on the classification of the tree's bat roost potential but demonstrates that the tree does (or is more likely to) support roosting bats.

Surveys were completed by the following WFE staff (always working in pairs):

- Mary Goddard BSc MSc ACIEEM (ecologist)
- Alex Lowe BSc MArborA (arborist - working in a pair with an ecologist)
- Ptolemy McKinnon BSc MSc (assistant ecologist)
- Justin Parry BSc (assistant ecologist)
- Alice Petherick BA (assistant ecologist)
- William Riddett BA ACIEEM (senior ecologist)
- Graham Riley BSc ACIEEM (senior ecologist)
- Katrina Salmon BSc (assistant ecologist)

⁶ Collins, J. (ed) (2016) Bat Surveys - Best Practice Guidelines, 3rd Edition. Bat Conservation Trust, London.

- Adam Stickler BSc MSc ACIEEM (ecologist)
- Robert Yaxley BSc CEnv CEcol MCIEEM (principal ecologist)

In order to increase surveyor capacity during weeks when extensive land parcel access was granted, the following subcontractor surveyors were used to assist with WFE ecologist (i.e. making up one of the pair of surveyors):

- Daniel Carne BSc (independent ecological and ornithological consultant)
- Phillip Farndon BSc (independent ecological and ornithological surveyor)
- David Showler (independent ecological and ornithological consultant)

Each of the above subcontractor surveyors completed one day of survey, working as one of a pair with a WFE surveyor.

The main EP1HS effort commenced on 3rd March 2020 and ceased on 17th September 2020. However, there was a cessation in the surveys in late March and early April due to Covid-19 related restrictions and to allow time for relevant precautionary working methods to be put in place. EP1HS were also paused in June 2020 to allow the ecologists to focus on great crested newt surveys, which are seasonally restricted and have to be completed before the end of June. Due to these cessations in the survey and the ongoing access agreement process (whereby relatively few land parcels were accessible in March, April and May), the vast majority of EP1HS was completed between July and early September 2020, which is also a more optimal time of year for EP1HS.

In January 2021, the landowner access situation was reviewed with the Applicants land agent and it was determined that sufficient new land parcels had become available for access to warrant recommencing with the EP1HS. Surveys were therefore restarted (and completed in accordance with the same methodology as outlined above) and ran from 13th to 27th January 2021, covering land parcels within the PEIR boundary which had not been accessible for surveys in 2020.

4.2 Biodiversity Net Gain

At the start of July 2020, the survey scope was increased to include collection of data to allow BNG baseline calculations to be completed. This involved recording plant species lists for each habitat, noting any indicators or good or poor quality habitat and classifying the habitat type in accordance with UK Habitat Classification (UK Hab) criteria rather than Phase 1 Habitat Survey classifications. As the survey technique is easily incorporated with the EP1HS, both surveys were conducted for each land parcel surveyed from the start of July 2020. The surveyors and methods are largely the same as outlined above for the EP1HS.

The prevalence of plant species within each habitat was recorded using the DAFOR scale (D: dominant, A: abundant, F: frequent, O: occasional and R: rare).

4.3 GIS Digitising

The field notes and maps were transcribed and digitised in QGIS, a GIS software programme. Metadata was incorporated within each relevant mapped feature, such as plant species, structure, surveyors and other notes recorded (meaning each hedgerow, grassland, woodland etc. has its data related to the mapped polygon or polyline). Each

feature had a unique reference assigned, such as H0001, H0002, H0003 etc. for hedgerows.

4.4 Constraints and Limitations of Survey

The main constraint to the 2020 EP1HS effort related to the limited landowner access at the time of the survey. This has meant habitat classifications of the inaccessible areas have been done using Norfolk Living Maps data from NBIS, rather than detailed walkover surveys. The Norfolk Living Maps data does not reveal signs of or suitable habitat for protected species. However, using professional judgement and knowledge of the local area, a preliminary assessment of these areas has been undertaken. The conclusions of which will be subject to ground truthing once landowner access has been obtained.

The vast majority of the EP1HS took place during the optimal survey season between May and September in 2020. Small areas of the PEIR boundary were surveyed in March and April 2020 and January 2021. These are acceptable times of year for completing EP1HS (as the survey can be done at any time of year), but they are outside the optimal season. This is not considered a significant constraint because most of these areas were arable habitats or improved grasslands which can be accurately classified at the times of year they were surveyed.

The EP1HS recorded habitats on accessible land parcels within a former, mostly wider iteration of the PEIR boundary. All features were therefore classified according to their total footprints within that boundary; for example, hedgerow classifications were based on all features of a hedgerow within the relevant area, but not on parts of the hedgerow outside the PEIR boundary at the time of the survey. As the boundary has subsequently been refined, it is possible that some of these classifications are now slightly inaccurate. The same may apply for numerous other habitats such as grasslands and woodlands, where the overall classification assigned to an area applied to a wider area than is now relevant.

5. RESULTS

The results of the EP1HS are provided in Figures 1-16 and Target Notes (TNs) are described in Table 2, below. Given the extensive size of the PEIR boundary, a full description of all habitats (feature by feature) within the survey area is not provided at this time. However, a summary of the general habitat mosaic throughout the PEIR boundary is provided, and specific features of notable ecological value (e.g. woodlands, rivers etc.) are then listed and described.

GIS metadata is provided alongside this report, which includes a unique reference for each mapped feature (hedgerow, field, grassland water-body etc.) within the PEIR boundary, along with relevant details on each feature (such as species composition, structure etc.).

5.1 General Overview of Phase 1 Habitat Survey Results

In general, the PEIR boundary runs through a predominantly arable landscape, with arable habitat by far the most abundant habitat type noted during the survey. Field boundaries are mostly comprised of hedgerows, with others marked by ditches (dry/seasonal and wet), verges/field margins, fences, tree-lines/shelter-belts and walls.

A small number of arable fields were found to be in uncultivated (fallow/set-aside) condition at the time of the survey. The habitat classification of these fields is arable

(because this is their typical, long-term habitat type), even though at the time of the survey the habitat may have been more similar to classifications such as tall-herb and ruderal, ephemeral/short perennial or improved/poor semi-improved grassland. However, these classifications do not reflect the long-term condition of the habitat (indeed, it is likely that many of these fields will be re-cultivated in the near future).

Arable fields are typically of low ecological value and are suboptimal for use by protected and notable species. However, for ground-nesting birds such as skylark *Alauda arvensis*, arable fields do provide nesting habitat. Terrestrial mammals such as brown hares *Lepus europeus* also use arable fields for foraging and shelter.

Small water-bodies are widespread throughout much of the PEIR boundary, particularly in the south and far north. Many of these ponds are located within or around the edges of arable fields, and have an associated bank of scrub or trees around them. More detail on ponds as a habitat is provided in the *2020 Great Crested Newt HSI and eDNA Survey Report*.

The PEIR boundary also passes through a number of woodlands (listed below). Most of these are small pockets of semi-natural broad-leaved or plantation woodlands. In general, the PEIR boundary avoids woodland, with the boundary aligned around the edges of woodlands such as Mossymere Wood (between the Civil Parishes [CP] of Saxthorpe and Itteringham), Black Bridge Wood and Bluestone Plantation (between the CPs of Cawston and Heydon), Scotchwood Hills (in the CP of Morton-on-the-Hill), Colton Wood (an ancient woodland in the CP of Marlingford and Colton) and Smeeth Wood (an ancient woodland in the CP of Ketteringham).

There are occasional grasslands along the PEIR boundary, most of which are improved or poor semi-improved grasslands used for grazing livestock. There are a small number of semi-improved grasslands, typically occupying small pockets of land which have not been as intensively managed as most other grasslands.

The PEIR boundary passes through the river corridors of the Rivers Yare, Tiffey, Tud, Wensum and Bure, including tributaries and drainage ditches associated with them. These river corridors are amongst the more diverse mosaics of habitat within the PEIR boundary, with various grasslands, woodlands, scrub, hedgerows, ditches and ponds (amongst other habitats) often recorded within close proximity to the river channels and floodplains. All these rivers are either classified as chalk streams or are tributaries of rivers which are classified as such; for example, the River Tiffey is a tributary of the River Yare (which is a chalk stream), which itself converges with the River Wensum (another chalk stream). The PEIR boundary also runs adjacent to the source/headwaters of the River Glaven (also a chalk stream) near Bodham.

There are assorted other habitat types along the PEIR boundary, typically occupying small, linear and disused parcels of land such as along roadsides, beside railways (including disused railways), beneath electricity pylons and within and around villages. These disused areas of land support a range of habitat classifications including scrub, tall herb and ruderal, bare ground and poor semi-improved grassland.

5.2 Hedgerows

All eight Phase 1 Habitat Survey hedgerow classifications were recorded along the PEIR boundary, as follows:

- Intact, species-rich hedgerow with trees: 87 hedgerows

- Intact species-rich hedgerow (without trees): 34 hedgerows
- Intact, species-poor hedgerow with trees: 23 hedgerows
- Intact, species-poor hedgerow (without trees): 26 hedgerows
- Defunct, species-rich hedgerow with trees: 49 hedgerows
- Defunct, species-rich hedgerow (without trees): 13 hedgerows
- Defunct, species-poor hedgerow with trees: 20 hedgerows
- Defunct, species-poor hedgerow (without trees): 12 hedgerows.

Hedgerows are mostly comprised of common hedgerow shrub species such as hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa*, field maple *Acer campestre*, elder *Sambucus nigra*, dog-rose *Rosa canina* and hazel *Corylus avellana*. Climbing plants such as bramble *Rubus fruticosus* agg. and ivy *Hedera helix* were also recorded in most hedgerows.

Trees within hedgerows within the PEIR boundary are mostly oak *Quercus robur*, although field maple and ash *Fraxinus excelsior* were also commonly recorded.

5.2.1 Hedgerows Protected Species Appraisal

Hedgerows will support a range of nesting bird species, some of which will be of elevated conservation status. They also have an ecologically important connective function for a range of wildlife including terrestrial mammals (such as badgers, bats and hedgehogs), amphibians, birds, invertebrates and reptiles. Most hedgerows have associated margins or verges which contribute to their ecological function (although there is no Phase 1 Habitat classification for verge or margin, and these are not mapped). Arable margins, where managed for the benefit of wildlife, can qualify as a Priority Habitat, reflecting their conservation importance.

Many of the aforementioned protected and notable species will also use hedgerows for foraging, either directly on nectar, fruits or the vegetation itself, or on other animals such as invertebrates and small mammals which will be present here. Hedgerows can also provide shelter/refuge for most of the above listed species.

A high number of trees within hedgerows were found to have suitable features for roosting bats.

5.3 Woodland

Whilst the PEIR boundary is aligned to avoid most woodland habitat, it passes through the following notable areas of woodland (listed from south to north):

- Furze Meadow (between Swardeston and Ketteringham): broad-leaved plantation woodland dominated by poplar trees, with a band of semi-natural broad-leaved woodland in the south dominated by alder *Alnus glutinosa* in a low-lying area with standing water (during the January survey). There are some nearby sections of conifer plantation dominated by Scots pine *Pinus sylvestris*, and mixed plantation dominated by Scots pine, oak, beech *Fagus sylvatica*, silver birch *Betula pendula*

- and sweet chestnut *Castanea sativa*. A small section of this woodland is listed on the PHI as Deciduous Woodland.
- Norwich Hill (between Swardeston and Ketteringham): semi-natural mixed woodland, mostly broad-leaved, dominated by oak, sycamore *Acer pseudoplatanus* and Scots pine, with a dense understorey of bramble. This woodland is listed on the PHI as Deciduous Woodland.
 - The Oval (between Swardeston and Ketteringham): broad-leaved plantation woodland dominated by sweet chestnut, oak and ash with elm *Ulmus* sp. and hazel understorey. This woodland is listed on the PHI as Deciduous Woodland.
 - Two unnamed woodland belts between School Wood and Church Plantation (in Ketteringham): The easternmost belt is a mixed plantation woodland dominated by ash, field maple, hawthorn and sycamore. The westernmost is a semi-natural broad-leaved woodland dominated by ash, oak, wych elm *Ulmus glabra*, sweet chestnut, holm oak *Quercus ilex* and Scots pine, with an understorey of elder and hazel. The westernmost woodland belt is listed on the PHI as Deciduous Woodland.
 - The Wong (south of Wong Farm near Hethersett): broad-leaved plantation woodland dominated by mature oak and ash with understorey of hawthorn, holly, elder and field maple. The woodland is listed on the PHI as Deciduous Woodland.
 - Durrell's Clump (south-east of Barford): conifer plantation (Christmas trees), parts of which had been recently harvested at the time of the survey, and with small areas of mixed and broad-leaved plantation woodland in the north-east, dominated by oak, field maple, ash, hazel, beech, hawthorn, sweet chestnut, silver birch, wild cherry *Prunus avium* and Scots pine.
 - Two unnamed pockets of woodland adjacent to the River Tiffey (east of Barford): not accessible for survey so woodland classification is unknown. Part of this woodland is designated as Yare Valley (Marlingford Hall) CWS (no. 229). These woodlands are also listed on the PHI as Deciduous Woodland.
 - Unnamed woodland adjacent to Colton Wood, north of the River Yare (between Barford and Colton): semi-natural broad-leaved woodland and young broad-leaved plantation dominated by grey willow *Salix cinerea*, alder, ash, goat willow *S. caprea*, crack willow *Salix fragilis*, hazel and elder. This woodland is designated as Yare Valley (Colton Wood) CWS (no. 228). This woodland is also listed on the PHI as Deciduous Woodland.
 - Morris' Grove (west of Marlingford): broad-leaved plantation dominated by mature oaks with sycamore, sweet chestnut, ash, hazel, hawthorn and elder. This woodland is listed on the PHI as Deciduous Woodland.
 - Unnamed woodland on the south side of the A47, enclosing a large pit which is a seasonal pond. The woodland is dominated by ash with occasional oak. The woodland is listed on the PHI as Deciduous Woodland.
 - Unnamed woodland (south-west of Harman's Grove, north-west of Easton): broad-leaved plantation woodland bordering the River Tud, dominated by hybrid black poplar *Populus x canadensis*. The woodland is listed on the PHI as Deciduous Woodland.

- Ringland Covert (south-west of Ringland): semi-natural broadleaved woodland. This woodland is designated as Hall Hills/Ringland Covert CWS (no. 2105). The canopy is dominated by ash, beech, sycamore, silver birch, hornbeam *Carpinus betulus* and sweet chestnut. This woodland is also listed on the PHI as Deciduous Woodland.
- A band of woodland on the south side of The Broadway (south-east of Weston Green): semi-natural mixed woodland dominated by Scots pine, sycamore, sweet chestnut, beech and larch *Larix decidua*. The woodland is listed on the PHI as Deciduous Woodland.
- The Spinney, north-east of Ringland Lane (east of Weston Longville): semi-natural broad-leaved woodland dominated by sycamore, oak, wild cherry, field maple, ash and hawthorn. This woodland is listed on the PHI as Deciduous Woodland.
- Two small woodland pockets south-east of Scotchwood Hills (between Weston Longville and Attlebridge): semi-natural broad-leaved woodland (listed on the PHI as Deciduous Woodland) and broad-leaved plantation dominated by alder and poplar.
- Southern edge of Moegoe's Plantation (north-east of Swannington): semi-natural broad-leaved woodland dominated by oak, hazel, hawthorn, elm, and blackthorn. The woodland is listed on the PHI as Deciduous Woodland.
- North-eastern edge of Bluestone Plantation (north of Cawston): not accessible for survey so woodland classification is unknown. A small part of this woodland on the north side of the B1149 is listed on the PHI as Deciduous Woodland, as is another small area on the south side of the B1149 further north from the plantation.
- Unnamed woodlands (west of Oulton): broad-leaved plantation dominated by oak, sweet chestnut, ash, alder and wild cherry. The woodland is listed on the PHI as Deciduous Woodland.
- Hundred Acre Wood/Weybourne Wood (between Bodham and Weybourne): much of the woodland was not accessible for survey for woodland classifications are unknown. The sections which were surveyed are semi-natural broadleaved woodland and semi-natural mixed woodland. Most of Hundred Acre Wood and the western parts of Weybourne Wood are listed on the PHI as Deciduous Woodland.
- Roundhills Plantation (north-west of Weybourne): broad-leaved woodland dominated by field maple, oak and beech. The woodland is listed on the PHI as Deciduous Woodland.

The PEIR boundary also passes through some small woodlands, mostly shelter-belts around the edges of arable fields.

5.3.1 Woodlands Protected Species Appraisal

Woodlands will support a variety of native wildlife including protected and notable species such as nesting birds, bats (roosting, foraging and commuting), badgers (setts, foraging and commuting), invertebrates and amphibians. Some woodlands with large, mature trees and suitable foraging resources nearby are suitable for nesting and/or

roosting by Schedule 1 bird species such as barn owl *Tyto alba*, red kite *Milvus milvus* and firecrest *Regulus ignicapilla*.

The EP1HS found widespread evidence of protected species presence throughout many of the woodlands surveyed, including trees with High and Moderate bat roost potential, abundant bird nesting activity (occasionally by Schedule 1 species) and badger setts and other signs of activity (tracks, latrines, feeding signs etc.).

5.4 Grassland

The majority of grasslands within the PEIR boundary are improved, meaning they have historically been heavily influenced by management such as intensive grazing or application of fertilisers and herbicides to a degree that suppresses the diversity of grasses and forbs within the sward. Most such grasslands were found to be dominated by perennial rye grass *Lolium perenne*, cocksfoot *Dactylis glomerata*, Yorkshire fog *Holcus lanatus*, false oat *Arrhenatherum elatius* and bent grasses *Agrostis* spp., with clovers *Trifolium* spp., daisy *Bellis perennis*, dandelions *Taraxacum* spp., plantains *Plantago* spp., docks *Rumex* spp., thistles *Cirsium* spp. ragwort *Senecio jacobaea* and stinging nettle *Urtica dioica* also widely recorded.

Semi-improved neutral grassland and semi-improved acid grassland were rarely recorded, and occupy small pockets of land, mostly in close proximity to or enclosed by woodland, scrub or heathland. These grasslands support notably more diverse swards which include species which would typically be outcompeted on more nutrient-enriched soils.

All sizeable areas of non-improved grassland are summarised below:

- Poor semi-improved grassland on the north side of the B1108 Watton Road, and south of the River Tiffey at Barford.
- Semi-improved neutral grassland north of the River Yare and east of Colton Wood.
- Poor semi-improved grassland east of Taverham Road and north of Brickkiln Clump, north-east of Honingham.
- Semi-improved neutral grassland south of Attlebridge near the River Wensum. This grassland is listed on the PHI as Coastal and Floodplain Grazing Marsh.
- Multiple poor semi-improved grasslands east of Swannington. The areas of grassland south of Moegoe's Plantation are listed on the PHI as Good Quality Semi-Improved Grassland.
- Improved and poor semi-improved grasslands with scrub and ditches near the River Bure between Itteringham and Saxthorpe. Most of the grassland is listed on the PHI as Coastal and Floodplain Grazing Marsh.
- Two improved grassland fields south of Little Barningham: The easternmost field is listed on the PHI as Good Quality Semi-Improved Grassland.
- Coastal grasslands north-west of Weybourne, at the landfall location. The westernmost areas of grassland are listed on the Priority Habitat Inventory as Coastal and Floodplain Grazing Marsh.

There are further areas of poor semi-improved and semi-improved neutral grasslands within the PEIR boundary but these typically occupy small, peripheral parcels of land (e.g. gardens and paddocks on the edges of the corridor) which are expected to be avoided/avoidable.

5.4.1 Grasslands Protected Species Appraisal

Most of the grasslands, especially poor semi-improved and semi-improved grasslands, provide opportunities for a range of native wildlife including protected and notable species such as badgers, amphibians, birds, invertebrates, bats and reptiles. For most such species, the presence of invertebrates or other small animals within grasslands will attract them to forage here. For reptiles and amphibians, grasslands can also provide a key habitat in which they can shelter, forage, commute and (for reptiles) breed. Grasslands are particularly suitable for reptiles and amphibians when they form part of a habitat mosaic, such as in close proximity to areas of scrub, woodland and water-bodies.

Ground-nesting birds such as lapwing *Vanellus vanellus* will use certain types of grasslands for nesting.

5.5 Rivers

The five river corridors through which the PEIR boundary passes are all broadly classifiable as chalk streams, meaning they are all either classified as chalk streams in their own right or feed into a larger river systems which are classified as chalk streams. This habitat classification (which is not a Phase 1 Habitat category) is highlighted because it denotes an ecologically rare and sensitive habitat type. Chalk streams occur in landscapes with chalky and therefore highly permeable bedrock. Consequently, chalk streams are fed by aquifers with largely constant/consistent temperature, nutrient levels and flow rates. These rivers do not receive significant amounts of water from overland flow or runoff (due to the permeable nature of land in the surrounding catchments), which can often lead to nutrient enrichment, high sediment load or other forms of pollution in non-chalk-streams. The water in chalk streams is therefore typically very clear, with low but stable nutrient content. These habitat conditions are conducive to establishment of oxygenating plants such as crowfoots *Ranunculus* spp., which in turn provide suitable conditions for aquatic animals such as white-clawed crayfish *Austropotamobius pallipes* and brown trout *Salmo trutta*. These animals also require the type of gravelly (rather than muddy) river beds, which are typical of chalk streams, in which to breed.

In terms of their global occurrence, chalk streams are a very rare ecosystem, with around 200 known globally, 85% of which (around 170) are found in the UK⁷, and most of these are located in southern and eastern England.

Given their ecological diversity, river corridors are ecologically important features both in a connective capacity but also as a foraging, sheltering and breeding habitat in their own right.

The crossings of all river corridors of the onshore cable corridor are listed below (running from south to north):

⁷ wildlifetrusts.org/habitats/freshwater/chalk-rivers

- Unnamed stream and ditches west of Swardeston (a tributary of the River Yare): the stream and ditches are bordered by areas of improved, poor semi-improved and marshy grassland, plus an area of semi-natural broad-leaved woodland. The grassland is listed on the PHI as Coastal and Floodplain Grazing Marsh, and the woodland is listed as Deciduous Woodland.
- River Tiffey east of Barford (a tributary of the River Yare): the river channel here is surrounded by rank poor semi-improved grassland, fen (flood-plain mire), pockets of wet broadleaved woodland and a network of small drainage ditches and ponds which feed into the river. The river channel itself is fairly narrow and appeared (during the EP1HS) to have silty/muddy substrate.
- River Yare between Barford and Marlingford: The river channel is bordered by arable fields and improved/poor semi-improved grassland fields to the south, and by a semi-natural broad-leaved woodland to the north. The river channel itself is meandering and with a stony river-bed.
- River Tud between Easton and Honingham (a tributary of the River Wensum): The river channel is narrow and meandering, with scattered trees on the banks. The immediate surrounds of the river are improved grassland pasture, with a seasonal drainage channel to the north of the river channel. To the south of the river and grassland floodplain, there is a narrow band of mixed plantation woodland. On the PHI, the grassland is listed as Good Quality Semi-Improved Grassland and the woodland is listed as Deciduous Woodland.
- River Wensum south of Attlebridge: The River Wensum is considered a tributary of the River Yare (with the rivers converging south-east of Norwich) even though the Wensum is the larger of the two rivers. The River Wensum is designated as a Special Area of Conservation (and Site of Special Scientific Interest) for the presence of one Annex I habitat and one Annex II species. The site also supports three Annex II species, although these are not primary reasons for the site's designation. Information on the River Wensum's SAC designation⁸ is listed below:

- Annex I habitat which is a primary reason for selection of the site:

3260: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. The Wensum represents sub-type 1 in lowland eastern England. Although the river is extensively regulated by weirs, *Ranunculus* vegetation occurs sporadically throughout much of the river's length. Stream water-crowfoot *R. penicillatus* ssp. *pseudofluitans* is the dominant *Ranunculus* species but thread-leaved water-crowfoot *R. trichophyllus* and fan-leaved water-crowfoot *R. circinatus* also occur.

- Annex II species that are a primary reason for selection of the site:

1092: white-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*. The Wensum is a chalk-fed river in eastern England, and is an eastern example of riverine white-clawed crayfish populations. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe. Designation of the river as a SAC provides as much protection as can be afforded to such vulnerable populations.

⁸ <https://sac.jncc.gov.uk/site/UK0012647>

- Annex II species present as a qualifying feature but not a primary reason for site selection:

1016: Desmoulin's whorl snail *Vertigo moulinsiana*

1096: brook lamprey *Lampetra planeri*

1163: bullhead *Cottus gobio*

At the proposed crossing point of the PEIR boundary, the river corridor comprises part of the floodplain of predominantly improved and semi-improved neutral grassland, occasionally grazed by cattle and sheep. The grasslands are intersected by a network of drainage ditches which are seasonally inundated. There are also scattered trees (mostly willows) throughout the floodplain. The grasslands themselves are occasionally inundated, mostly from late autumn to spring. There are, therefore, seasonal pools, ponds and scrapes within the floodplain. The river channel itself is bordered by dense marginal vegetation, mostly common reed *Phragmites australis*. The riverbed appears to be stony/gravelly with submerged aquatic vegetation including crowfoot species.

Part of the grassland floodplain to the south-west of the river is designated as Wensum Pastures at Morton Hall CWS (no. 2070).

- Two unnamed streams east of Swannington (tributaries of the River Wensum). The northernmost of the streams is bordered by emergent vegetation such as meadowsweet *Filipendula ulmaria*, hemp agrimony *Eupatorium cannabinum*, wild angelica *Angelica sylvestris* and purple loosestrife *Lythrum salicaria*. The land between and immediately around the streams are sheep-grazed improved grasslands with occasional seasonal drainage ditches. The southernmost stream is bordered by a bank of broadleaved trees on its south side, so supports relatively little emergent and aquatic vegetation due to shading. However, in small areas the aforementioned species were recorded. This channel also has dense stands of Himalayan balsam on certain stretches of its banks.
- An unnamed stream north-east of Swannington, south of Moegoe's Plantation (a tributary of the River Wensum). This small drainage channel flows southwards around the east and south side of Moegoe's Plantation, then along the west side of a cattle-grazed poor semi-improved grassland with scattered scrub. The stream itself is heavily shaded by surrounding trees, scrub and a hedgerow. It supports little aquatic or semi-aquatic vegetation at the point the PEIR boundary passes it.
- River Bure between Saxthorpe and Itteringham. At the point the PEIR boundary crosses the river channel, the river is also crossed by the B1354 road, running north-west to south-east across the river which flows south-west to north-east. The road crossing is bridged. South of the road, the river channel is heavily shaded by a bank of trees to the south-east. It appears to have a partially silty/muddy substrate with gravel/stones visible in patches. The banks of the river to the north-west are dominated by poor semi-improved grassland with occasional shrubs and stands of Himalayan balsam. To the north-west of the river there is an area of improved grassland with ponds, ditches and scattered shrubs and trees. To the north of the road crossing, the river is bordered to the north-west by a poor semi-improved grassland field occasionally grazed by cattle. The grassland also has a network of drainage ditches and ponds, with scattered trees and scrub.

5.5.1 Rivers Protected Species Appraisal

Chalk streams provide suitable habitat for native river wildlife including rare and protected species such as water voles *Arvicola amphibius*, otter *Lutra lutra*, birds such as kingfisher *Alcedo atthis* (a Schedule 1 species) and numerous specialist (i.e. restricted to river habitat) species of invertebrates and plants. Much of the associated, connected and nearby habitats around rivers are also suitable for and likely support a relatively wide range and high number of species (relative to much of the surrounding landscape), including protected species.

Further survey effort in 2021 is due to focus on the river crossings and nearby habitats. This will involve surveys for bats, breeding birds, amphibians (where ponds are present), reptiles, invertebrates including white-clawed crayfish and riparian mammals, namely otter and water vole.

5.6 Other Notable Habitats and Features in the PEIR Boundary

The PEIR boundary also runs through the following areas and features:

- The Carrs Woodland CWS no. 196 is located between Swardeston and East Carleton. It is notified for its semi-natural woodland with ponds, fen areas and grassland. The PEIR boundary overlaps a very small part of this CWS in its far northern corner.
- “Kett’s Oak” (noted on some maps as the “Oak of Reformation”) is located on the north side of the B1172 between Wymondham and Hethersett, close to the south-west side of the PEIR boundary. It is a veteran oak tree over 500 years old, noted primarily for its historical interest.
- Yare Valley (Marlingford Hall) CWS no. 229 is located east of Barford at the PEIR boundary’s crossing point of the River Tiffey. It is notified for its woodland, marshy (mostly neutral) grassland and fen bordering the river.
- Yare Valley (Colton Woods) CWS no. 228 is located south of Colton Wood. The CWS is an area of low-lying marshy grassland and tall fen bordering the River Yare. The site also supports areas of wet semi-natural woodland and scrub.
- River Tud at Easton and Honingham: 250 is located near Easton. The CWS consists of Species-rich aquatic, marginal and emergent riverine flora.
- Hall Hills/Ringland Covert CWS no. 2105 is located west of Ringland. It is an area of woodland (listed as an ancient woodland in the CWS citation but not included on Natural England’s database of ancient woodland) with widespread replanting.
- Wensum Pastures at Morton Hall CWS no. 2070 borders the River Wensum south of Attlebridge. It is an area of predominantly cattle grazed improved grassland within the floodplains of the River Wensum and crossed by a network of drains supporting diverse aquatic flora. The site is periodically flooded and contains small areas of neutral and damp grassland.
- Marriott’s Way CWS no. 2176 is a former railway line which crosses the PEIR boundary in two locations, north of Attlebridge and north of Cawston. It is a long, linear feature with embankments and cuttings dominated by scrub, mature trees, water-bodies and grass verges.

- Roadside Nature Reserve no. 63 on Matlask Road between Saxthorpe and Little Barningham (west of Mossymere Wood). The verge is up to 20m wide, and is backed by a hedgerow set back from the roadside. The NBIS citation specifies that the grassland is lowland calcareous with the only noted species of interest being long-stalked cranesbill *Geranium columbinum*.
- Kelling Heath Park and 100 Acre Wood CWS no. 1150 is a semi-natural broad-leaved woodland with dry heath and associated scrub.
- Beach Lane, Weybourne CWS no.1156 is an area of reedbed within a shallow pool just inland of the shingle sea defences. It is fed by a stream so the pool is part freshwater and part brackish.
- Kelling Hard CWS no. 1107 is located on the coast at the far north-western edge of the PEIR boundary. It is a mosaic of unimproved, calcareous, neutral and marshy grasslands with some swamp vegetation, which are influenced by the site’s proximity to the coast. Much of the nearby grassland within the PEIR boundary (but outside of this CWS) is also a mosaic of non-improved coastal grasslands.
- Sandy cliffs above the shingle beach at the landfall location north of Weybourne. The cliffs are part of the same cliff-line which form Weybourne Cliffs SSSI which is notified principally for geological interest, but is also noted for its ecological interest related to nesting sand martins *Riparia riparia* and fulmars *Fulmaris glacialis* on/in the cliff faces. The cliffs are listed on the PHI as Maritime Cliff and Slope. The shingle shoreline at the base of the cliff is listed on the PHI as Coastal Vegetated Shingle.
- Brook House Marshes: 2315 near Easton. This site comprises three fields of relatively species-poor grassland lying in the floodplain of the River Tud.

5.7 Invasive Non-Native Species

The EP1HS recorded INNS in certain locations along the PEIR boundary. Table 2, below, lists the plant INNS recorded along with their approximate location.

Table 2: Invasive Non-Native Species Recorded During the EP1HS

Species (common name)	Location	Description
Himalayan balsam	TG 1232 1152 Between Honingham and Easton	Himalayan balsam within stands of woodland bordering the River Tud. This is largely outside of the refined onshore cable corridor.
Himalayan balsam	TG 1411 1893 East of Swannington	Dense stands of Himalayan balsam on the banks of an unnamed stream
Himalayan balsam	TG 1309 2987 East of Saxthorpe	Stands of Himalayan balsam on the banks of the River Bure

Construction works within these areas will need to adopt strict precautions to ensure these species are not accidentally spread. Precautionary waste processing procedures may need to be adopted if removal of soil or plant material from these areas is required. A method of working relating to Invasive Non-Native Species will be produced and adopted in areas where their presence has been recorded.

Figure 1: Phase 1 Habitat Survey Results Map (Onshore Substation Area to Swardeston)

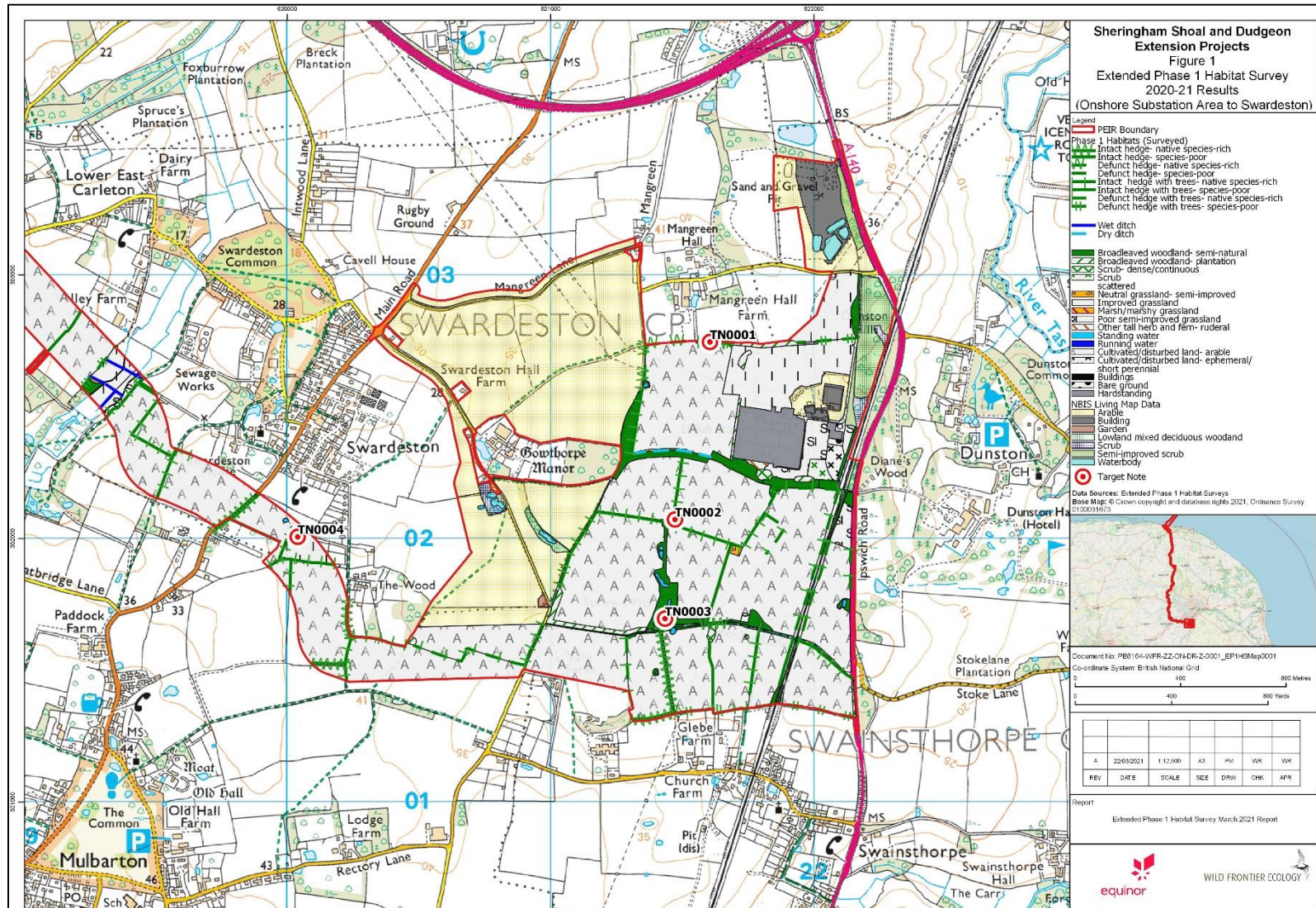


Figure 2: Phase 1 Habitat Survey Results Map (East Carleton to Ketteringham)

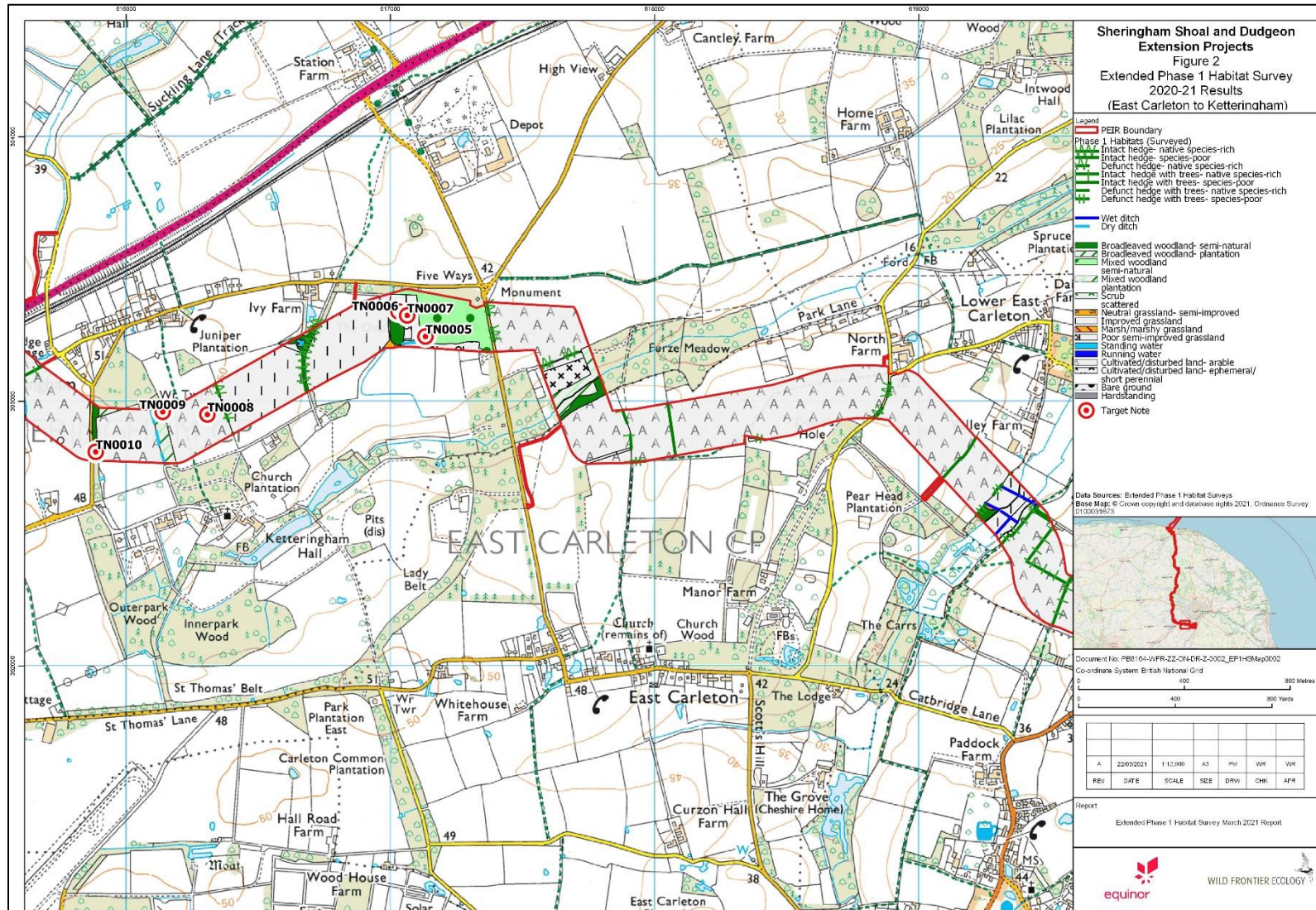


Figure 3: Phase 1 Habitat Survey Results Map (Hethersett)

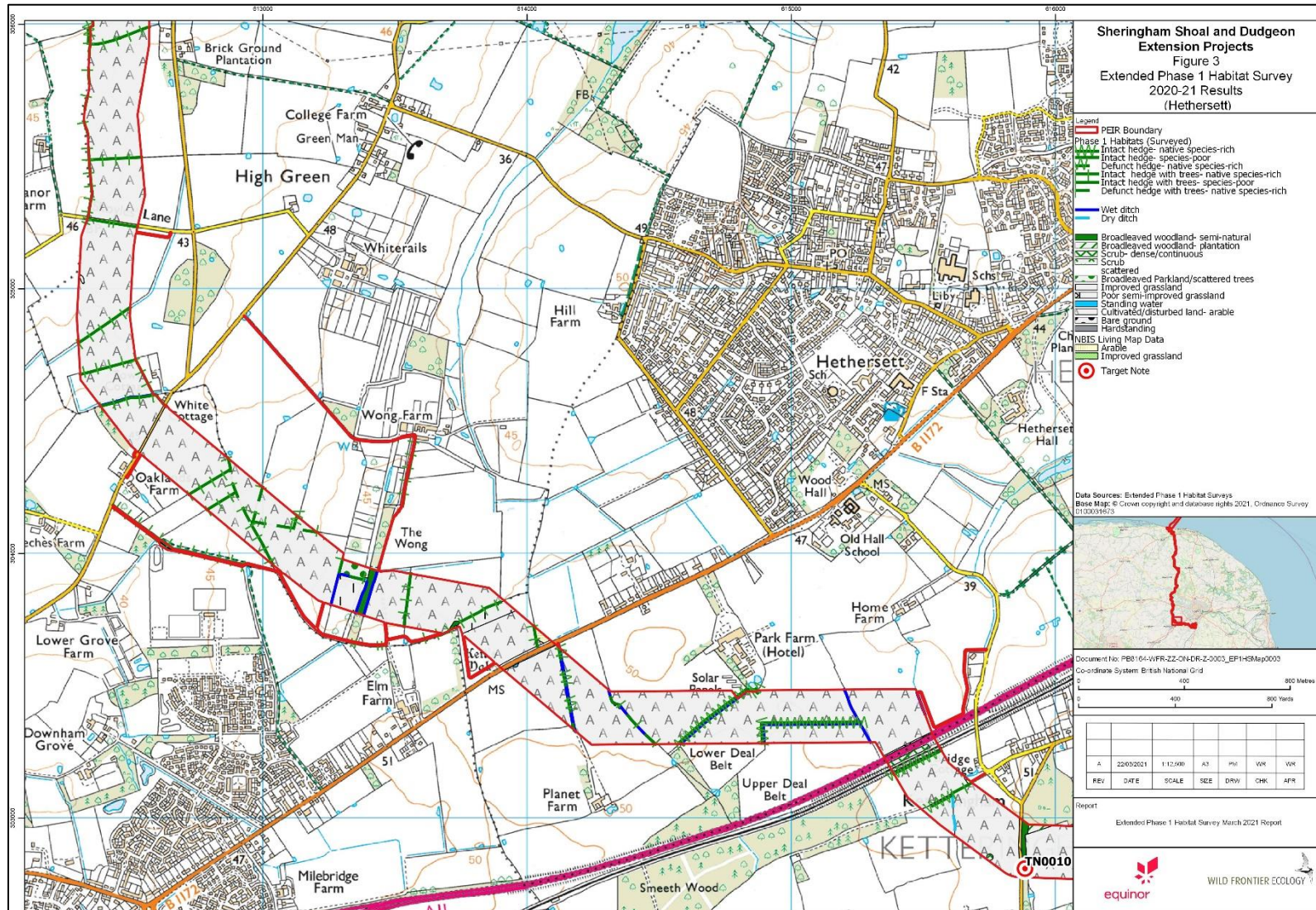


Figure 4: Phase 1 Habitat Survey Results Map (Wramplingham to Barford)



Figure 5: Phase 1 Habitat Survey Results Map (Barford to Easton)

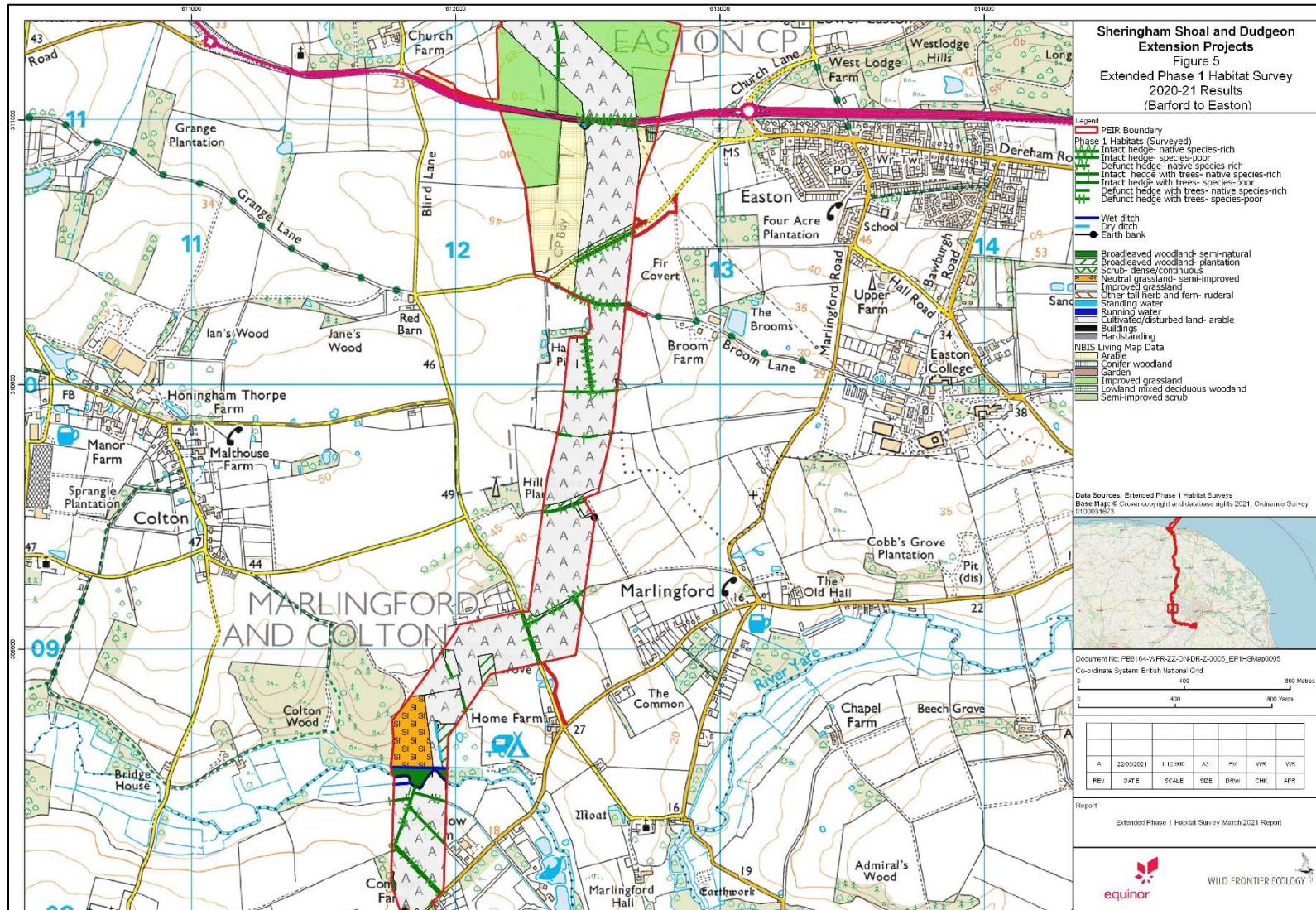


Figure 6: Phase 1 Habitat Survey Results Map (Easton to Ringland)

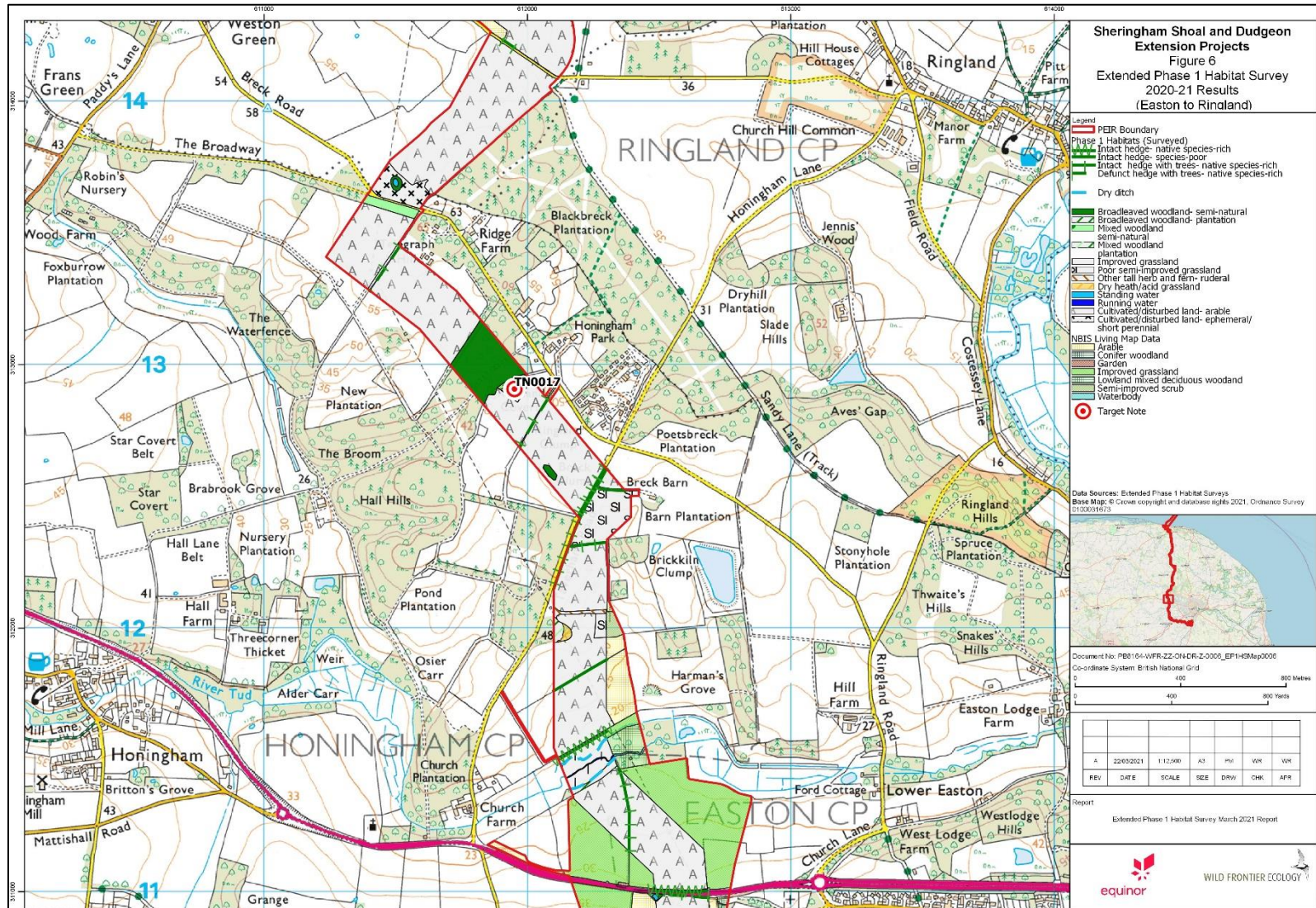


Figure 7: Phase 1 Habitat Survey Results Map (Ringland to Attlebridge)

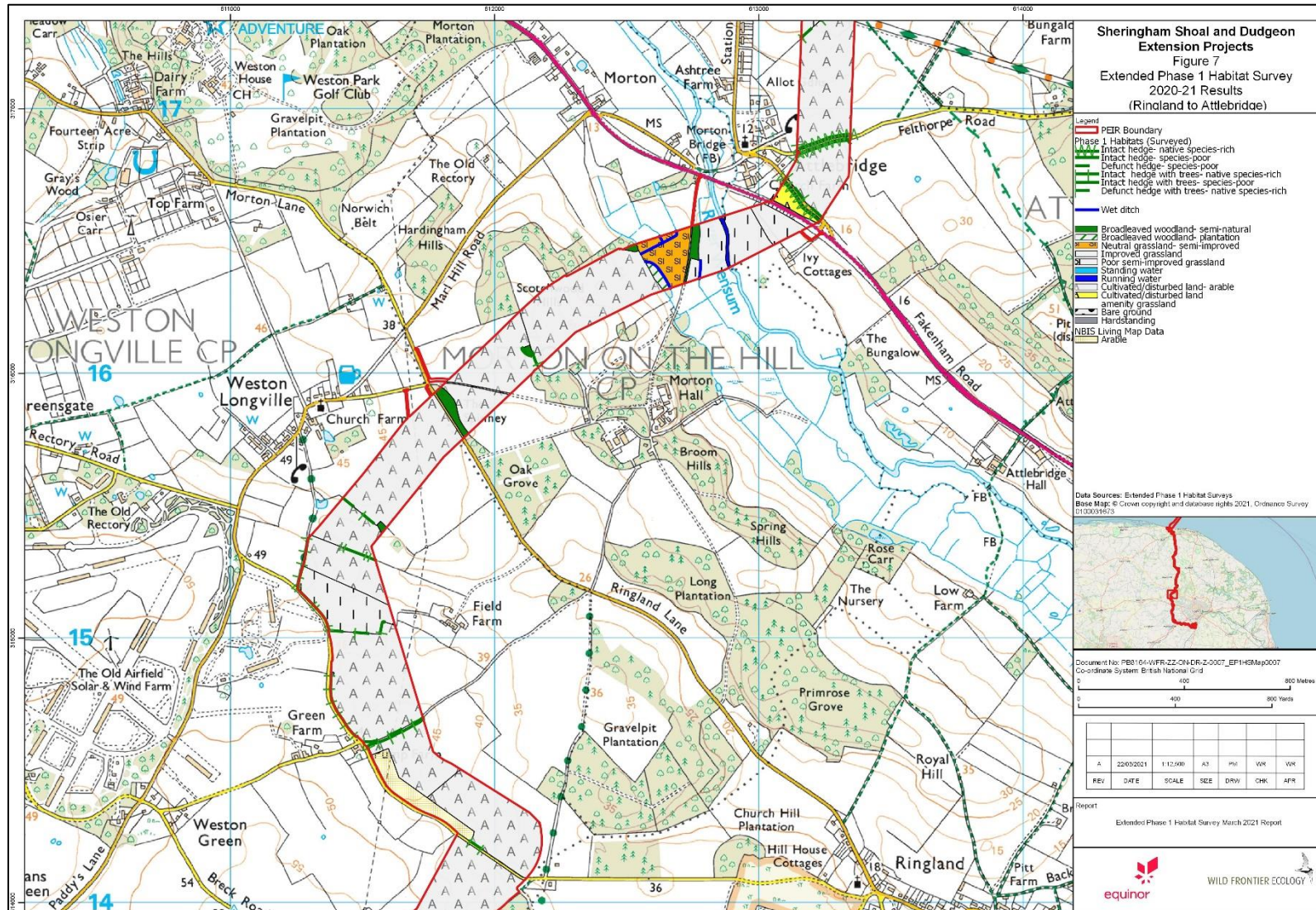


Figure 8: Phase 1 Habitat Survey Results Map (Attlebridge to Swannington)



Figure 9: Phase 1 Habitat Survey Results Map (Brandiston to Eastgate)



Figure 10: Phase 1 Habitat Survey Results Map (Cawston)

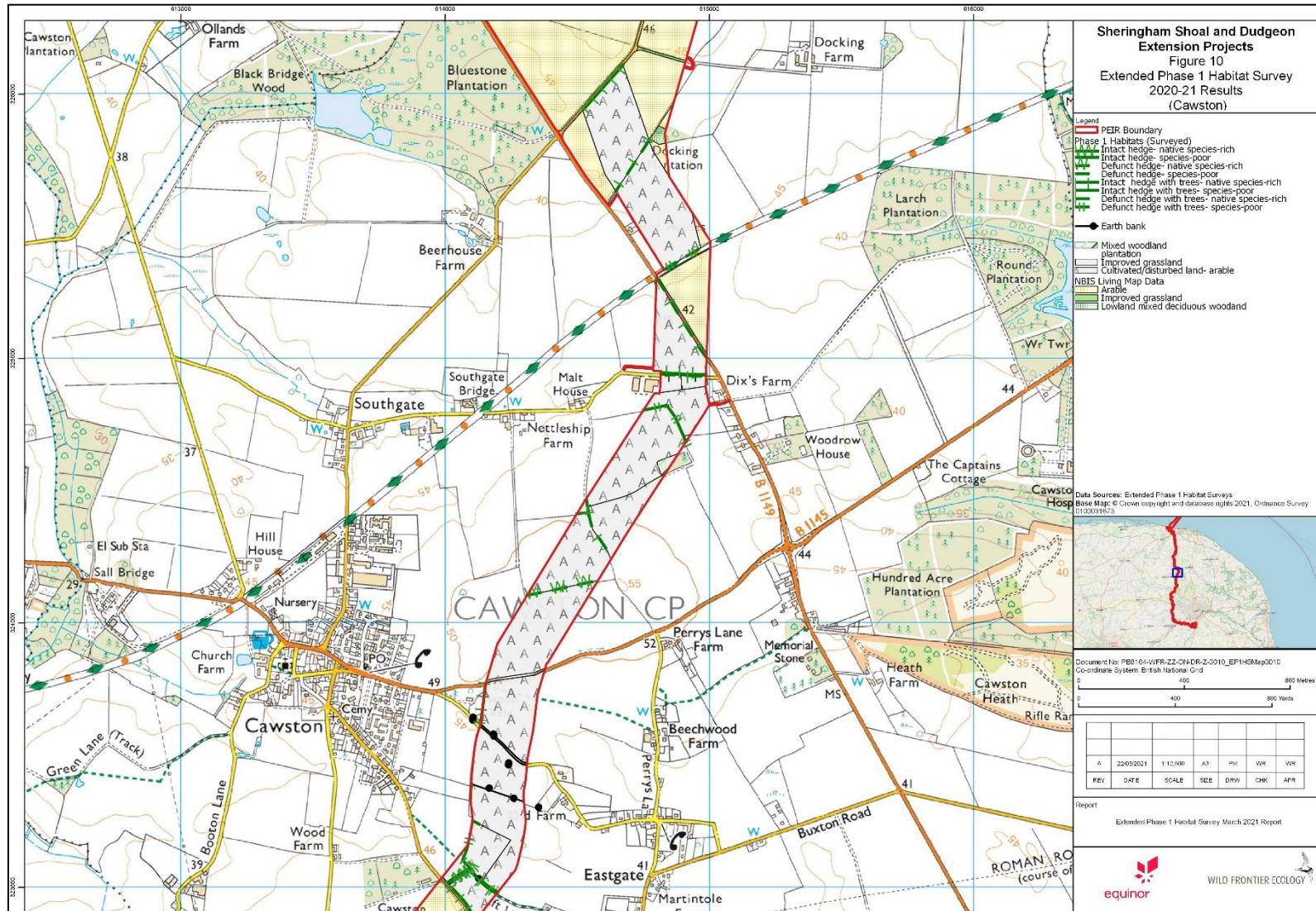


Figure 11: Phase 1 Habitat Survey Results Map (Ringland to Easton)

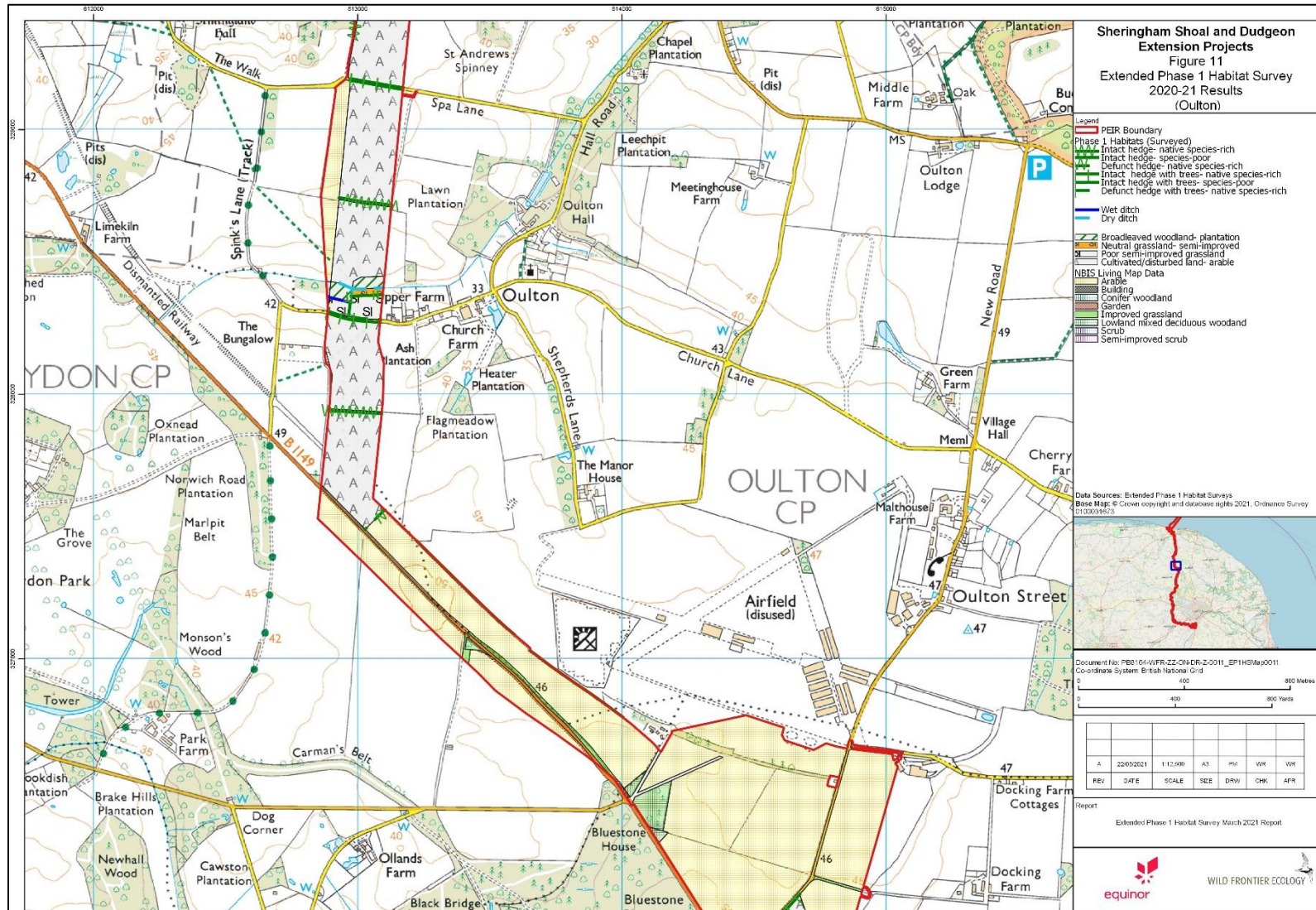


Figure 12: Phase 1 Habitat Survey Results Map (Saxthorpe)

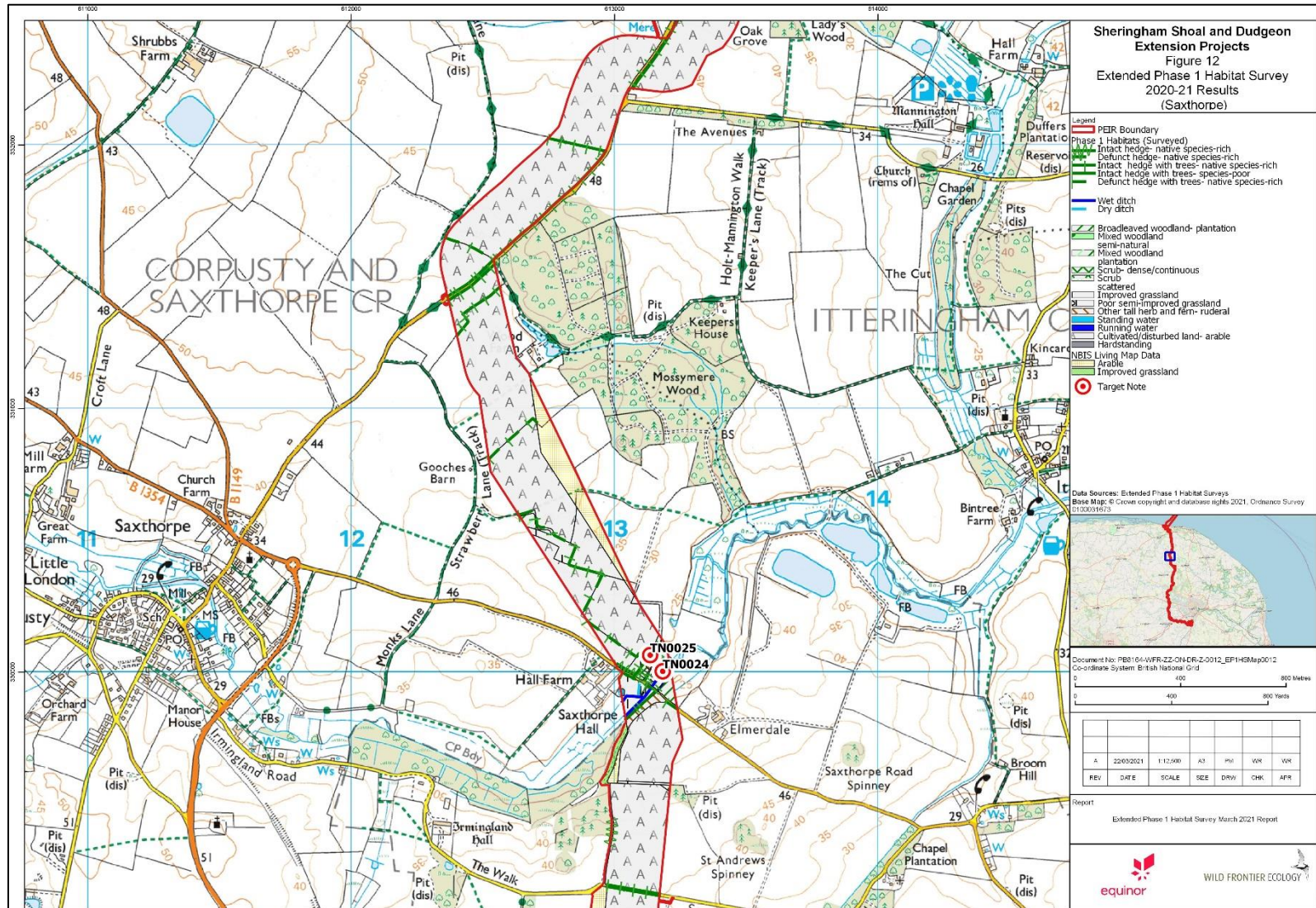


Figure 13: Phase 1 Habitat Survey Results Map (Little Barningham to Plumstead)



Figure 14: Phase 1 Habitat Survey Results Map (Plumstead to Baconsthorpe)

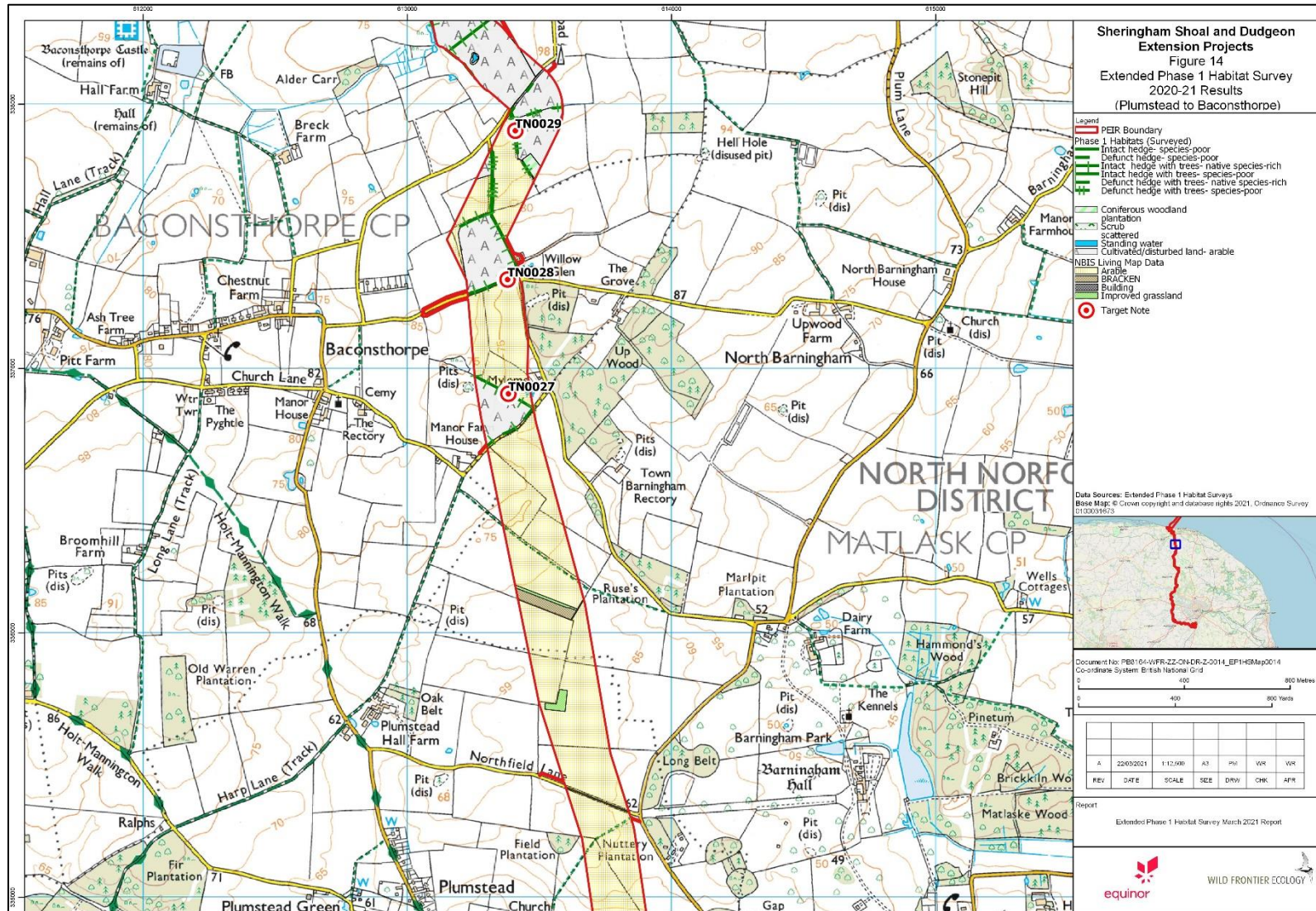
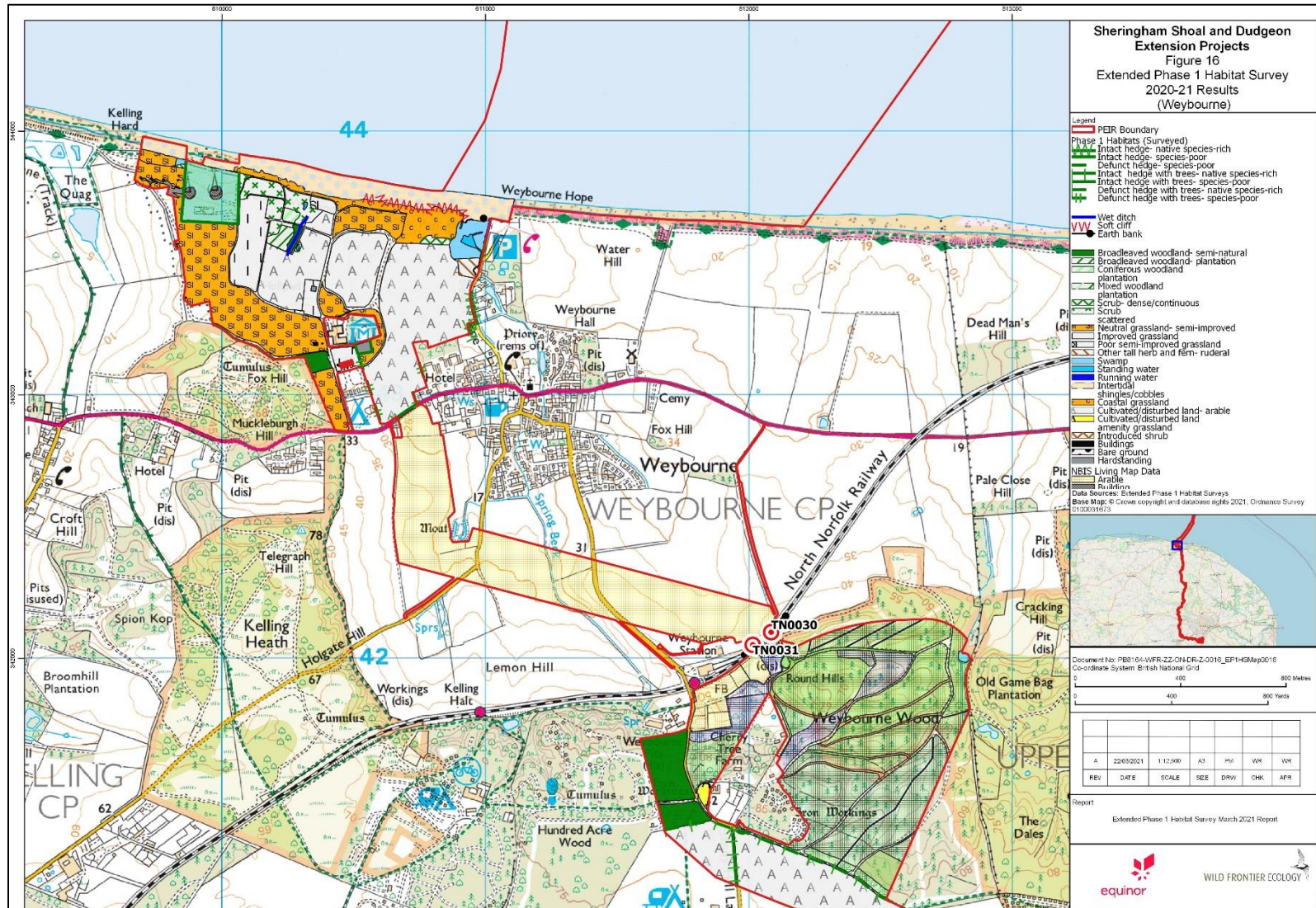


Figure 15: Phase 1 Habitat Survey Results Map (Ketteringham to East Carleton)



Figure 16: Phase 1 Habitat Survey Results Map (Swardeston to Sub-station)



6. Target Notes

Further information relating to each TN denoted on Figures 1-16 is presented in Table 3, below.

Table 3: EP1HS TNs

Target Note (TN)	Description
TN0001	Green lane enclosed by horse chestnut, oak, elder, hawthorn, field maple, hazel and sycamore.
TN0002	Dry pits within wooded area. Pits may hold water at certain times of year but were dry when surveyed.
TN0003	Sprow's Pits and Hickling Lane: Two large dry pond basins in wooded area to the north of Hickling Lane. The pits may hold water at certain times of year but were dry when surveyed. Hickling Lane is a densely wooded green lane used as a footpath and bridleway. It is enclosed on both sides by trees and shrubs including elm, hawthorn, blackthorn, oak, holly, elder and dog-rose. Parts of Hickling Lane and the wooded areas surrounding Sprow's Pits are classified on the PHI as Deciduous Woodland.
TN0004	Developing hawthorn scrub in horse paddock.
TN0005	Old pheasant pens in Norwich Hill woodland.
TN0006	Dry pit in The Oval woodland.
TN0007	Species poor, semi-improved grassland (PSIG0006) is a sown nectar strip.
TN0008	Dry pond basin with what appears to be highly fluctuating seasonal water levels.
TN0009	Metal water tower with low bat roost potential, situated within a woodland belt.
TN0010	Gap in belt of woodland. Possible opportunity to align construction footprint through this gap and thereby minimise impacts to this semi-natural broad-leaved woodland belt.
TN0011	Pond basin (dry at the time of the survey) within area of dense scrub and trees.
TN0012	Pond basin (dry at the time of the survey) amongst oak trees within a coniferous (Christmas tree) plantation woodland.
TN0013	Dry pond basin within a mixed plantation woodland.
TN0014	Owl box mounted on a pole close to hedgerow. Box is surrounded by dense vegetation so it was not possible to establish if it was in-use.
TN0015	Mown paths within floodplain of the River Tiffey, where most grassland is tall and rank.
TN0016	Wide ditch/waterbody on the south side of the River Tiffey, dominated by reed sweet-grass <i>Glyceria maxima</i> .
TN0017	Enclosed pheasant pens (not surveyed as access was restricted)
TN0018	Possible pond (dry at time of survey). Terrestrial habitat surrounding the dry pond basin is optimal for amphibians and reptiles.
TN0019	Area of poor semi-improved grassland with scattered scrub adjacent to woodland and ditch with flowing water. Also multiple piles of deadwood and other materials throughout this area. Habitat is likely to support a relatively rich invertebrate assemblage.
TN0020	Scattered stands of bramble, hawthorn and blackthorn.
TN0021	Large gap in hedgerow

Target Note (TN)	Description
TN0022	Concrete farmyard area with large area of tall ruderal vegetation, scattered willow scrub and bare ground.
TN0023	Wide field entrance – no boundary feature here
TN0024	Badger paths
TN0025	Likely ancient hedge with coppiced hazel.
TN0026	Field of improved grassland which appears to be long-term set-aside. Habitat had been cut shortly prior to the survey, but is expected to be suitable for reptiles, especially along southern boundary where there is a wide field margin bordering a seasonal ditch.
TN0027	Multiple owl pellets recorded within veteran oak tree in hedgerow.
TN0028	Turkey oak tree with raptor nest in. A young kestrel was also recorded flying within the vicinity.
TN0029	Harvest mouse nest within hedgerow.
TN0030	Significant gap in hedgerow.
TN0031	Deep railway cutting besides the active railway line. Banks are dominated by tall herb and ruderal vegetation, with hedgerows/scrub/trees near the tops of the banks. Mining bees recorded within railway bank.

7. Further Survey Requirements

7.1 Overview

The EP1HS has identified those habitats which have the potential to support legally protected or notable species. In light of these findings and in order to characterise the ecological baseline, further Phase 2 species-specific surveys have been identified and subsequently underway since completion of the EP1HS. The findings of those surveys completed to date, are provided in separate technical appendices and the information has not been repeated in this document.

7.2 Phase 1 Species-Specific Surveys

7.2.1 Bat roost emergence/re-entry surveys

As outlined in **Section 5**, the EP1HS identified features (trees and/or buildings) as providing suitability to support roosting bats. In accordance with the BCT guidelines (BCT, 2016) all features assessed as providing moderate or high suitability for supporting roosting bats require additional surveys (i.e. emergence/re-entry surveys) to confirm the likely presence and/or absence of a bat roost. Targeted surveys will be undertaken in 2021.

All trees assessed as providing low suitability for supporting roosting bats will still be considered as potentially supporting opportunistic roosts in the future, but further surveys are not required to confirm presence or absence, following the guidelines set out by the BCT guidelines (BCT, 2016). Mitigation measures for trees assessed as providing low suitability for roosting bats will be identified and subsequently implemented.

The emergence/re-entry surveys will be undertaken in accordance with the methodology outlined in the BCT guidelines (BCT, 2016). For each feature offering moderate suitability, two survey visits (i.e. one dusk emergence survey and one dawn re-entry survey) will be undertaken. Each dusk emergence survey will commence 15 minutes before sunset and cease 1.5-2 hours after sunset. The dawn re-entry surveys will commence 1.5-2 hours before sunrise and cease 15 minutes after sunrise. These surveys will be undertaken at least two weeks apart and between May and September with one survey visit between May and August. For each feature offering high suitability, an additional dusk emergence or dawn re-entry survey will be undertaken, in line with BCT guidance.

Hand-held bat detectors (any type) and recording equipment to record any echolocation calls will be used for each survey. Laboratory sound-analysis will be used to identify the calls of any bat species picked up using the bat detectors. Species, timing, and activity noted during each survey and for each bat picked up during the survey will be recorded.

Weather conditions including temperature, wind speed and precipitation, will be recorded at the start and end of each survey visit. Surveys will not be carried out when the temperatures are below 10°C at sunset, or during heavy rain or strong wind unless justified by the surveying ecologist.

7.2.2 Bat activity transect and static detector surveys

Linear features (i.e. hedgerows and watercourses) with the potential to support commuting and foraging bats within the EP1HS study area have been identified. Although a preliminary survey effort for foraging/commuting bats has been undertaken in 2020, further surveys are planned as further refinements are made to the PEIR boundary. All further surveys will be undertaken in accordance with the BCT guidance (BCT, 2016) and will comprise of monthly walked transect surveys and the deployment of static bat detectors.

The result of the bat activity surveys undertaken to date are reported separately.

7.2.3 Birds (over-wintering and breeding birds)

An over-wintering bird survey effort was undertaken between November 2019 and March 2020 and repeated between November 2020 and March 2021. The survey comprised walked transects within areas of suitable habitat within the PEIR boundary. The findings of which will be used to determine the usage of the habitats within the PEIR boundary by over-wintering species.

Standard recording procedures were used to note the species, number of sightings and activity (Bibby et al. 2000). The surveyors also recorded the exact route taken, so that during subsequent visits alternative circuitous routes of each transect could be used to ensure that all parts of each survey area can be surveyed at a different time of day.

A breeding bird survey effort was undertaken between April 2020 and June 2020 and comprised two visits per month. The methodology followed the same as the over-wintering bird survey effort.

The results of the over-wintering and breeding bird surveys undertaken to date are reported separately.

7.2.4 Water voles

During the EP1HS, watercourses identified as potentially providing optimal habitat for water voles will be subject to a water vole presence/absence survey, comprising two separate survey visits in 2021.

The water vole surveys will be undertaken in accordance with the protocol for Environmental Assessment Surveys set out in the Water Vole Conservation Handbook (Strachan et al. 2011). Surveys will be undertaken from the banks and where possible within the watercourse subject to the survey. Surveyors will search for field signs of water voles primarily within the marginal vegetation along the bank toe and along the length of the watercourse within the PEIR boundaries (50m upstream and downstream), and up to 1m either side of this vegetation along one bank of the watercourse. All field signs of water vole will be recorded, including sightings, burrows, latrines, feeding stations, lawns, nests, footprints and runways. Field signs, habitat information, and weather conditions at the time of the survey will also be recorded alongside their location.

7.2.5 Otters

During the EP1HS, watercourses identified as potentially providing optimal habitat for otters will be subject to an otter presence/absence survey in 2021.

The otter survey (comprising two separate visits) will be undertaken in accordance with the protocol set out by Scottish Natural Heritage (Otters and Development, 2016). Surveys will be undertaken along one bank for the full length of each optimal watercourse within the PEIR boundaries, plus an additional 250m upstream and 250m downstream. Each watercourse will be walked by an ecologist, and all field signs of otter will be recorded. This will include signs of mink, spraints, holts, couches, prints, feeding remains, anal jelly and sightings. The field sign and its location will be recorded. Surveys will not be undertaken following heavy rain.

Due to the overlap in survey methodology and in habitats, the otter survey will be undertaken concurrently with the water vole survey.

7.2.6 Great crested newts

All accessible ponds within and up to 250m of the PEIR boundary were subject to a daytime Habitat Suitability Index (HSI) assessment in accordance with standard methodology (Oldham et al. 2000). The HSI assessment considers habitat attributes that are considered to influence the suitability of a pond for breeding great crested newts. These attributes are as follows:

- Location;
- Area;
- Drying;
- Water quality;
- Shade;
- Waterfowl presence;
- Fish presence;

- Terrestrial habitat;
- Macrophyte presence; and
- Number of waterbodies within 1km.

Each accessible pond was subsequently subject to an environmental DNA (eDNA) survey following the field sampling protocol as set out in Briggs et al. (2014). Samples were collected from around the accessible parts of each water body perimeter by a GCN licenced ecologist, including open water areas and areas with vegetation present. Each water body sampling has been completed with a fresh sampling pack to avoid cross contamination.

Each sample was then sent to the Sure Screen laboratory for analysis for eDNA in accordance with approved field and laboratory protocols (Briggs et al. 2014). The presence or absence of GCN from each of the surveyed ponds was determined based on the results of the eDNA analysis.

The HSI assessment and subsequent eDNA survey was undertaken between mid-April and the end of June 2020.

The results of the great crested newt eDNA surveys undertaken to date are reported separately.

8. Survey Validity

The EP1HS results should be considered valid for up to 12 months from its completion (i.e. January 2022). Given the limited ecological interest of the arable habitat, which is by far the most abundant habitat type within the PEIR boundary, the data on these sections could be considered to remain valid for slightly longer because this habitat is very unlikely to change within one year. Data on non-arable habitats would need to be verified/updated after one year has elapsed.

Although most habitat classifications are unlikely to change within 12 months, given the mobility of species, there is a likelihood that protected/notable species activity could change within this timeframe. For example, badgers could establish new setts, trees could become suitable for use by roosting bats and ponds could become suitable or unsuitable for great crested newts.

9. CONCLUSIONS

An EP1HS was undertaken to record the habitats within the PEIR boundary and to identify the presence or likely presence of legally protected and notable species. The EP1HS covered approximately 65-70% of the PEIR boundary with the remaining 30% being currently unsurveyed due to no landowner access being granted. This area was reviewed using the Norfolk Living Maps from NBIS and where possible will be ground truthed once landowner access is obtained.

The EP1HS recorded a range of habitats within the PEIR boundary, most of which are heavily managed areas of farmland (i.e. arable land). There are some areas of rare or otherwise ecologically valued habitats such as woodlands, rivers/streams/ditches, ponds, grasslands and scrub, but these occupy a small proportion of the overall PEIR boundary.

The survey recorded occasional instances of invasive, non-native species, which will require further consideration if construction impacts to these areas cannot be avoided.

The EP1HS recorded numerous signs or confirmed records of protected species including badgers, reptiles and breeding birds. The survey also found a large number of trees with suitable roosting opportunities for roosting birds and abundant suitable habitat for nesting birds.

Further surveys have and will be undertaken within the appropriate survey periods during 2021 for these species and as agreed with relevant stakeholders (i.e. Natural England, Environment Agency, Broadland District Council, North Norfolk District Council and South Norfolk Council) at the ETG meeting held on the 28th January 2020.