A47 Blofield to North Burlingham Dualling

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6.1 Environmental Statement
Chapter 8 - Biodiversity

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8. Biodiversity

8.1 Introduction

8.1.1 As part of the EIA process, this Environmental Statement (ES) chapter reports the potential significant effects for biodiversity as a result of the Proposed Scheme. This assessment includes a review of the existing baseline conditions, consideration of the potential impacts and identification of proportionate mitigation and enhancement.

8.1.2 The approach to this assessment follows the Scoping Report (February 2018)[1] and subsequent agreed Scoping Opinion (March 2018) (**TR010040/APP/6.6**) for the Proposed Scheme, in combination with the most up to date guidance in the Design Manual for Roads and Bridges (DMRB), LA 108 Biodiversity.

8.1.3 Legislation, standards, best practice guidelines and regional policy relevant to this assessment are listed in ES Appendix 8.1 (**TR010040/APP/6.2**).

8.1.4 The main chapter text is supported by appendices (**TR010040/APP/6.3**):

- Appendix 8.1: Legislation and policy framework
- Appendix 8.2: DMRB biodiversity evaluation assessment methodology
- Appendix 8.3: 2018 Bat survey report
- Appendix 8.4: 2018 Breeding bird report
- Appendix 8.5: Wintering bird report
- Appendix 8.6: Confidential Badger report
- Appendix 8.7: Terrestrial invertebrate report
- Appendix 8.8: Great crested newt report
- Appendix 8.9: Reptile survey report
- Appendix 8.10: 2020 Bat survey report
- Appendix 8.11: Bat Activity crossing point report
- Appendix 8.12: 2020 Breeding bird report
- Appendix 8.13: Botany report

8.2 Competent expert evidence

8.2.1 The ecological technical lead for the Proposed Scheme has over 19 years' experience in UK ecological and environmental consultancy, as well as

[1] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010040/TR010040-000009-BLOF%20Scoping%20Report.pdf

experience of planning and conducting ecological survey work overseas. They are an active member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and have conducted and produced a wide variety of ecological surveys and reports, including; Phase 1 habitat and protected species surveys, ES chapters, habitat regulations assessments (HRA) and statutory agency licence applications. Furthermore, they have designed, implemented and managed mitigation projects for bats, badgers, otters, reptiles and great crested newts.

8.3 Legislative and policy framework

8.3.1 In preparation of this chapter, the following key legislature and policy documentation has been used, for full detail of the legislative scope of each document, please see ES Appendices 8.1 to 8.14 (**TR010040/APP/6.2**).

- National Networks National Policy Statement (2014) (Section 5)
- National Planning Policy Framework (2019) (Section 15)
  - Statement 9 (PPS9): Biodiversity and Geological Conservation (2005) (withdrawn)
  - ODPM 06/2005: Biodiversity and Geological Conservation – Statutory Obligations and their impact within the Planning system.
- Planning Policy (Regional) - The East of England Plan (2008)
  - POLICY ENV1: Green Infrastructure
  - Policy ENV3: Biodiversity and Earth Heritage
- Planning Policy (Local) – The Joint Core Strategy for Broadland, Norwich and South Norfolk Local Plan (Adopted January 2014) (Objective 9)
  - Policy 1: Addressing climate change and protecting environmental assets.
  - Policy 18: The Broads
  - Norfolk Biodiversity Action Plan
- Key Legislation (International/European)
  - The Habitats Directive (Council Directive 92/43/EEC1992)
  - The Birds Directive (Council Directive 2009/147/EC2009)
- Key legislation (National)
  - Conservation of Habitats and Species Regulations 2017
  - The Wildlife & Countryside Act 1981 (as amended)
  - The Countryside and Rights of Way (CRoW) Act 2000
  - The Protection of Badgers Act 1992
  - Hedgerows Regulations 1997
  - The Natural Environment and Rural Communities Act 2006

- Highways England Biodiversity Action Plan (HEBAP) 2015

8.4 Assessment methodology

8.4.1 An extended Phase 1 habitat survey and a desktop study were undertaken by two suitably qualified ecologists in April 2016 for all possible route alignments of the Proposed Scheme. This was updated during secondary surveys undertaken throughout 2017, to assess the ecological importance of the habitats over the Proposed Scheme and determine the requirement for Phase 2 species surveys. This chapter presents the results from the Phase 2 species surveys undertaken and does not reproduce the 2016 report.

8.4.2 Surveys have been undertaken in 2020 in order to update the data sets collected during 2017 and 2018 to ascertain how the habitats within the Proposed Scheme are used by protected species or species of conservation concern. This data has been assessed in order to inform appropriate mitigation.

8.4.3 The assessment within this biodiversity chapter of the ES follows the most recent Highways England guidance, the Design Manual for Roads and Bridges:

- Biodiversity design and ecological survey requirements - DMRB LD 118 Biodiversity Design
- Assessment and reporting of effects of highway projects on biodiversity - DMRB LA 108 Biodiversity

8.4.4 The assessment has also been undertaken in reference to the CIEEMs Ecological Impact Assessment (EcIA) guidance (2018).

8.4.5 The following key stages are involved in the EIA assessment:

- Identification and description of the baseline ecological conditions at the site and likely ecological constraints.
- Valuation of each individual ecological receptor.
- Identification of the zone of influence of the project and which important biodiversity resources could be significantly affected.
- Identification and characterisation of development activities that may effect ecological receptors.
- Identification of mitigation measures and enhancement opportunities to avoid or reduce the effects, as well as compensation measures where effects cannot be avoided.
- Identification of enhancement opportunities that will support environmental net gain.
- Evaluation of the significance of residual effects (nature and scale).

8.4.6 Ecological receptors are valued based upon their importance at a geographical scale as detailed in ES Appendix 8.2 Table A8.1 (**TR010040/APP/6.2**) (taken from DMRB LA 108 Biodiversity). Receptors valued at lower than local value were defined as having negligible value. Only ecological receptors of value (local value or higher), or those which have legal constraints (for example, badger and Invasive Non-native Species (INNS)) were taken forward in the impact assessment process.

8.4.7 Impacts are defined as the changes resulting from an action, and effects are defined as the consequences of these impacts. This section describes the assessment methodology for potential effects of the Proposed Scheme on the identified ecological receptors arising from construction and operation.

8.4.8 The level of impact upon ecological receptors is assessed in reference to the guidance of DMRB LA 108 Biodiversity, which is detailed in in ES Appendix 8.2 Table 8.2 (**TR010040/APP/6.2**). Activities that are not considered to have any observable impacts (either positive or negative) upon some ecological receptors were not taken forward in the impact assessment process. The predicted impacts for the Proposed Scheme are presented in Table 8-6 prior to the consideration of mitigation.

8.4.9 Professional judgement has been used to predict the level of the impact upon each receptor in accordance with DMRB guidance set out in LA 108 Biodiversity.

8.4.10 Impacts are considered in the relation to identified biodiversity resources and are divided into two categories:

- Construction activity impacts – includes those impacts which arise as a result of construction activities.
- Operation impacts - includes those impacts which arise as a result of activities during use of the Proposed Scheme (such as bird mortality through traffic collisions).

8.4.11 Activities during construction and operation of the Proposed Scheme have the potential to result in impacts on ecological features. The level of impact of these activities on the ecological features that have been carried through to assessment are characterised taking account of the following parameters:

- Positive (beneficial) or negative (adverse): a positive impact is a change that improves the quality of the environment or impacts that may halt or slow an existing decline in quality of the environment. A negative impact is a change which reduces the quality of the environment.
- Duration: the duration of an impact (permanent or temporary) is determined in relation to the ecological feature’s characteristics and lifecycle.

- Reversibility: an impact is considered to be irreversible (permanent) if it is "one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it". An impact is considered reversible (temporary) where "Spontaneous recovery is possible, or which may be counteracted by mitigation" (CIEEM, 2019).
- Extent: this is defined as the geographical area over which the impact will occur. In relation to sites and habitats, the extent and magnitude will be the same.
- Magnitude: magnitude refers to the 'size' of the impact such as the total area of habitat or the number of individuals impacted. The description of an impact's magnitude is quantitative where possible.
- Timing and Frequency: the number of times an activity occurs which will influence the resulting impacts and the timing of an impact upon the ecological feature's life-stages or seasonal behaviour.

8.4.12 Measures to avoid or reduce the impact on ecological resources have been considered throughout the development of the Proposed Scheme as part of an iterative process. Mitigation measures have been developed to reduce impacts during both the construction and operation phases as detailed within this chapter.

8.4.13 In accordance with CIEEM guidance, mitigation and design interventions for the Proposed Scheme are detailed in Section 8.6.

8.4.14 Cumulative impacts of multiple threats or pressures can make habitats and species more sensitive to change. The cumulative effects of the Proposed Scheme have been considered in combination with all other developments within a potential Zone of Influence (ZOI) including developments currently in planning, consented, being built, completed or operational.

8.4.15 The combined and cumulative residual effects of chapters 5 to 14 are considered on each receptor and reported in chapter 15 Cumulative Effects Assessment (**TR010040/APP/6.2**)).

8.4.16 The biodiversity chapter within the ES considers the potential temporary and permanent construction and operational impacts of the Proposed Scheme on ecological features (sites, habitats and species) based on CIEEM guidelines and DMRB LA 108 (2019), which are described in Table 8-6.

8.5 Study area

8.5.1 The Site extends along the existing A47 highway corridor between Blofield and North Burlingham. The A47 corridor is located within a largely rural landscape characterised by agricultural land use and dispersed settlement linked by a network of local roads.

8.5.2 The distance over which the Proposed Scheme could affect ecological receptors can vary, due to the variability between ecological receptors.

8.5.3 The Zone of Influence includes the red line boundary (Figure 1.1 Scheme overview ((**TR010040/APP/6.3**)), and the appropriate species-specific areas used for ecological surveys. These areas differ depending on the species or group and are presented in the Scoping Report for the Proposed Scheme (2018) and can be found in Table 8-1.

Table 8-1 : Zone of Influence for each biodiversity resource.

Biodiversity resource	Distance from the Development Consent Order (DCO) boundary
International and nationally designated sites (including Special Areas of Conservation (SAC), possible SACs (pSAC), Special Protection Areas (SPA), potential SPAs (pSPA), Wetlands of International Importance (Ramsar Sites), National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI) and ancient woodland	2km unless connected via a green corridor or hydrologically
SAC designated for bats	30km
Locally designated conservation sites (including Local Nature Reserves (LNR), Local Wildlife Sites (LWS) and RSPB reserves)	2km
Phase 1 habitat survey	100m
Great crested newts (GCN) *Triturus cristatus*	500m
Surveys for breeding birds and wintering birds and bat activity	500m
Aquatic invertebrates from within wetland sites that could be directly impacted by the Proposed Scheme	50m
Surveys for other ecological receptors, including badger *Meles meles* and reptiles	50m
Barn owl *Tyto alba* nests that could be directly impacted or disturbed by the Proposed Scheme	1.5km
Bats – roosts in trees and buildings	50m

Update to guidance and scope of assessment

8.5.4 Following a review of the updated 2019 guidance of DMRB LA 108 Biodiversity and LD 118 Biodiversity Design, the scope of the assessment in this chapter has been updated from the Scoping Report of the Proposed Scheme (2018). This is shown in Table 8-2.

Table 8-2 : Summary of DMRB changes for Nature Conservation and Biodiversity

Updates to assessment approach	Changes to approach set out in 2018 Scoping Report
Significance of effects has reverted to matrix approach (previously the approach in the guidance relied more on professional judgement).	The assessment of the significance of effects will draw on the table format using a matrix of the importance of resource and level of impact The assessments of importance of resource and level of impact are used to determine the significance of effects in a matrix approach.
LA 108 includes a specific requirement for monitoring where significant effects are predicted to remain following the implementation of design and mitigation measures. Mechanisms for implementation and criteria for success or failure must be included in the EIA Report.	Monitoring requirements for biodiversity receptors and geographic locations where significant residual effects are anticipated will need to be discussed with Natural England and set out in the EIA Report.

8.5.5 In summary, LA 108 (and LD 118) do not materially change the scope and method of assessment. The new guidelines now place a requirement for projects to identify opportunities for enhancement and net gain, and a requirement for monitoring of receptors where significant residual effects are predicted, which were not previously included. The assessment will be fundamentally similar to the previous approach but updated with the new guidance on terminology and reporting.

Consultation

8.5.6 Consultation has been undertaken in February 2020 with the following consultees:

- Natural England
- Environment Agency
- Norfolk Wildlife Trust (NWT)
- Norfolk County Council (NCC)
- Norfolk Biodiversity Information Service (NBIS)
- RSPB

8.5.7 Consultation was undertaken with Natural England and the Environment Agency to consider biodiversity net gain. The fragmented landscape presents an opportunity for biodiversity net gain and to mitigate habitat severance.

8.5.8 As a result of this consultation, NWT were contacted regarding the information and species data for the Roadside Nature Reserves (RNR) road verge habitat. A response was received in the same month stating that records must be sought from NBIS.

8.5.9 A bat survey data exchange between this Scheme and the proposed Norwich Western Link Road (NWL) was recommended in the meeting with NCC and Natural England held in February 2020.

8.5.10 NCC have been consulted regarding barbastelle bats *Barbastella barbastellus* and the wider mitigation proposals for bats by the Proposed Scheme. In addition, bat mitigation implemented as part of the completed northern distributor road and the associated monitoring data was discussed. Data was exchanged on the locations of barbastelle bats.

8.5.11 The RSPB approved the survey methodologies and design with regard to birds for the Proposed Scheme in April 2020 and NCC have been invited to comment. To date, NCC have not responded. In addition, the RSPB were consulted regarding barn owls, and made no objections regarding the barn owl survey methodology.

8.5.12 NBIS were consulted for records of designated sites and protected and notable species in 2017 and again in 2020 with no significant changes to the records received between the two.

Assessment criteria

8.5.13 The relative biodiversity resource importance is considered within the following geographical framework stated by DMRB LA 108 guidance (see Table A8.1 of ES Appendix 8.2 (**TR010040/APP/6.2**)):

- International or European
- National (UK)
- Regional (East of England)
- County (Broadlands)
- Local (Scheme and vicinity)

8.5.14 Reference to DMRB guidance LA 108 Biodiversity is used to determine the level of importance of a resource, and whether the resource should be carried through the assessment stage. For designated sites the importance depends on the level to which they are protected.

8.5.15 DMRB guidance LA 108 Biodiversity states that the importance of habitats depends on whether they are listed as priorities for conservation action (such as in the UKBAP or LBAP); their relative naturalness, rarity, size, level of connectedness with other habitats and whether they are threatened by the impacts from Proposed Scheme at a given geographic scale. Included are areas of habitat which meet the definition for designated habitats, but which are not themselves designated. The category levels in LA 108 Biodiversity are

international, national, regional, county, or local (Appendix 8.2 (**TR010040/APP/6.2**) for a full set of habitat criteria from LA 108 Biodiversity).

8.5.16 For species, the importance is determined according to their level of protection (all species which are protected under European or national legislation are important from an Ecological Impact Assessment (EcIA) perspective) and also their relative rarity (e.g. inclusion in red data lists), population size, how easily they spread or disperse and whether they are threatened. Included are species at a critical stage of their life cycle and populations of species that form critical parts of the wider population.

8.5.17 Legally controlled species (that is, Invasive Non-native Species (INNS)) listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) are considered important species because of the legal requirements to control or manage them.

8.5.18 Badgers are considered because of the legal requirements of The Protection of Badgers Act, 1992 (Appendix 8.1 (**TR010040/APP/6.2**) for details of the Act).

8.5.19 The level of impact is considered in line with in DMRB LA 108 guidance, which is described in detail in Table A8.2 of Appendix 8.2 (**TR010040/APP/6.2**). Professional judgement has been used to categorise the level of impact of each activity as being ‘major’, ‘moderate’, ‘minor’, ‘negligible’ or ‘no change’ and ‘adverse’ or ‘beneficial’.

8.5.20 Activities during construction and operation of the Proposed Scheme have the potential to result in impacts on ecological features. The level of impact of these activities on the ecological features that have been carried through to assessment are characterised taking account of the following parameters:

- Positive (beneficial) or negative (adverse)
- Duration: the duration of an impact (permanent or temporary)
- Reversibility
- Extent or Magnitude
- Timing and Frequency

8.5.21 Magnitude of impact refers to size, amount, intensity and volume, as per the CIEEMs Ecological Impact Assessment (EcIA) guidance (2018).

8.5.22 The term ‘level of impact’ has been used in place of ‘magnitude’ for the purposes of this ES, as stated in the DMRB guidance in LA 108 Biodiversity.

8.5.23 The importance of the ecological resource and the level of impact has been used to determine the significance of effects taking account of the matrix in Table 8-3,

in combination with professional judgement. The significance of effects that are categorised as 'moderate' or above are considered significant in the context of the EIA Regulations.

Table 8-3 : Significance of effects matrix

Importance	Level of impact				
	No change	**Negligible**	**Minor**	**Moderate**	**Major**
International or European	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
National (UK)	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Regional (east of England)	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
County (Broadlands)	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Local (scheme and vicinity)	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

8.5.24 Mitigation was deemed as being required where one or both of two criteria were met:

i. the ecological resource is offered legal protection and a mandatory obligation is imposed to provide measures to ensure that an offence would not be committed (such as badgers and INNS).

ii. because impacts which are significant in EIA terms have been identified in the assessment process. Mitigation is proposed (where practicable) at the relevant scale of significance, using the following hierarchy: Avoidance, Mitigation, Compensation, Enhancement.

8.5.25 Residual effects take into consideration committed mitigation and design interventions, and these are assessed and detailed in Table 8-9.

8.6 Assessment assumptions and limitations

8.6.1 The following assessment assumptions and limitations have been identified:

Bats

8.6.2 One static bat detector was damaged during the surveys, data was retrieved however this led to static surveys being repeated to make sure data was collected for each location during the designated period. Equipment failures due to battery life also occurred in 2017 and 2018 on the transect surveys and the automatic surveys. These failures are not considered to be a constraint to the

results of the survey as a full set of data was gathered to span the months of April to October (inclusive) to support the assessment.

Birds

8.6.3 During the first wintering survey in 2018, weather conditions were not ideal, with low visibility caused by mist. Birds were mainly identified and recorded through audio location, with fewer birds recorded visually compared to surveys two and three.

8.6.4 The sound of the adjacent A47 in some areas made the audio identification of birds during the surveys almost impossible in the 2018 and 2019 surveys. Birds were present in isolated areas adjacent to the main road, although were only picked up visually.

8.6.5 There is potential for species to be missed or go unnoticed due to the nature of wintering bird surveys and possibilities of birds not vocalising or being located in dense vegetation. There is also potential to miss nocturnal species as the surveys were undertaken in daylight hours.

8.6.6 Despite the above limitations, it is not considered that the assessment of the level of impact upon birds has been affected as the species data collected throughout 2017 and 2018 do not significantly vary.

Terrestrial invertebrates

8.6.7 Field work extended from early April until late May 2018, which came following unsettled weather during late winter and early spring. Temperatures in March and the first half of April were below average, and rainfall was above average, resulting in a cool, wet and delayed spring. The conditions leading up to the 2018 survey season are perceived to have delayed emergence of many of our spring fauna. However, the subsequent more settled and warmer weather during the survey period is considered to have resulted in the appearance of both spring and summer faunas in a narrower timeframe than typically occurs. The use of static trapping, particularly the malaise trap, is likely to have mitigated the effects of this unusual seasonal phenology and therefore, the species recorded are considered to be an accurate reflection of the fauna present within the zone of influence.

8.6.8 As a result of the COVID-19 pandemic, all surveys planned to be undertaken between April and June 2020 were delayed, in line with guidance on social distancing measures.

8.6.9 Great crested newt eDNA and full conventional surveys were limited by the covid-19 pandemic occurring during the survey season. Not all eDNA surveys

planned were undertaken and no conventional surveys were undertaken. These surveys will be completed preconstruction. Where great crested newts are identified, licences will be required.

8.6.10 It has been assumed that impacts of negligible significance, and the majority of impacts of minor significance will be mitigated through the application mitigation measures described in best practice guidance.

8.6.11 Ecological receptors which are not connected to the Proposed Scheme either geographically or hydrologically have been excluded from the assessment within this ES. It is anticipated that there will be no impact and therefore no effects upon these receptors. This exclusion does not apply to any sites within 30km of the Proposed Scheme that may be designated for bats.

8.7 Baseline conditions

8.7.1 A baseline report in the form of an Environmental Assessment Report (EAR) was produced in December 2017 for the Stage 2 Options Assessment. It includes the desk study and Phase 1 habitat survey information, and details the survey methodologies and results for the following Phase 2 biodiversity receptors:

- Badgers
- Bats
- Birds
- Botany
- Fungi
- Great crested newts
- Habitats and designated sites
- Hedgerows
- Invasive species
- Invertebrates
- Otters
- Reptiles
- Water voles

8.7.2 Further phase 2 surveys were undertaken in 2018 in order to gain a full data set for each biodiversity resource that may be supported by the habitats throughout the alignment of the Proposed Scheme. The biodiversity resources that were surveyed in 2017 and 2018 were as follows:

- Badgers (also in 2019)
- Bats
- Botany
- Great crested newts
- Breeding birds
- Overwintering birds
- Terrestrial invertebrates

8.7.3 Surveys undertaken in 2020 include updates of bat emergence, bat crossing point surveys, great crested newt, breeding birds, barn owl, terrestrial invertebrates, botany including hedgerows and reptiles.

8.7.4 Technical species reports have been prepared as appendices for key species groups, detailing survey methodologies, results and figures within this ES chapter, in Appendices 8.3 to 8.14 (**TR010040/APP/6.2**).

Designated sites

8.7.5 A number of nationally and locally designated sites occur within the study area, which are presented in Table 8-5. There are no possible Special Areas of Conservation (pSAC) or potential Special Protection Areas (pSPA) within the ZOI. Species and populations that are possible considerations for qualifying designations are detailed below. The data was updated in August 2020 and locations of the designated sites are provided in Figure 8.1 Designated sites (**TR010040/APP/6.3**).

Table 8-4 : Summary of existing nature conservation designated sites.

Designated site	Distance from the site
The Broads SAC - largest example of calcareous fens in the UK with examples of transition mire. Rare fauna and flora species as well as protected freshwater mammals are qualifying features: Desmoulin's whorl-snail *Vertigo moulinsiana*, little whirlpool ram's-horn snail *Anisus vorticulus*, fen orchid *Liparis loeselii*, and otter *lutra lutra*.	2.5km south west (from A47 at Blofield)
Broadland SPA - Annex 1 species from which the site derives its designation include: Eurasian bittern *Botaurus stellarisi*, Bewick's swan *Cygnus columbianus bewickii*, marsh harrier *Circus aeruginosus*, hen harrier *Circus cyaneus* and ruff *Philomachus pugnax*.	1.9km south west (from A47 to nearest point)
Broadland Ramsar - Low-lying wetland complex straddling the boundaries between east Norfolk and northern Suffolk. Includes river valley systems of the Bure, Yare, and Waveney. Occupying the same extent as The Broads (SAC).	2.5km south west (from A47 at Blofield)
Breydon Waters Ramsar - Qualifies under criterion 6 by supporting species/populations occurring at levels of international importance, species with peak count for Bewick's swan *Cygnus columbianus bewickii* and northern lapwing *Vanellus vanellus*. Species and populations identified subsequent to designation for future possible consideration under criterion 6, with peak count in winter: pink-footed goose *Anser brachyrhynchus*, eurasian wigeon *Anas Penelope,* northern shoveler *Anas clypeata*, golden plover *Pluvaialis apricaria apricaria* and black-tailed godwit *Limosa limosa islandica.*	8km south east (from Acle on the A47)
Breydon Waters SPA - Annex 1 species that the site derives its designation include: Bewick's swan *Cygnus columbianus bewickii*, avocet *Recurvirostra avosetta*, golden plover *Pluvialis apricaria*, ruff *Philomachus pugnax* and common tern *Sterna hirundo*. The site is also designated for lapwing *Vanellus vanellus*.	8km south east (from Acle on the A47)

Designated site	Distance from the site
Decoy Carr, Acle SSSI - Lowland, fen, marsh, and swamp with wet carr woodland. Designated for floral species of note such as marsh sow-thistle *Sonchus palustris*, mixed fen vegetation, and rare mosses like *Cinclidium stygium* and *Camptothecium nitens.*	1.85km south of the Proposed Scheme
Paston Great Barn SAC (designated for *Barbastellus barbastelle* bat maternity roost and populations)	24.6km north of the Proposed Scheme
Ancient semi-natural woodland	1.90km north of the Proposed Scheme at Walsham Wood
Ancient replanted woodland	2km north west of the Proposed Scheme at Pedham Grove
Lingwood Community Woodland - This broadleaved plantation woodland was planted in 2003 and is 4.69ha. It was part of the Norfolk County Council tree planting schemes, and connects with Burlingham Woodland Walks.	0.07km south (from A47 at Lingwood)
Church and Drive Plantations County Wildlife Site (CWS)	0.14km north (from A47 at North Burlingham)
Woodbastwick Road Roadside Nature Reserve (RNR)	0.29km north (from A47 at Blofield)
Belt Plantation CWS	0.56km north (from A47 at North Burlingham)
Howe's Meadow CWS	0.99km north (from A47 at Blofield)
Acle Road RNR	1-1km north (from Acle on the A47)
Birch Grove and Dawling's Wood CWS	1.39km north east (from A47 at Blofield)
Damgate Wood CWS	1.42km south (from Acle on the A47)
Highnoon Farm Braydeston CWS	1.60km north (from A47 on High Noon Lane)
Land adjacent to Witton Lane CWS	1.65km north (from A47 at Yarmouth)
Walsham Wood CWS	1.90km north (from A47 at Pedham)
Long Lane RNR	2km south west (from Lingwood on the A47)

8.7.6 Six priority habitats listed on Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006) are recorded within the study area. These are: arable field margin, eutrophic standing water, hedgerows, lowland mixed deciduous woodland, traditional orchards and pond habitats (Figure 8.2 Priority habitats (**TR010040/APP/6.3**)). Habitats listed on the Norfolk Biodiversity Action

Plan that are present both within and adjacent to the Proposed Scheme boundary are allotments.

Bats

Aerial tree survey

8.7.7 A total of 93 trees were found to have moderate to high bat roost potential (BRP) and these were climbed and inspected for hibernation roosts in January 2017. None of the trees were identified as having hibernation roosts. Twenty trees were also climbed and inspected for summer roosts in May 2017. No summer roosts were identified during the climbing surveys, but roost potential was identified.

Dusk emergence and dawn return to roost survey

8.7.8 Either one bat emergence or one return to roost survey was completed on each of the trees and buildings identified as having suitability for roosting bats (following bat roost potential appraisals undertaken in January and February 2017). A second survey was undertaken on each of the same features in 2018. Features assessed in 2017 as having high bat roost potential or a confirmed roost had three surveys undertaken. All dusk emergence and dawn re-entry surveys have been updated in 2020.

8.7.9 In 2017, bat day roosts were found in five buildings and two trees within the 50m buffer of the Proposed Scheme: The Lindens (One common pipistrelle and one brown long-eared bat); Oaklands (one common pipistrelle); three buildings at Poplar Farm (three common pipistrelle); The White House (one common pipistrelle); St Andrew's Church (four common pipistrelle) and Trees 5 (T5) (one common pipistrelle) and 67 (T67) (one common pipistrelle). The technical species report shown in ES Appendix 8.3 (**TR010040/APP/6.2**) contains a map of where these roosts are located.

8.7.10 The 2018 surveys identified a total of seven day roosts at T1 (one unidentified pipistrelle), T53 (one unidentified pipistrelle), three buildings at Poplar Farm (two common pipistrelle and two brown long-eared), The Lindens (three common and soprano pipistrelle) and Hall Cottages (one soprano pipistrelle) that would be either destroyed or disturbed by the Proposed Scheme. In addition to these roosts, the 2017 bat surveys identified roosting activity at T5, T67, Oaklands, The White House barn and St Andrew's Church. No further surveys were conducted at St Andrew's Church following changes to the scheme design which put it beyond the zone where disturbance would occur. The roosts at T5, T67, Oaklands (one common pipistrelle *Pipistrellus pipistrellus*) and The White House (one common pipistrelle) are characterised as day roosts as a further two surveys in 2018 revealed no roosting activity at these locations.

8.7.11 The results of the 2020 update surveys found roosts in Poplar Farm - brown long-eared bat day roost (three bats) and feeding roost in large thatched barn; brown long-eared feeding roost in building in north-east corner of courtyard to the east of large thatched barn; common pipistrelle day roost (minimum three bats) in building in north-eastern corner of courtyard to east of large thatched barn.

8.7.12 The Lindens – common pipistrelle day roost (two bats); The White House – common pipistrelle day roost (one bat); Hall Cottages (west) – common pipistrelle day roost (one bat); Tree T1 – soprano pipistrelle day roost (one bat). In total, four trees and five buildings were determined to contain bat roosts and are within the 50m buffer zone of the Proposed Scheme.

Bat activity survey

8.7.13 Bat activity was generally considered to be low during monthly walked transect surveys undertaken between July and October 2017, and April and June 2018 with the most bat activity identified on land surrounding St Andrew's Church and St Peter's Church ruins in North Burlingham.

8.7.14 Static detector surveys undertaken in 2017 identified the highest number of bat passes in October behind farm buildings to the north of the A47 and the west of South Walsham Road. The corner of Lingwood Lane and the A47 had the highest recorded number of noctule *Nyctalus noctula* passes in August and September.

8.7.15 The activity surveys have revealed a total of eight species commuting and foraging across the site. The majority of these are common species (common and soprano pipistrelle *Pipistrellus pygmaeus*, noctule, Leisler's *Nyctalus leisleri* and brown long-eared bats *Plecotus auritus*). Calls from bats of the genus *Myotis* were also recorded but could not be identified to species level. One such bat call was recorded during Transect Three in May 2018, with a further seven bats, all south of the existing A47 and to the west of Poplar Farm recorded during emergence surveys. Two barbastelle bats were recorded on Transect Three and three bats of this species were recorded to the east of the Proposed Scheme in emergence surveys. One Nathusius' pipistrelle bat *Pipistrellus nathusii* was recorded in April 2018 on Transect Two to the north east of the existing A47. Barbastelle and Nathusius' pipistrelle bats are considered rare species. Common pipistrelle was the most frequently recorded species.

8.7.16 Bat activity crossing point surveys have been undertaken between July and August 2020 in order to understand how and where bats are crossing the existing road. Based on the activity survey data obtained in 2017 and 2018, five potential crossing points were initially surveyed on two occasions.

- Crossing point 1: Where High Noon Lane and Hemblington Road meet the A47
- Crossing point 2: The junction between Lingwood Road and the A47
- Crossing point 3: Point west of North Burlingham where the Main Road meets the A47
- Crossing point 4: Point east of North Burlingham where the Main Road meets the A47
- Crossing point 5: Point where the B1140 Acle Road from the south meets the A47.

8.7.17 Based on the results of the initial two surveys, three of the five crossing points were found to have bats crossing the road and had a further six surveys totalling eight in all. The surveys found that:

- Crossing point 1: The highest number of bats confirmed crossing the A47 at crossing point one recorded in any one survey was seven bats. Overall, four species were recorded crossing at this point including common and soprano pipistrelle, noctule and serotine.
- Crossing point 2: The highest number of bats confirmed crossing the A47 at crossing point two recorded in any one survey was seven bats. Overall, six species were recorded crossing at this point including common and soprano pipistrelle, noctule, brown long-eared bat, barbastelle and serotine.
- Crossing point 5: The highest number of bats confirmed crossing the A47 at crossing point five recorded in any one survey was three bats. Overall, two species were recorded crossing at this point including soprano pipistrelle and noctule.

Great crested newt

8.7.18 Habitat suitability index (HSI) assessments were carried out in 2016 on all identified water bodies within the ZOI for all of the route options for the Proposed Scheme. There were 66 water bodies in total; 27 were scoped out using professional judgement and HSI assessment scores, as they were either dry or entirely unsuitable. Ponds that were assigned HSI ratings of below average, average, good or excellent were subject to environmental DNA (eDNA) surveys to confirm presence or likely absence of great crested newt (GCN).

8.7.19 Of the 39 ponds considered for eDNA survey there were four positive results, two ponds were false positive likely due to sediment, three indeterminate and the remaining ponds were negative. In 2017, one pond was re-tested for GCN eDNA following an indeterminate result in 2016, and two additional ponds were tested for GCN eDNA in 2017. One pond was tested as containing GCN eDNA, which was subsequently filled in by the landowner.

8.7.20 Population size class surveys (manual) techniques were then undertaken on five ponds - all ponds which tested positive as well as a garden pond, which was identified after the eDNA surveys had been carried out. However, no GCN were found in these ponds.

8.7.21 HSI surveys were undertaken in 2019 on ponds previously not surveyed.

8.7.22 These surveys have been updated in 2020, firstly with HSI assessments on 24 ponds within 500m of the Proposed Scheme boundary. Fifteen further ponds could not be accessed in the short time left after covid-19 delays and the end of the survey season for GCN. From the 24 ponds assessed, 11 ponds were dry and eDNA surveys were required on 13 ponds to ascertain presence or likely absence of the species in each pond. Seven of these ponds could be accessed for eDNA sampling and all of these were negative for GCN eDNA.

Breeding birds

8.7.23 A single breeding bird survey visit was undertaken in July 2017, where breeding activity was difficult to determine due to the timing of the survey visit at the later stages of the breeding bird season. Three further breeding bird surveys were undertaken from March to June 2018 to cover the early part of the breeding season that was missed in 2017. The findings are detailed below.

8.7.24 A total of 73 species were recorded within the ZOI during the suite of surveys in 2017 to 2018, of which:

- Seven species are listed on Wildlife and Countryside Act (1981) Schedule 1
- Fifteen species are listed on NERC S41
- Fifteen were Birds of Conservation Concern (BoCC Red List species)
- Thirteen were Birds of Conservation Concern (BoCC Amber List species)
- Eight are listed as LBAP species

8.7.25 Of the 73 species, 22 were confirmed as breeding. This was concluded through the identification of recently fledged young, adults visiting nests and adults carrying food.

8.7.26 Twenty species were considered probable breeders. This was concluded through pairs observed in suitable breeding habitat, birds permanently on territories, agitated behaviour, nest building and courtship displays.

8.7.27 Twelve species were considered as possibly breeding. This was concluded by birds either being observed in suitable breeding habitat or singing males present in suitable habitat. The other 19 species of birds recorded were classed as non-breeders.

8.7.28 The full technical breeding bird report is shown in ES Appendix 8.4 (**TR010040/APP/6.2**) 2018 Breeding Bird Report and details the methodology and results of the survey undertaken with figures and full species lists.

8.7.29 Four breeding bird surveys were undertaken between March and June 2020. A total of 61 species were recorded on site during the breeding bird surveys, of which twenty-seven species of importance were identified. These consisted:

- Five Wildlife and Countryside Act schedule 1 species
- Eleven BoCC red listed species
- Eleven BoCC amber listed species

8.7.30 The remaining species were all BoCC green listed consisting of common species, mainly associated with woodland, hedgerows and gardens that can be found along the A47.

8.7.31 None of the breeding assemblages of either the SPA or Ramsar were recorded during the surveys.

8.7.32 The full technical breeding bird report is shown in ES Appendix 8.11 (**TR010040/APP/6.2**) 2020 Breeding Bird Report and details the methodology and results of the survey undertaken with figures and full species lists.

Barn owls

8.7.33 A single barn owl survey was undertaken in July 2018. This survey inspected three barn owl nest boxes across the site, and suitable nesting habitat in the form of barns, and in buildings where there is anecdotal evidence of historical nesting sites. Landowners were interviewed to help develop the understanding of the location and distribution of the species across the ZOI.

8.7.34 A barn owl nest was found in one of the three nest boxes. However, the eggs were found to not be incubated and it was concluded that this nest had failed. No other barn owl nests were observed in the remaining survey locations.

8.7.35 A barn owl survey was undertaken in August 2020. Out of eight locations surveyed, four had evidence of breeding or roosting barn owls. They were located at Home Farm, St Peter's Church Ruins, Burlingham Lodge Barns and Coxhill Farm.

Passage bird surveys

8.7.36 A total of 13 notable bird species were recorded during surveys undertaken in September 2017. Nine bird species recorded are classed as migrant or resident birds and four are classed as passage or winter visitors. This does not meet any

importance thresholds as the assemblage consists of fewer than 25 species over the entire Proposed Scheme. The following notable species and assemblages were recorded:

- two species listed in the Norfolk BAP: song thrush *Turdus philomelos* and skylark *Alauda arvensis*
- six species listed on the BoCC (2009) Red List: linnet *Linaria cannabina*, lapwing *Vanellus vanellus*, skylark, song thrush and herring gull *Larus argentatus*
- seven species listed on the BoCC (2009) Amber List: pink-footed goose *Anser brachyrhynchus*, black headed gull *Chroicocephalus ridibundus*, common gull *Larus canus*, mute swan *Cygnus olor* and kestrel *Falco tinnunculus*
- five species which are NERC Act (2006) section 41 species: linnet, herring gull, lapwing, skylark and song thrush

8.7.37 Further passage surveys were undertaken in April 2018 as part of the breeding bird survey to record spring passage migration. This ensures that impacts to SPA qualifying species are assessed appropriately. Two notable passage migrant species listed on the BoCC (2009) Red List were recorded: fieldfare *Turdus pilaris* and redwing *Turdus iliacus*.

8.7.38 The results of the autumn passage survey are detailed in the full technical overwintering bird report, shown in ES Appendix 8.5 (**TR010040/APP/6.2**). This report details the methodology and results of the survey undertaken with figures and full species lists.

Overwintering birds

8.7.39 Two Schedule 1 species: fieldfare and redwing were observed on land within the ZOI during surveys undertaken in December 2017 and February 2018.

8.7.40 In January 2019, two additional Schedule 1 species were found flying over the ZOI: marsh harrier *Circus aeruginosus* and Peregrine falcon *Falco peregrinus.*

8.7.41 Potential impacts on overwintering and breeding birds are be considered as part of this ES.

8.7.42 The full technical overwintering bird report is shown in ES Appendix 8.5 (**TR010040/APP/6.2**) details the methodology and results of the survey undertaken with figures and full species lists.

Badgers

8.7.43 A badger survey was undertaken in April 2018 and again in August 2019 in order to gather a full data set. No badger setts or signs of badger activity were found within the 50m ZOI of the proposed scheme. No further assessment has been made with regard to badgers. Precautionary measures in the general mitigation for other species, such as covering trenches at night, or inserting a ramp to provide an escape route for trapped animals and avoiding night lighting where possible would provide mitigation for badgers in the unlikely event that they should venture into the site from the wider area.

Reptiles

8.7.44 No reptiles were noted during the 2017 survey.

8.7.45 Reptile surveys have been undertaken between June and September 2020 in order to update the results of the 2017 survey and to further understand if and how reptiles utilise habitats within the footprint of, and within 50m of, the Proposed Scheme. One female, adult grass snake *Natrix natrix* was found south west of North Burlingham but overall a low population of reptiles was found within the ZOI.

Otters

8.7.46 Surveys previously undertaken in February 2017 noted there was no suitable habitat present to support otter *Lutra lutra*.

8.7.47 Otter surveys are not required for the Proposed Scheme in 2020 as there is no habitat on the chosen route alignment to support otters.

Water voles

8.7.48 Surveys undertaken in February 2017 by Highways England found the ZOI of the Proposed Scheme to have limited habitat to support water vole *Arvicola amphibius*, and no field signs were recorded.

8.7.49 Water vole surveys are not required for the Proposed Scheme in 2020 as there is no habitat within the study area of the chosen route alignment to support water voles.

Aquatic invertebrates

8.7.50 Surveys for aquatic invertebrates were undertaken in June 2017. Results of these surveys from sweep netting showed that waterbodies are of generally poor water quality due to pollution from farming activities. There were no notable species recorded, the site is currently of low value for aquatic invertebrates.

8.7.51 No recommendations are made with regard to aquatic invertebrates within the 50m ZOI of the Proposed Scheme as there is no habitat to support aquatic invertebrates.

Terrestrial invertebrates

8.7.52 Results from a walkover survey in June 2017 assessed the majority of the Proposed Scheme as arable farmland of limited potential to support a diverse invertebrate fauna. Few habitat features of value were present such as tussocks, banks or bare patches which would support nesting, over-wintering or basking invertebrates, and poor vegetation structure.

8.7.53 Three visits were undertaken in April and May 2018, in order to collect a full data set. The assessment made in 2018 was that the site is of low importance for invertebrates. The survey reported 10 species of conservation concern from the site and a further three species where the conservation status is in need of review.

8.7.54 These surveys have been repeated in 2020 in order to update the data collected in 2018. This survey recorded 14 species with a current conservation status, but the status of at least two of these needs to be reviewed by the notifying bodies in light of recent range expansions. It may be that the species are more prolific and their conservation value would be reduced. Much of the site is of limited value to terrestrial invertebrates because of the large areas of agricultural land. In terms of invertebrate conservation, the most interesting habitats across the site are old trees with decay features.

Botanical and hedgerows

8.7.55 Habitats were assessed during the Phase 1 Extended habitat survey undertaken during 2017. Habitats present were arable fields (and margins), poor semi-improved grassland, tall ruderal, dense and scattered scrub, plantation broad-leaved woodland and semi-natural mixed woodland.

8.7.56 A Phase 2 botanical walkover survey was undertaken in July 2017 in which plant species were assessed using the DAFOR scale (DAFOR relates to plant species abundance at a site where D = dominant, A = abundant, F = frequent, O = occasional, R = rare). The majority of habitat present was arable fields of little botanical interest. Field margins and road verges were a mix of poor semi-improved grassland and tall ruderal strips generally between 2m and 4m wide, although with a few larger patches. All showed signs of nutrient enrichment and regular management, and no species indicative of better quality grassland were recorded. Tall ruderal, scattered, and dense scrub were all generally marginal vegetation or covering rougher ground unsuitable for farming and contained little botanical interest.

8.7.57 The main woodland areas were assessed as being relatively young and planted at roughly the same period with limited vegetation structure. Tree species were mixed and largely native but equal aged with little new growth or understory and limited standing or fallen deadwood. Ground flora was similarly limited due to the closed canopy although there were some deliberately opened glades which are developing a limited ground flora.

8.7.58 Two important hedgerows were recorded within the ZOI in 2017. A further two hedgerows were found to be species-rich but assessed as being under 30 years old and therefore not considered important hedgerows, as stated in the Hedgerow Regulations 1997. The remaining hedgerows were species poor and not considered important hedgerows, being largely hawthorn-dominated.

8.7.59 Hedgerow and DAFOR surveys have been undertaken in 2020 in order to update the survey data undertaken in 2018. The majority of the area surveyed was found currently under arable cultivation. No county level habitats will be directly affected. No rare species were found during the surveys, with the majority of the habitats (other than arable) comprising poor semi-improved grassland areas with a high abundance of false oat grass.

8.7.60 Eighteen hedgerows were recorded in total, which will be impacted by the Proposed Scheme. Two potentially important hedgerows under the Hedgerow Regulations will be bisected.

Fungi

8.7.61 The survey corridor (ZOI) has been assessed as of low value during a fungi survey undertaken in October 2017 as only abundant and widespread fungi species were recorded. No protected or notable fungi were recorded during the survey. The current soil conditions are considered to be poor for supporting fungi due to extensive nitrogen deposition. This is due to sources such as fertiliser spray drift and poor air quality through emissions from long-term vehicle usage of the existing A47. Therefore, it is considered unlikely that the soil in the ZOI of the proposed scheme will support protected or notable species of fungi in the future.

8.7.62 No recommendations for further survey are made with regard to fungi within the 50m ZOI.

Other species

8.7.63 No specific surveys have been undertaken for other notable species such as hedgehog *Erinaceus europaeus* and brown hare *Lepus europaeus*. However, incidental sightings of these species have been recorded during surveys of other

ecological receptors throughout the alignment of the Proposed Scheme. Common toad *Bufo bufo* are considered likely to be in the area.

8.7.64 Additionally, data for mortality and injury of protected species from the Highways England Environmental Information System (EnvIS) has been assessed and no road kill or any notable or protected species were reported within it.

Invasive non-native species

8.7.65 There were no invasive species noted during the survey undertaken in 2017. No invasive species were found during surveys for other ecological receptors in 2018 or 2020.

Valuation of ecological receptors

8.7.66 The assessment criteria for the valuation of ecological receptors are detailed in section 8.3.

8.7.67 A summary of the valuation of and level of threat from the Proposed Scheme to ecological receptors is provided in Table 8-5.

Table 8-5 : Summary of valuation of ecological receptors.

Ecological receptors	Valuation
The Broads SAC	International
Broadland SPA and Ramsar	International
Breydon Waters SPA and Ramsar	International
Decoy Carr, Acle SSSI	National
Paston Great Barn SAC	International
Lingwood Wood Community Woodland	Local
Church & Drive Plantations CWS, Belt Plantation CWS, Howe's Meadow CWS, Birch Grove and Dawling's Wood CWS, Damgate Wood CWS, Highnoon Farm Braydeston CWS, Land adjacent to Witton Lane CWS, Walshm Wood CWS	County or Unitary Authority Area
Woodbastwick Road RNR, Acle Road RNR, Long Lane RNR	County or Unitary Authority Area
NERC Act (2006) Section 41 Priority habitats – important and species-rich hedgerows, standing water and traditional orchards adjacent to DCO Boundary of the Proposed Scheme.	National
Ancient Woodland – 1 parcel of ancient and semi-natural woodland and 1 parcel of ancient replanted woodland	National
Dense and scattered scrub - within and adjacent to the DCO boundary of the Proposed Scheme.	Negligible
Scattered trees – within and adjacent to the DCO boundary of the Proposed Scheme.	Local
Grasslands (poor semi-improved and amenity) – within and adjacent to the DCO boundary of the Proposed Scheme.	Local
Tall ruderal – within and adjacent to the DCO boundary of the Proposed Scheme.	Negligible

Ecological receptors	Valuation
Hedgerows – Species poor defunct within and adjacent to the DCO boundary of the Proposed Scheme.	Local
Plantation woodland – broadleaved and mixed plantation woodland.	Negligible
LBAP Allotments – within and adjacent to the DCO boundary of the Proposed Scheme.	County
Dry Ditches - within and adjacent to the DCO boundary of the Proposed Scheme.	Negligible
Buildings – church yards and cemeteries.	County
Buildings – within and adjacent to the DCO boundary of the Proposed Scheme.	Negligible
Terrestrial Invertebrates – within and adjacent to the DCO boundary of the Proposed Scheme.	Local
Aquatic Invertebrates – within and adjacent to the DCO boundary of the Proposed Scheme.	Negligible
Birds – (including barn owl) within and adjacent to the DCO boundary of the Proposed Scheme.	Regional
Birds – Broadlands SPA; Breydon Waters SPA.	International
Bats – Paston Great Barn SAC.	International
Bats – within and adjacent to the DCO boundary of the Proposed Scheme.	National
Badgers – within and adjacent to the DCO boundary of the Proposed Scheme.	Local (although subject to legal constraints)
Fungi – within and adjacent to the DCO boundary of the Proposed Scheme.	Negligible
Great crested newt – within a 500m buffer from the DCO boundary of the Proposed Scheme.	County (if found in remaining surveys to be completed)
Reptiles – within and adjacent to the DCO boundary of the Proposed Scheme.	Local
Species of Principal Importance (hedgehog, common toad and brown hare) – within and adjacent to DCO boundary.	Local

8.8 Potential impacts

8.8.1 Habitats Regulations Assessment (HRA) screening has been undertaken to assess the likelihood of the Proposed Scheme to result in any Likely Significant Effects upon the National Site Network (previously referred to as Natura 2000 sites) or their designated features. This has been undertaken in reference to the Habitats and Species Regulations 2017 (as amended). No significant effects were concluded in the Habitats Regulations Assessment screening report upon international designated sites or the nationally designated SSSI. In addition, the air quality assessment (Chapter 5) and the road drainage and water environment assessment (Chapter 13) found no significant impacts on the designated sites from the Proposed Scheme. The CWSs and RNRs listed in section 8.6.2 were scoped out as they are too far from the Proposed Scheme to be affected.

8.8.2 Professional judgement has been used to determine whether an impact is likely to occur on each biodiversity resource. The Proposed Scheme is not due to impact some biodiversity resources. The following biodiversity resources are unlikely to be impacted by the Proposed Scheme, and therefore have not been carried forward in the impact assessment:

- The Broads SAC
- Broadland SPA and Ramsar
- Breydon Waters SPA and Ramsar
- Paston Great Barn SAC
- Decoy Carr, Acle SSSI
- Ancient Woodland – too distant from the Proposed Scheme to be affected
- Woodbastwick Road RNR
- Acle Road RNR
- Long Lane RNR
- Church & Drive Plantations CWS
- Belt Plantation CWS
- Howe's Meadow CWS
- Birch Grove and Dawling's Wood CWS
- Damgate Wood CWS
- Highnoon Farm Braydeston CWS
- Land adjacent to Witton Lane CWS
- Walsham Wood CWS
- Buildings – churchyards and cemeteries – outside of the Proposed Scheme boundary
- Fungi – poor habitat
- Aquatic invertebrates – poor habitat
- Otter – no suitable habitat
- Water vole – no suitable habitat
- Badger – not present

8.8.3 This section presents the potential impacts of the proposals and considers their potential to give rise to significant environmental effects. The level of predicted impacts has been considered in combination with the sensitivity of the baseline to determine the potential for significant effects.

8.8.4 Activities likely to cause significant impacts as a result of the Proposed Scheme include:

Construction (temporary and permanent impacts)

- Site clearance and land-take of habitats, and barrier effects upon habitats (can be both temporary and permanent)

- Physical damage to vegetation from smothering, damage to roots and changes to hydrology or soil chemistry (can be both temporary and permanent)
- Loss of foraging and breeding areas due to fragmentation of habitats and severance of linear features through road construction (can be both temporary and permanent)
- Pollution of habitats from increased surface water runoff and accidental chemical and pollutant spillage (temporary)
- Increased atmospheric, noise and light pollution during construction (temporary)
- Direct mortality of local fauna due to site plant collisions (permanent)
- Spread of INNS and diseases (can be both temporary and permanent)

Operation (permanent impacts)

- Vegetation clearance for maintenance of roads, verges and associated infrastructure
- Tree maintenance associated with road safety
- Increased air quality and noise levels upon ecological receptors due to increase in use of the road by vehicles
- Barrier effect of new road caused by increased width
- Disturbance of breeding species (such as birds and reptiles) and their resting places due to light spill
- Mortality of local flora and fauna due to pollution events and spills
- Direct mortality of species due to road traffic collisions (RTC).

8.8.5 The predicted impacts for the Proposed Scheme are presented in Table 8-6 prior to the consideration of mitigation.

Table 8-6 : Predicted impacts on ecological receptors.

Ecological receptors	Description of impact	Level of impact
Construction impacts		
Lingwood Wood Community Woodland	Impacts from tree removal and associated loss of woodland ground flora of part of Lingwood Wood Community Woodland. The exact extents to be permanently lost are 0.25ha with 0.0044ha temporarily lost. Pollution of remaining habitat from air quality and surface water runoff and accidental spillages (temporary).	Major Adverse
Bats	Disturbance of tree roosts during construction. Loss of one tree roost during construction. Disturbance of known bat roosts in buildings in Poplar Farm, Oaklands, the Lindens, Hall Cottages and the White House from noise and light (temporary). Permanent loss of foraging habitat, severance of commuting routes and foraging areas, resulting in avoidance and abandonment of habitats and roosts.	Major Adverse
County BAP Allotments	Direct impacts from loss of habitat extent of hard-standing in car park area only (permanent). Gas pipe to cross the allotments (temporary). Pollution of remaining habitat from air quality and surface water runoff and accidental spillages (temporary).	Negligible Adverse
NERC Act (2006) Section 41 Priority habitats (important and species-rich hedgerows, standing water and traditional orchards)	Direct impacts from permanent loss of species-rich hedgerows, standing water. No impacts upon traditional orchards. Pollution of remaining habitat from air quality and surface water runoff and accidental spillages (temporary).	Major Adverse
Breeding Birds (incl. barn owl, within Proposed Scheme boundary)	Loss of habitat including breeding habitat, fragmentation of habitat, loss of links between woodlands and other species-specific habitats. Permanent loss of arable habitat as it cannot be replaced. Direct mortality from site clearance of vegetation during breeding season, disturbance of nesting locations from noise and light pollution. Permanent loss of arable habitat.	Major Adverse
Grasslands	Permanent loss of habitat, pollution of remaining habitat from air quality and surface water runoff and accidental spillages.	Major Adverse
Wintering Birds within Proposed Scheme boundary	Loss of habitat including foraging and loafing habitat, fragmentation of habitat, loss of links between woodlands and other species-specific habitats. Direct mortality from site clearance of vegetation during winter season, disturbance of foraging and loafing from noise and light pollution. Permanent loss of arable habitat.	Major Adverse
Species of Principal Importance (hedgehog, common toad and brown hare)	Permanent loss of commuting routes and areas of shelter and foraging. Direct mortality of individuals from collisions with construction traffic, entrapment in excavations,	Major Adverse

Ecological receptors	Description of impact	Level of impact
	disturbance from noise and light pollution of places of shelter leading to abandonment. Permanent loss of arable habitat.	
Scattered trees	Removal or impact to root systems.	Minor Adverse
Hedgerows (species-poor defunct)	Removal or impact to root systems.	Minor Adverse
Terrestrial Invertebrates	Removal of habitat (permanent). Pollution risk of mortality from dust and accidental spills and changes to habitat suitability for common terrestrial invertebrates. Disturbance from light pollution (temporary).	Major Adverse
Wintering Birds (Species as features of Broadlands SPA and Ramsar	One marsh harrier has been recorded flying over the site. Disturbance from construction noise, vibration and light spill.	Negligible Adverse
Transfer of diseases (all ecological receptors)	Introduction of diseases during construction could result in death of plants and animals (examples: Ash dieback, ranavirus) (permanent).	Major Adverse
Great crested newts (if found in remaining surveys to be completed).	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.	Moderate Adverse
Reptiles	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.	Moderate Adverse
Introduction of INNS (all ecological receptors)	Introduction of invasive species during construction may result in squeezing out of native habitats and species. (temporary).	Moderate Adverse
Operation activity impacts		
Lingwood Wood Community Woodland	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages.	Moderate Adverse
Bats	Direct mortality through traffic collisions due to wider road. Pollution of water courses could lead to reduction in prey availability. Disturbance for noise, vibration or light spill resulting in permanent avoidance and abandonment of foraging habitats, commuting routes and roosts.	Major Adverse
Notable species (hedgehog, common toad and brown hare)	Direct mortality through traffic collisions due to wider road to cross. Barrier effect of the road.	Minor Adverse
NERC Act (2006) Section 41 Priority habitats	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages.	Moderate Adverse

Ecological receptors	Description of impact	Level of impact
(standing water, species-rich hedgerow)		
Grasslands	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages.	Moderate Adverse
Scattered trees	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages.	Moderate Adverse
Hedgerows (species-poor defunct)	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages.	Moderate Adverse
Terrestrial Invertebrates	Pollution risk of mortality (through increased air and surface water run-off pollution) and avoidance of foraging habitats of nocturnal species from adverse light pollution.	Moderate Adverse
Breeding Birds (incl. barn owl, within Proposed Scheme boundary)	Direct mortality through traffic collisions due to wider road.	Minor Adverse
Wintering Birds within Proposed Scheme boundary	Direct mortality through traffic collisions due to wider road.	Minor Adverse
Wintering Birds (Species as features of Broadlands SPA and Ramsar)	The only qualifying species recorded was 1 x Marsh Harrier flying over the site on one occasion. Direct mortality through traffic collisions due to wider road are unlikely but not impossible.	Negligible Adverse
Great crested newts	Pollution of breeding ponds from surface water run-off carrying contaminants and pollutants due to increased area of hard-standing. Loss of terrestrial habitat. Changes to habitat suitability through pollution.	Minor Adverse
Reptiles	Changes to habitat suitability for reptiles through air and water surface run-off pollution. Loss of habitat.	Minor Adverse

8.9 Design mitigation and enhancement measures

8.9.1 This section presents an overview of mitigation measures proposed in response to the impacts identified. The purpose of these measures is to avoid or reduce the ecological effects associated with the construction and operation of the Proposed Scheme and maximise benefits. These measures take into account best practice, legislation and guidance documents from CIEEM, (Highways England (DMRB) and Natural England.

8.9.2 Mitigation measures employed to reduce the impact of the Proposed Scheme on ecological receptors can be categorised using a hierarchical system as follows:

- avoidance and prevention: design and mitigation measures to prevent the effect (e.g. alternative design options or avoidance of environmentally sensitive sites)
- reduction: where avoidance is not possible, then mitigation is used to lessen the magnitude or significance of effects
- remediation: where it is not possible to avoid or reduce a significant adverse effect, these are measures to offset the effect.

Table 8-7 : Ecological mitigation measures for the Proposed Scheme.

Biodiversity resource	Description of impact	Proposed mitigation
Construction impacts		
Lingwood Wood Community Woodland	Direct impacts from tree removal and associated loss of woodland ground flora of part of Lingwood Wood CW. The exact extents are 0.25 ha permanently lost and 0.0044ha temporarily lost. Pollution of remaining habitat from air quality and surface water runoff and accidental spillages (temporary).	Replacement woodland planting with a net gain of 1.98ha is proposed alongside the Proposed Scheme. Tree species will be replaced using native species with a greater number of trees planted in order to enhance the area of this habitat. Pollution during construction will be mitigated by using best practice methods for pollution prevention and water management (Volume 1: Chapter 13). This would be implemented as part of the Record of Environmental Actions and Commitments (REAC) and overall Environmental Management Plan (EMP). No significant effects from air quality have been assessed, so no mitigation required (Volume 1: Chapter 5).
Bats	Direct mortality through roost destruction during removal of tree roosts (permanent). Disturbance of known bat roosts in buildings in Poplar Farm, Oaklands, the Lindens, Hall Cottages and the White House from noise, vibration and light (temporary). Permanent loss of foraging habitat, severance of commuting routes and foraging areas, resulting in avoidance and abandonment of habitats and roosts.	Habitat creation in the form of artificial roosting habitat will be installed prior to the start of construction under a precautionary method statement. The tree felling will be undertaken to avoid sensitive seasons for bats. It will be soft felled with supervision from a registered bat licence holder with Natural England and under a fully detailed precautionary method statement. Works near trees and that may disturb roosting bats in buildings will be undertaken under supervision from a registered bat licence holder. This will also be reported in the REAC and the EMP. Disturbance of buildings from noise and vibration will be mitigated by noise barriers, quieter plant and reducing time on noisy activities. (Volume 1: Chapter 11). Habitat loss and severance from the larger footprint of the new road cannot be mitigated at the start of construction. It will be compensated for as each phase of the road is completed with increased and enhanced tree planting as a remediation measure. At crossing point locations extra heavy standard trees will be planted of at least 4.25m high when planted. The tree height has been selected on a precautionary basis that bats cross the road at a risk height.
County BAP allotments	Direct impacts from loss of habitat extent of car park area only (Permanent). (Temporary). Pollution of remaining habitat from air	~~Car park area to be replaced in adjacent arable land.~~ Pollution during construction will be mitigated by using best practice methods for pollution prevention and water management (Volume 1: Chapter 13). This would be

Biodiversity resource	Description of impact	Proposed mitigation
	quality and surface water runoff and accidental spillages (temporary).	implemented as part of the REAC and overall Environmental Management Plan (EMP). No significant effects from air quality have been assessed, so no mitigation required (Volume 1: Chapter 5).
NERC Act (2006) Section 41 Priority habitats (important and species-rich hedgerows, standing water and traditional orchards)	Direct impacts from permanent loss of species-rich hedgerows, standing water, No impacts upon traditional orchards. Pollution of remaining habitat from air quality and surface water runoff and accidental spillages (temporary).	The parts of the two species-rich hedgerows located at the west side of Lingwood Lane that would be lost under the scheme will be translocated to the area around the soakaway in the field to the west. Species-rich hedgerows are proposed to be planted throughout the Proposed Scheme alignment for the purposes of habitat connectivity for birds, mammals and invertebrates. A wildlife pond of at least 0.08ha is to be created to compensate for the loss of standing water. This will be planted with riparian and submerged native plants. Scattered broadleaved trees are proposed in a woodland structure to compensate for the loss of trees throughout the Proposed Scheme during construction. Pollution during construction will be mitigated by using best practice methods for pollution prevention and water management (Volume 1: Chapter 13). This would be implemented as part of the REAC and overall Environmental Management Plan (EMP). No significant effects from air quality have been assessed, so no mitigation required (Volume 1: Chapter 5).
Grasslands	Permanent loss of habitat, pollution of remaining habitat from air quality and surface water runoff and accidental spillages.	Species-rich areas of grassland are proposed to be planted throughout the scheme. Pollution during construction will be mitigated by using best practice methods for pollution prevention and water management (Volume 1: Chapter 13). This would be implemented as part of the REAC and overall Environmental Management Plan (EMP). No significant effects from air quality have been assessed, so no mitigation required (Volume 1: Chapter 5).
Breeding Birds (incl. barn owl, within Proposed Scheme boundary)	Direct mortality from site clearance of vegetation during breeding season, disturbance of nesting locations from noise and light pollution. Loss of habitat including breeding habitat, fragmentation of habitat, loss of links between woodlands and other species-specific habitats.	Provision of alternative artificial refuges will be provided for many bird species to mitigate loss of habitat. Species specific bird boxes for kestrel, turtle dove, swift and tawny owl and barn owl are proposed in addition to general open-fronted nest boxes for all other breeding birds. Will be erected prior to vegetation clearance. Suitable planting will be used to provide opportunities for above ground habitat, and foraging habitat for other species. An area of agricultural land is to be reinstated. Four skylark scrapes will be provided, where grassland is maintained to provide nesting habitat for skylark. This will mitigate the effect of the arable habitat loss that will occur as a result of the construction of the new road. Enhancement for birds includes the addition of an attenuation pond and associated wetland planting.

Biodiversity resource	Description of impact	Proposed mitigation
		The extra heavy standard trees to be planted at bat crossing points will be at least 4.25m high at initial planting and encourage birds and barn owls to cross higher above the road. Management of the new habitats will be detailed in the EMP. Timing of vegetation clearance to outside of the breeding season which runs from March to August (inclusive) to minimise the risk of mortality of breeding birds. If inside of this season, vegetation clearance will be undertaken under the supervision of an Ecological Clerk of Works (ECoW). Alternatively, construction can be phased so that construction activities can commence in areas unsuitable for supporting any breeding birds. Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared during the daytime. Night lighting during construction will not affect these species. The permanent noise barriers that form part of the embedded mitigation for operational noise shall be built as early as possible in the construction programme so that they can offer noise mitigation during the construction phase to reduce impacts.
Wintering Birds within Proposed Scheme boundary	Loss of foraging habitat and winter roost habitat (permanent). Disturbance of foraging areas from construction noise, vibration and light spill.	Suitable hedgerow, scattered tree and woodland planting will be used to provide opportunities for above ground habitat, and species-rich grassland foraging habitat for over-wintering bird species. The species-rich grassland is behind barriers of closely spaced trees or fencing to prevent barn owls and raptors from low-level foraging over the road. The permanent noise barriers that form part of the embedded mitigation for operational noise shall be built as early as possible in the construction programme so that they can offer noise mitigation during the construction phase to reduce impacts. The heavy standard trees to be planted at bat crossing points will be at least 4.25m high and encourage birds and barn owls to cross higher above the road. Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared during the daytime. Night lighting during construction will not affect these species.
Species of Principal Importance (hedgehog, common toad and brown hare)	Permanent loss of commuting routes and areas of shelter and foraging. Direct mortality of individuals from collisions with construction traffic, entrapment in excavations, disturbance from noise and light pollution of places of shelter leading to abandonment.	Hedgerow with trees to replace existing vegetation and to enhance habitat connectivity along the original A47 corridor. Proposed on north and south throughout the Proposed Scheme boundary. Vegetation clearance will be undertaken under the supervision of an ECoW. Tool-box talks will be given by the ECoW and excavations will either be covered at night, or a ramp left in, so animals can climb out. Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared during the daytime. Night lighting during construction will not affect these species. The permanent noise barriers that form part of the embedded mitigation for

Biodiversity resource	Description of impact	Proposed mitigation
		operational noise shall be built as early as possible in the construction programme so that they can offer noise mitigation during the construction phase to reduce impacts.
Scattered trees	Removal or impact to root systems.	Proposed planting in addition to retention of existing trees to contribute to reinforcement of the woodland plantation structure to either side of the A47 highway. Planting to contribute to physical separation of the existing and proposed A47, to enhance habitat connectivity along the original A47 corridor, in particular providing a high tree flight line for bats crossing the road. Trees to be retained will have root protection zones in place before work commences.
Hedgerows (species-poor defunct)	Removal or impact to root systems.	Hedgerow with trees to replace existing vegetation which will be lost and to enhance habitat connectivity with habitats along the original A47 corridor. Hedgerows will be planted along the length of the scheme boundary throughout the design. Hedgerows to be retained will have root protection zones in place before work commences.
Terrestrial Invertebrates	Loss of habitat (permanent). Pollution risk of mortality from dust and accidental spills and changes to habitat suitability for common terrestrial invertebrates. Disturbance from light pollution (temporary).	To replace the loss of any vegetation suitable for supporting terrestrial invertebrates. Tree planting is proposed along the length of the scheme boundary throughout the design and hedgerows are to be remediated with species-rich native ones. Species-rich grassland is proposed between the A47 and High Noon Lane. Species rich grassland is proposed between the A47 and the farm access track (to include scrub in this area). Grassland tolerant of damp conditions to contribute to landscape integration and with an added value contribution to species diversity. Habitat piles with dimensions of 1m by 1m are proposed along length of the scheme boundary throughout the design. Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared during the daytime. Night lighting during construction will not affect these species. Pollution during construction will be mitigated by using best practice methods for pollution prevention and water management (Volume 1: Chapter 13). This would be implemented as part of the REAC and overall Environmental Management Plan (EMP). No significant effects from air quality have been assessed, so no mitigation required (Volume 1: Chapter 5).
Wintering Birds (Species as features of Broadlands SPA and Ramsar)	Disturbance from construction noise, vibration and light spill.	The only qualifying species recorded was one Marsh Harrier flying over the site on one occasion.

Biodiversity resource	Description of impact	Proposed mitigation
		The species-rich grassland is behind barriers of closely spaced trees or fencing to prevent barn owls and raptors from low-level foraging over the road. The permanent noise barriers that form part of the embedded mitigation for operational noise shall be built as early as possible in the construction programme so that they can offer noise mitigation during the construction phase to reduce impacts. The heavy standard trees to be planted at bat crossing points will be at least 4.25m high and encourage birds and barn owls to cross higher above the road. Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared during the daytime. Night lighting during construction will not affect these species.
Transfer of diseases (all ecological receptors)	Introduction of diseases during construction could result in death of plants and animals (examples: Ash dieback, ranavirus) (permanent).	The transfer of diseases during construction will be mitigated by implementation of a Biosecurity Management Plan, which will also be reported in the REAC and the EMP.
Introduction of INNS (all ecological receptors)	Introduction of invasive species during construction may result in squeezing out of native habitats and species. (temporary).	The introduction of INNS during construction will be mitigated by implementation of an INNS Management Plan. This will contain knowledge of appropriate treatment methods to ensure that construction proceeds within the legal framework to ensure prevention of spread both within and beyond the site boundaries. The INNS plan will also cover animal biosecurity if necessary. These will be designed and reported in the REAC, the mitigation register, and in the EMP.
Great crested newts (if found in preconstruction surveys)	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.	If this species is found present within 500m of the scheme in the remaining surveys that could not be completed due to covid-19, then works would need to be undertaken in those parts of the site affected under a Natural England mitigation licence. It would be necessary to find or create suitable receptor sites that include both breeding and terrestrial habitat. Newts would be removed from the area of works prior to commencement. Enhancement of the site to encourage this species back into the area includes the creation of tree lines, hedgerows, copses, species-rich grassland and an attenuation pond with associated wetland planting. These will be designed and reported in the REAC, the mitigation register, and in the EMP.
Reptiles	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations,	Vegetation clearance will be undertaken under the supervision of an ECoW. Tool-box talks will be given by the ECoW and excavations will either be covered at night, or a ramp left in, so animals can climb out. The timing of the clearance of suitable

Biodiversity resource	Description of impact	Proposed mitigation
	disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.	reptile habitat will be at an appropriate time during the reptile active season (from March to October inclusive) Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared during the daytime. Night lighting during construction will not affect these species. The permanent noise barriers that form part of the embedded mitigation for operational noise shall be built as early as possible in the construction programme so that they can offer noise mitigation during the construction phase to reduce impacts. To replace the loss of any vegetation suitable for supporting reptiles. Planting is proposed along the length of the scheme boundary throughout the design. Species-rich grassland is proposed between the A47 and High Noon Lane. Species rich grassland is proposed between the A47 and the farm access track (to include scrub in this area). Grassland tolerant of damp conditions to contribute to landscape integration and with an added value contribution to species diversity. Habitat piles with dimensions of 1m by 1m are proposed along length of the scheme boundary throughout the design. These will be designed and reported in the REAC, the mitigation register, and in the EMP.
Operation activity impacts		
Lingwood Wood Community Woodland	Indirect impacts upon all six habitats from pollution of habitat from air quality and surface water runoff, sedimentation and accidental spillages	Appropriate drainage system in place - change in hydrology or increased pollution unlikely. (Chapter 13: Road Drainage and Water Environment) No significant increases in air pollution or surface water run-off pollution have been identified in operation. Chapter 5 (Air Quality) and Chapter 13 (Road drainage and Water Environment.)
Bats	Direct mortality through traffic collisions due to wider road. Pollution of water courses could lead to reduction in prey availability Disturbance for noise, vibration or light spill resulting in permanent avoidance and abandonment of foraging habitats, commuting routes and roosts.	To provide bat crossing points within the wider general extents of planting. Four proposed bat hops consisting of tall trees either side of the new road to guide bats upwards over the wider highway at the existing crossing points used by bats. Crossing points to be monitored during operation and if required, changes to the EMP can be made. High tree line for bats - both north and south of the proposed A47 and existing A47. The heavy standard trees to be planted at bat crossing points will be at least 4.25m high. New planting will be used where applicable to create new linkages between habitats to mitigate for severance of bat commuting routes. Lighting will be directional, and positioned sympathetically, to minimise light spill and disturbance for sensitive receptors including foraging bats. A low noise road surface and four permanent noise barriers are included in the design.

Biodiversity resource	Description of impact	Proposed mitigation
Notable species (hedgehog, common toad and brown hare)	Direct mortality through traffic collisions due to wider road to cross. Barrier effect of road.	New and continuous habitat provided on both sides of the road as a refuge. It is not considered that the effects of mortality to mammals will be at a level that would justify the installation of mammal underpasses. The existing road already acts as a barrier and the new road is not likely to further hinder dispersal of the populations of these species that are already present. Permanent fencing systems will be installed throughout the Proposed Scheme to mitigate for operational traffic mortality. Lighting will be directional, and positioned sympathetically, to minimise light spill and disturbance for sensitive receptors including notable habitats.
NERC Act (2006) Section 41 Priority habitats (species-rich hedgerow, standing water)	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages due to increased area of hard standing	Drainage design has been undertaken whereby surface water run-off will be infiltrated to ground via infiltration basins or infiltration strips and soakaways. These will be subject to a sufficient level of pollution attenuation through the Sustainable Urban Drainage System measures designed. Chapter 13 (Road Drainage and Water Environment). No significant increases in air pollution have been identified in operation. Chapter 5 (Air Quality).
Grasslands		
Scattered trees		
Hedgerows (species-poor defunct)		
Terrestrial Invertebrates	Pollution risk of mortality (through increased air and surface water run-off pollution) and avoidance of foraging habitats of nocturnal species from adverse light pollution.	Habitat suitable for supporting terrestrial invertebrates in the form of species-rich grassland is proposed through the Proposed Scheme boundary in order to provide sufficient habitat for terrestrial invertebrates. No significant increases in air pollution or surface water run-off pollution have been identified in operation. Chapter 5 (Air Quality) and Chapter 13 (Road drainage and Water Environment). Lighting will be directional, and positioned sympathetically, to minimise light spill and disturbance for sensitive receptors including notable habitats.
Breeding Birds (incl. barn owl, within Proposed Scheme boundary)	Direct mortality through traffic collisions due to wider road.	To minimise risk of mortality to birds, new and continuous habitat in the form of hedgerows, scattered broadleaved trees to include individual 'parkland' trees adjacent to Blofield Overbridge and species-rich grassland will be provided on both sides of the road as a refuge. In the masterplan, the vast majority of the species-rich grassland is behind tree lines, hedges or fencing and not on the verges. The actual verges are proposed to be amenity grassland which will provide a low maintenance buffer with the operational highway and to ensure clear sight lines to signs and visibility splays. This should prevent barn owls and raptors from foraging on the verges. This planting will also aid the visual screening from the road. The bat-hops will additionally provide a safer road crossing option for birds and barn owls.

Biodiversity resource	Description of impact	Proposed mitigation
		The management of created habitat will be detailed in the EMP.
Wintering Birds within Proposed Scheme boundary	Direct mortality through traffic collisions due to wider road. Loss of arable habitat.	To minimise risk of mortality to birds, new and continuous badgers habitat in the form of hedgerows, scattered broadleaved trees to include individual 'parkland' trees adjacent to Blofield Overbridge. and species-rich grassland will be provided on both sides of the road as a refuge. The species-rich grassland is behind barriers of closely spaced trees or fencing to prevent barn owls and raptors from low-level foraging over the road. This planting will also aid the visual screening from the road. The bat-hops will additionally provide a safer road crossing option for birds. A small area of agricultural land to be remediated. The management of created habitat will be detailed in the EMP.
Wintering Birds (Species as features of Broadlands SPA and Ramsar)	Direct mortality through traffic collisions due to wider road.	To minimise risk of mortality to birds, new and continuous habitat in the form of hedgerows, scattered broadleaved trees to include individual 'parkland' trees adjacent to Blofield Overbridge. and species-rich grassland will be provided on both sides of the road as a refuge. The species-rich grassland is behind barriers of closely spaced trees or fencing to prevent barn owls and raptors from low-level foraging over the road. This planting will also aid the visual screening from the road. The bat-hops will additionally provide a safer road crossing option for birds. The management of created habitat will be detailed in the EMP.
Great crested newts	Pollution of breeding ponds from surface water run-off carrying contaminants and pollutants due to increased area of hard-standing. Loss of terrestrial habitat. Changes to habitat suitability through pollution.	No significant increases in surface water run-off pollution have been identified in operation. Chapter 13 (Road Drainage and Water Environment.) No significant increases in air pollution Chapter 5 (Air Quality). Enhancement of biodiversity in new habitats and refuges to compensate for loss of terrestrial habitat. The management of created habitat will be detailed in the EMP. Population to be monitored during operation and if required, changes to the EMP can be made.
Reptiles	Changes to habitat suitability for reptiles through air and water surface run-off pollution. Loss of habitat.	No significant increases in surface water run-off pollution have been identified in operation. Chapter 13 (Road Drainage and Water Environment.) No significant increases in air pollution Chapter 5 (Air Quality). Enhancement of biodiversity in new habitats and refuges to compensate for loss of terrestrial habitat. The management of created habitat will be detailed in the EMP.

8.9.3 The type and area of habitat affected during construction is calculated below with * indicating Priority habitats:

- Hedgerows* Important intact: 377 linear metres
- Native species poor defunct: 906 linear metres
- Tree lines: 1327 linear metres
- Broadleaved and mixed plantation woodland: 1.22ha
- Poor semi-improved grassland: 1.12ha
- Ponds*: 0.07ha
- Arable: 55.99ha
- Scrub: 0.37 ha
- Tall ruderal: 0.46ha
- Scattered individual trees: 6 no.

8.9.4 The types and areas of habitat creation and the increases or decreases in size of each habitat are provided in Table 8-8.

Table 8-8 : Habitat types and areas to be remediated or enhanced

Habitat type	Habitat loss amount		Reinstatement or enhancement of habitat amount	Net gain or loss of habitat type
	Permanent works	Temporary works		
Hedgerows (important)	132m	245m	Hedgerows to be translocated	None
Hedgerows (species poor)	551m	355m	6513m to be planted	Net gain of 5607m
Tree lines	948m	379m	481 individual trees to be planted	N/A
Plantation broadleaved and mixed woodland	0.27ha	0.95ha	3.20ha to be planted	Net gain of 1.98ha
Poor semi-improved grassland	0.78ha	0.34ha	0.57ha of open grassland created	Net loss of 3.35ha
Amenity grassland	None	None	3.9ha created	Net gain of 3.9ha
Species-rich grassland and grassland with bulbs	None	None	25.93ha species-rich grassland and 0.0284ha of grassland with bulbs created	Net gain of 25.96ha
Marshy/wet grassland	None	None	0.37ha created	Net gain of 0.37ha
Ponds	0.03ha	0.04ha	0.08ha	Net gain of 0.01ha
Arable	26.75ha	29.24ha	39.7ha reinstated	Net loss of 16.29ha
Scrub	0.29ha	0.08ha	0.01ha created	Net loss of 0.36ha
Tall ruderal	0.14ha	0.32ha	0.29ha of shrubs created	Net loss of 0.17ha
Scattered individual trees	2	4	481 trees to be planted which will additionally compensate for the loss of tree lines.	N/A

8.10 Assessment of likely significant effects

8.10.1 An assessment of the residual ecological effects predicted following the implementation of mitigation outlined within Section 8.6 is presented within Table 8-9.

8.10.2 The mitigation section of this report includes all measures which would need to be taken in order to ensure that legal obligations are met with respect to protected habitats and species. This section of the ES is concerned with effects on ecological receptors which are predicted to be significant after the successful implementation of generic and specific mitigation measures as well as ecological enhancements.

8.10.3 There are anticipated to be effects on ecological receptors which are significant in EIA terms after the successful implementation of generic and specific mitigation measures as well as ecological enhancements.

Table 8-9 : Predicted significance of residual effects on biodiversity resources following implementation of committed mitigation

Biodiversity resource and valuation	Description of impacts (construction)	Level of impact pre-mitigation	Description of impact (operation)	Level of impact pre-mitigation	Residual effects after mitigation	Level of impact after mitigation	Significance of residual effects
Lingwood Wood Community Woodland (Local)	Tree removal of part of Lingwood Wood CW. The exact extents of which are 0.2544ha.	Major Adverse	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages.	Moderate adverse	Although a greater amount of woodland planting is to be undertaken to remediate the loss, this will take a long time to reach its former maturity.	Major Adverse	Slight adverse
Bats (within Proposed Scheme boundary) (National)	Loss of one tree roost and disturbance of 3 tree roosts during construction. Disturbance of known bat roosts in buildings in Poplar Farm, Oaklands, the Lindens, Hall Cottages and the White House from noise, vibration and light. Permanent loss of foraging habitat, severance of commuting routes and foraging areas, disturbance resulting in avoidance and abandonment of habitats and roosts.	Major Adverse	Direct mortality through traffic collisions due to wider road. Pollution of water courses could lead to reduction in prey availability. Disturbance from noise, vibration or light spill resulting in permanent avoidance and abandonment of foraging habitats, commuting routes and roosts.	Major adverse	After mitigation included in the precautionary method statement, residual effects to roosts will be neutral. Disturbance from loss of habitat during construction will not be remediated immediately as there will be a time lag between loss and the remediated habitats reaching maturity. Disturbance from noise, vibration and light spill is not predicted to cause residual effects. Mortality through traffic collisions is predicted to be less likely once remediated road side trees mature. Mitigation has been designed on a precautionary basis ie that bats may cross the road	Moderate Adverse	**Moderate Adverse**

Biodiversity resource and valuation	Description of impacts (construction)	Level of impact pre-mitigation	Description of impact (operation)	Level of impact pre-mitigation	Residual effects after mitigation	Level of impact after mitigation	Significance of residual effects
					at a risk height and this is reflected in the residual effects stated for the bats.		
County BAP allotments (County)	Direct impacts from loss of habitat extent of car park area only (Permanent). Pollution of remaining habitat from air quality and surface water runoff and accidental spillages (temporary).	Negligible	No operational impacts predicted	No change	No residual effects predicted	No change	Neutral
NERC Act (2006) Section 41 Priority habitats (Important and species-rich and important hedgerows, standing water) (National)	Direct impacts from permanent loss of species-rich hedgerows, standing water. No impacts upon traditional orchards. Pollution of remaining habitat from air quality and surface water runoff and accidental spillages (temporary).	Major Adverse	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages due to increased area of hard standing.	Moderate adverse	NERC Act (2006) S41 species-rich or important hedgerows are to be translocated and not lost. Residual effects on standing water will be a permanent gain of 0.01ha of habitat, which will take a short time to mature. No residual effects from pollution predicted.	Minor beneficial	Slight beneficial
Grasslands (Local)	Permanent loss of habitat, pollution of remaining habitat from air quality and surface water runoff and accidental	Major adverse	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages	Moderate adverse	Residual effects on grassland will be fewer as planted habitat matures quicker. Arable and poor semi-improved grassland will incur	Minor beneficial	Slight beneficial

Biodiversity resource and valuation	Description of impacts (construction)	Level of impact pre-mitigation	Description of impact (operation)	Level of impact pre-mitigation	Residual effects after mitigation	Level of impact after mitigation	Significance of residual effects
	spillages.		due to increased area of hard standing.		a net loss combined of 19.63ha with a gain from amenity grassland 3.8974ha. Net gains will be made with species-rich grassland 25.960ha and marshy wet grassland 0.30705ha which are more diverse than the existing grassland habitats to be lost. No residual effects anticipated		
Breeding Birds (incl. barn owl, within Proposed Scheme boundary) (Regional)	Direct mortality from site clearance of vegetation during breeding season, disturbance of nesting locations from noise and light pollution. Loss of habitat including breeding habitat, fragmentation of habitat, loss of links between woodlands and other species-specific habitats. Permanent loss of arable habitat.	Major adverse	Direct mortality through traffic collisions due to wider road.	Minor adverse	No direct mortality or disturbance of breeding birds during construction with mitigation. Breeding habitats are to be remediated but there will be a time lag before maturity is achieved. Arable habitat cannot be fully remediated. No residual effects from pollution predicted. Tall habitat near new road to encourage birds to fly higher will take time to mature.	Minor Adverse	Slight adverse
Wintering Birds within Proposed	Loss of foraging habitat and winter roost habitat	Major	Direct mortality through traffic collisions due to	Minor adverse	Foraging and loafing habitats are to be remediated but there will be a time lag before	Minor Adverse	Slight adverse

Biodiversity resource and valuation	Description of impacts (construction)	Level of impact pre-mitigation	Description of impact (operation)	Level of impact pre-mitigation	Residual effects after mitigation	Level of impact after mitigation	Significance of residual effects
Scheme boundary (Regional)	(permanent). Disturbance of foraging areas from construction noise, vibration and light spill. Direct mortality through traffic collisions due to wider road. Loss of arable habitat.	adverse – construction	wider road. Loss of arable habitat.		maturity is achieved, arable habitat cannot be remediated fully, so predicted residual effect of permanent deterrence of some individual birds. No residual effects from pollution predicted. Tall habitat near new road to encourage birds to fly higher will take time to mature. Arable habitat cannot be replaced.		
Notable species (hedgehogs common toad and brown hare) (Local)	Permanent loss of commuting routes and areas of shelter and foraging. Direct mortality of individuals from collisions with construction traffic, entrapment in excavations, disturbance from noise and light pollution of places of shelter leading to abandonment. Permanent loss of arable habitat.	Major Adverse	Direct mortality through traffic collisions due to wider road to cross. Barrier effect of road.	Minor adverse	Direct mortality during construction to be mitigated. Habitats to be remediated and some suitable habitat for these species will grow back quickly as not dependent on mature trees and hedgerows. Residual effects from barrier of new road and mortality from collisions likely to stay similar to that of present road. No residual effects from pollution predicted. Arable habitat cannot be replaced.	Minor Adverse	Slight adverse

Biodiversity resource and valuation	Description of impacts (construction)	Level of impact pre-mitigation	Description of impact (operation)	Level of impact pre-mitigation	Residual effects after mitigation	Level of impact after mitigation	Significance of residual effects
Scattered trees (Local)	Removal or impact to root systems.	Major Adverse	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages due to increased area of hard standing.	Moderate adverse	Habitats are to be remediated and number of trees increased but there will be a long time lag before maturity is achieved.	Moderate Adverse	Slight adverse
Hedgerows (species-poor defunct) (Local)	Removal or impact to root systems.	Major Adverse	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages due to increased area of hard standing.	Moderate adverse	Habitats are to be remediated and enhanced with species-rich native hedgerows, but there will be a time lag before maturity is achieved. Once achieved long-term, the remediation will have beneficial residual effects.	Moderate Adverse	Slight adverse
Terrestrial Invertebrates (Local)	Permanent loss of habitat, pollution risk of mortality and changes to habitat suitability for common terrestrial invertebrates. Pollution risk of mortality (through increased air and surface water run-off pollution) and avoidance of foraging habitats of nocturnal species from adverse	Major Adverse	Indirect impacts from pollution of habitat from air quality, surface water runoff, sedimentation and accidental spillages due to increased area of hard standing.	Moderate adverse	Residual effects predicted for species dependent on trees and hedgerows as there will be a time lag on remediation to reach maturity. Most invertebrates will benefit from other habitat planting and enhancement. No residual effects from pollution predicted.	Moderate Adverse	Slight adverse

Biodiversity resource and valuation	Description of impacts (construction)	Level of impact pre-mitigation	Description of impact (operation)	Level of impact pre-mitigation	Residual effects after mitigation	Level of impact after mitigation	Significance of residual effects
	light pollution.						
Wintering Birds (Species as features of Broadlands SPA and Ramsar) (International)	Disturbance from construction noise, vibration and light spill.	Negligible Adverse	Direct mortality through traffic collisions due to wider road.	Negligible adverse	The only qualifying species recorded was 1 x Marsh Harrier flying over the site. No change anticipated after mitigation.	Negligible adverse	Slight adverse
Transfer of diseases (all ecological receptors) (Up to International)	Introduction of diseases during construction could result in death of plants and animals (examples: Ash dieback, amphibian red-leg disease).	Major adverse	No operational impacts anticipated.	No change	Mitigation will prevent the transfer of diseases to a negligible level of impact during construction and no change in operation. No residual effects predicted	No change	Neutral
Introduction of INNS (all ecological receptors) (Up to International)	Introduction of invasive species during construction may result in squeezing out of native habitats and species.	Moderate adverse	No operational impacts anticipated	No change	Mitigation will prevent the introduction of INNS to a negligible level of impact during construction and no change in operation. No residual effects predicted.	Neutral	Neutral
Great crested newts (if found in remaining surveys to be	Direct mortality of individuals during vegetation clearance and from collisions	Major adverse	Pollution of breeding ponds from surface water run-off carrying contaminants and	Minor adverse	Direct mortality would be avoided by mitigation. If this species found present, suitable breeding and	No change	Neutral

Biodiversity resource and valuation	Description of impacts (construction)	Level of impact pre-mitigation	Description of impact (operation)	Level of impact pre-mitigation	Residual effects after mitigation	Level of impact after mitigation	Significance of residual effects
completed in 2021) (County)	with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.		pollutants due to increased area of hard standing. Loss of terrestrial habitat. Changes to habitat suitability through pollution.		terrestrial habitats would be enhanced and increased under licence. No change in population is predicted. No residual effects from pollution anticipated.		
Reptiles (Local)	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat. Changes to habitat suitability for reptiles through air and water surface run-off pollution. Loss of habitat.	Major Adverse	Changes to habitat suitability for reptiles through air and water surface run-off pollution. Loss of habitat.	Minor adverse	Direct mortality would be avoided by mitigation. Suitable grassland and scrub habitats to be remediated would not take long to mature. No change in population is predicted. No residual effects from pollution anticipated.	No change	Neutral

8.11 Monitoring

8.11.1 Habitats, bird and bat boxes will be monitored and managed for five years after they have been created. Further details of the monitoring to be undertaken can be found in the Environmental Management Plan (EMP) (**TR010040/APP/7.7**).

8.11.2 Post-development monitoring will be required for newly created habitats and protected species and will be detailed in the Register of Environmental Actions and Commitment (REAC) and EMP. Should a great crested newt mitigation licence be required (depending on the results of the surveys to be done preconstruction), monitoring may be required for between two and four years post construction as part of the licence.

8.11.3 The bat crossing points that have been mitigated with bat hops of extra heavy large trees will be monitored by re-surveying in years one, three and five after operation of the proposed road commences.

8.12 Summary

8.12.1 Avoidance of impacting trees and hedgerows was undertaken at the choosing of options stage of design planning and again at vegetation clearance planning, there remains small areas of these habitats that will need to be lost. The receptors assessed to have significant moderate adverse residual effects are the loss of ‘bats’, arising from the trees planted as bat hops at crossing points over the road and other replacements for mature trees to be lost. The residual effects arise from the time it takes for these remediated habitats to mature. On a precautionary basis, this residual effect is considered to cause more road traffic mortality to bats during operation.

8.12.2 It is possible to compensate for the permanent loss of trees within Lingwood Wood Community Woodland (plantation approximately 17 years old) habitat by replacement woodland planting with a net gain of 1.98ha alongside the Proposed Scheme. It is anticipated that the loss of this woodland habitat would remain at slight adverse due to the time lag until the same maturity levels have been achieved which is not significant for EIA purposes.

8.12.3 Grasslands within the scheme will have a slight beneficial residual effect as there will be a net gain of more biodiverse grasslands with the introduction of species-rich and marshy, wet grassland.

8.12.4 Residual effects on standing water will be slight beneficial due to a permanent gain of 0.01ha of this habitat which will be planted with native submerged and emergent plants.

8.12.5 Habitat severance and fragmentation will occur to woodland and open habitats and will affect notable species such as bats and breeding birds (including barn owl). However, the risks from construction and operation (from road-traffic collisions) are predicted to result in residual effects of slight adverse for birds and moderate adverse for bats. Risk to birds from road traffic collisions are not significant in EIA terms with the provision of safe crossing points but risk to bats are significant due to the presence of barbastelle bats which are of a national value of importance.

8.12.6 All other residual effects after mitigation would be either slight adverse or neutral which are considered to be not significant for EIA.

8.13 References

Amey (2017). *A47 Blofield to North Burlingham: Environmental Assessment Report.*

British Trust for Ornithology. *Birds of Conservation Concern 4 (2015)* [online] https://www.bto.org/sites/default/files/shared_documents/publications/birds-conservation-concern/birds-of-conservation-concern-4-leaflet.pdf [accessed May 2020]

Design Manual for Roads and Bridges (2019). *Sustainability and Environment. Appraisal: LA 108*: Biodiversity. [Online] Available at https://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20108%20Biodiversity-web.pdf. Accessed 27/03/2020.

Design Manual for Roads and Bridges (2019).*Sustainability and Environment. Design: LD 118 Biodiversity Design*. [Online] Available at https://www.standardsforhighways.co.uk/dmrb/search/9317652b-4cb8-4aaf-be57-b96d324c8965

All UK (and individual UK countries) legislation can be viewed at: http://www.legislation.gov.uk/browse , accessed April 2020.

Department of Communities and Local Government, *The National Planning Policy Framework Planning Practice Guidance*. [Online] available at http://planningguidance.communities.gov.uk/ , accessed April 2020.

Norfolk Biodiversity Partnership, *Norfolk Biodiversity Action Plan*, [Online] available at http://www.norfolkbiodiversity.org/actionplans/ , accessed April 2020.

Harris, S., Cresswell, P., and Jefferies, D., (1989). *Surveying Badgers*, Mammal Society.

Collins (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition).

Chartered Institute 0f Ecology and Environmental Management (CIEEM), *Competencies for Species Surveys: Bats.*

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

Oldham, R. S., Keeble, J., Swan, M.J.S., and Jeffcote, M., (2000). *Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus)*, 2000, Herpetological Journal 10 (4), 143-155.

Biggs, J., *et al*., (2014). *Analytical and methodological development for improved surveillance of the Great Crested Newt*. Bibby, C.J., *et al.,* (2007). Bird census techniques (2nd edition), Academic press.

Natural England, *Protected Sites and Species*, [Online] available at https://www.gov.uk/topic/planning-developmentprotected-sites-species , accessed April 2020.

8.14 Glossary

8.1.1. The terms and abbreviations used in this biodiversity chapter have been defined in Table 8-10 in line with guidance from DMRB LA 108 Biodiversity.

Table 8-10 : Definitions of terms and abbreviations

Term or abbreviation	Definition
Biodiversity	The variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems.
Biodiversity resources	Ecological receptors that are present in the surrounding environment.
Designated sites	Internationally, nationally, or locally designated sites for species and/or habitats.
Ecological feature	Habitats, species or ecosystems which for the purposes of this document are collectively referred to as biodiversity resources.
Enhancement	Enhancement is improved management of a biodiversity resource or provision of new ecological features which result in a net benefit to biodiversity. Enhancement is 'over and above' that required to mitigate or compensate for a negative impact.
Habitat	The place or type of site where an organism or population naturally occurs. Often used in the wider sense referring to major assemblages of plants and animals found together.
Priority habitats and species	Those species and habitats which are defined in CIEEM's Guidelines for Preliminary Ecological Appraisal as:

Term or abbreviation	Definition
	1) listed as a national priority for conservation (such as those listed as habitats and species of principal importance for the conservation of biodiversity) 2) listed as a local priority for conservation, for example in the relevant local Biodiversity Action Plan (BAP) 3) Red Listed using International Union for the Conservation of Nature (IUCN) criteria or, where a more recent assessment of the taxonomic group has not yet been undertaken, listed in a Red Data Book 4) listed as Near Threatened or Amber Listed 5) listed as a Nationally Rare or Nationally Scarce species or listed as a Nationally Notable species where a more recent assessment of the taxonomic group has not yet been undertaken 6) endemic to a country or geographic location
Significant effect	An effect that either supports or undermines biodiversity conservation objectives for biodiversity resources or for biodiversity in general. These are, for example, impacts on structure and function of defined sites, habitats, or species and the conservation status of habitats and species (including extent, abundance and distribution).
Zone of influence	The area(s) over which biodiversity resources can be affected by biophysical changes as a result of the proposed project and associated activities.
BAP	Biodiversity Action Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CWS	County wildlife site
EcIA	Ecological impact assessment
IUCN	International Union for Conservation of Nature
LNR	Local nature reserves.
SAC	Special Areas of Conservation.
SPA	Special Protection Area.
SSSI	Sites of Special Scientific Interest.