Hopkins Ecology

Site:	**Sturgeon's Farm, Shelfanger Road, Diss**
Work Item:	**Strategic Ecological Assessment**
Client:	**GN Rackham & Sons Ltd**

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Summary

Hopkins Ecology Ltd was appointed by Bidwells on behalf GN Rackham and Sons Ltd to prepare a strategic ecological assessment of Sturgeon's Farm, Shelfanger Road, Diss, with a view to identifying constraints and opportunities in the context of its promotion for development.

The Site is on the northern fringe of Diss and mainly comprises arable and grass fields with smaller area of other habitats, totaling ~13.8ha in area. The phase 1 habitats identified are: arable, improved grassland, hedgerows, an ornamental hedge, scrub, pond and wet and dry ditches. There is also a modern pre-fabricated barn.

The only on-Site Habitat of Principal Importance is Hedgerow, but adjacent to the boundaries are two other such habitats: a small block of Lowland Deciduous Woodland and a small Traditional Orchard.

Many species of conservation concern are scoped-out from being present, but direct surveys for reptiles (in the scrub-edge habitat) and great crested newts (in an on-Site and one off-Site pond) are recommended. The other species of conservation concern likely to be present are typically widespread but declining species, and present as components of larger local populations: nesting birds, brown hares, hedgehogs and moths.

If reptiles and / or great crested newts are present then specific mitigation will be required, and it is considered likely that this will be able to mitigate for impacts on both species. Other measures to mitigate for impacts of construction include the timing of works to avoid the nesting bird season and following good practice to avoid pollutants, including soil, entering ditches.

The loss of semi-natural habitat for any scheme will likely be low and mitigation via soft landscaping is the most appropriate. At a strategic level such landscaping would offer new habitat area potentially relevant to: local green infrastructure proposals; the landscape conservation projects of the Claylands Living Landscape and the Waveney B-Line for pollinating insects; and also to buffer and improve the landscape connectivity for the two adjacent Habitats of Principal Importance, namely the block of Lowland Deciduous Woodland and a Traditional Orchard.

Impacts on designated sites are considered to be negligible, by virtue of distance and also the downstream location of the Site within the river catchment.

In conclusion, it is considered likely that the impacts on the majority of species can be mitigated, and appropriate landscaping and scheme design with have the potential to deliver net ecological enhancement.

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1. Introduction

BACKGROUND

1.1 Hopkins Ecology Ltd was appointed by Bidwells on behalf of RG Rackham Builders to prepare a strategic ecological assessment of the Sturgeon's Farm, Diss with a view to identify constraints and opportunities in the context of its promotion for residential development.

SITE CONTEXT AND STATUS

1.1 The Site is on the southern fringe of Diss and mainly comprises arable and grass fields with smaller area of other habitats, totaling ~13.8ha in area.

1.2 The Site is in the broader catchment of the River Waveney within the *South Norfolk and High Suffolk Claylands Natural Character Area*[1], which is characterised as an agricultural landscape *"incised by numerous small-scale wooded river valleys with complex slopes"*.

LEGISLATION AND PLANNING POLICY

1.3 The following key pieces of nature conservation legislation are relevant to legally protected species (with a more detailed description in Appendix 5):

- The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations); and
- The Wildlife and Countryside Act, 1981 (as amended).

1.4 Also, the National Planning Policy Framework (DfCLG, 2012[2]) requires local authorities to avoid and minimise impacts on biodiversity and, where possible, to provide net gains in biodiversity when making planning decisions. A substantial number of species are of conservation concern in the UK. A small number of these species are fully protected under the legislation listed above, but others in England are recognised as Species of Principal Importance under the Natural Environment and Rural Communities Act 2006 and reinforced by the National Planning Policy Framework. For these species local planning authorities are required to promote the "*protection and recovery"* via planning and development control. Examples include the widespread reptiles, skylarks and soprano pipistrelle and, brown long-eared bats.

1.5 Although the NPPF has an overarching aim of minimise impacts to biodiversity, the majority of species of conservation concern are not specifically recognised by legislation or planning policy. The level of protection afforded to these is undefined and should be considered within the overall aim of minimising impacts on biodiversity.

[1] Natural England (2014) *NCA Profile 83: South Norfolk and High Suffolk Claylands.* Available from: http://publications.naturalengland.org.uk/publication/6106120561098752

[2] DCLG (2010) *A National Planning Policy Framework for England*. Department for Communities and Local Government, London.

2. Methods

DESK STUDY

2.1 The desk study comprised a formal data search from the local records centre and a review of relevant data and information from other sources (Table 1).

Table 1. Overview of desk study data sources.

Source	Information
Norfolk Biodiversity Information Service (with cross-border search into Suffolk)	Designated sites, species of conservation concern; 2km search radius
MAGIC (www.magic.gov.uk)	Additional information on statutory sites, habitats of principal importance and wider countryside information
Great Norwich Area and South Norfolk DC planning policy documents	Information regarding local planning policies and green infrastructure stratagies
Local planning applications, manual map-based searching of the South Norfolk DC website	Recent survey data for protected species locally, including negative data
Various literature and web-based searches	Information on local projects and initiatives of potential relevance as well as some species-level data
Historic maps Norfolk (http://www.historic-maps.norfolk.gov.uk/)	Aerial photographs from 1988 and 1946; OS maps from 1880s and earlier

FIELD SURVEY

2.2 A Site walkover was undertaken 20 February 2018, when habitats were described according to the methods of JNCC (2010)[3] and hedgerows (following DEFRA, 2007[4]), albeit with herbs and possibly some woody species probably overlooked due to the time of year; the assessment of trees against the Hedgerow Regulations was therefore not undertaken. Trees were surveyed from ground level for their potential suitability for roosting bats, looking for gaps, cracks and other potential roost features (Collins, 2016[5]); searches were also made for signs of badgers.

2.3 The suitability of any ponds would be assessed using the Habitat Suitability Index (ARG, 2010)[6].

GUIDANCE

2.4 The ecological assessment has been prepared with reference to best practice guidance published by the Chartered Institute for Ecology and Environmental Management (CIEEM) and as detailed in British Standard 42020:2013 Biodiversity - Code of Practice for Biodiversity and Development.

CONSTRAINTS

2.5 It should be noted that whilst every effort has been made to provide a comprehensive description of the Site, the time of year limited the botanical survey with many species undoubtedly overlooked. The broad characterisation and assessment of the Site is, however, considered robust.

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[3] JNCC (2010) *Handbook for Phase 1 Habitat Surveys.* Joint Nature Conservation Committee, Peterborough.

[4] DEFRA (2007) *Hedgerow Survey Manual.* DEFRA, London.

[5] Collins, J. (2016) *Bat Surveys for Professional Ecologists*. Bat Conservation Trust, London.

[6] ARG (2010) *Great Crested Newt Habitat Suitability Index. May 2010 Advice Note 5.* Available from: http://www.arguk.org/info-advice/advice-notes/9-great-crested-newt-habitat-suitability-index-arg-advice-note-5/file

3. Designated Sites

OVERVIEW

3.1 The 2km radius around the Site includes part of Suffolk and two maps are presented to show designated sites within this radius (Figures 1a and b). The Site is located within the wider countryside north of Diss and the lower terrain of the River Waveney and valley-bottom habitats are to the south and south-west of Diss.

STATUTORY (INTERNATIONAL AND NATIONAL) SITES

3.2 There are two statutory sites within 2km:

- Wortham Ling Site of Special Scientific Interest (SSSI), located 1.9km south-west of the Site, on the opposite side of the River Waveney in Suffolk. This is principally designated for its lowland dry heath and acid grassland communities.
- Shelfanger Meadows SSSI, located 0.88km north-east upstream in the catchment. *"It is one of the most important areas of unimproved grassland in Norfolk, forming an outstanding example of traditionally managed, herb-rich, hay meadows".*

3.3 The nearest European / international site is Redgrave and Lopham Fen, 'upstream' in the River Waveney catchment, ~4.9km distant (Euclidean), designated as:

- Redgrave and South Lopham Fens Ramsar site;
- Waveney and Little Ouse Valley Fens Special Area of Conservation; and
- Redgrave and Lopham Fen SSSI.

Figure 1a. *Norfolk:* Data search results for designated sites within a 2km radius.

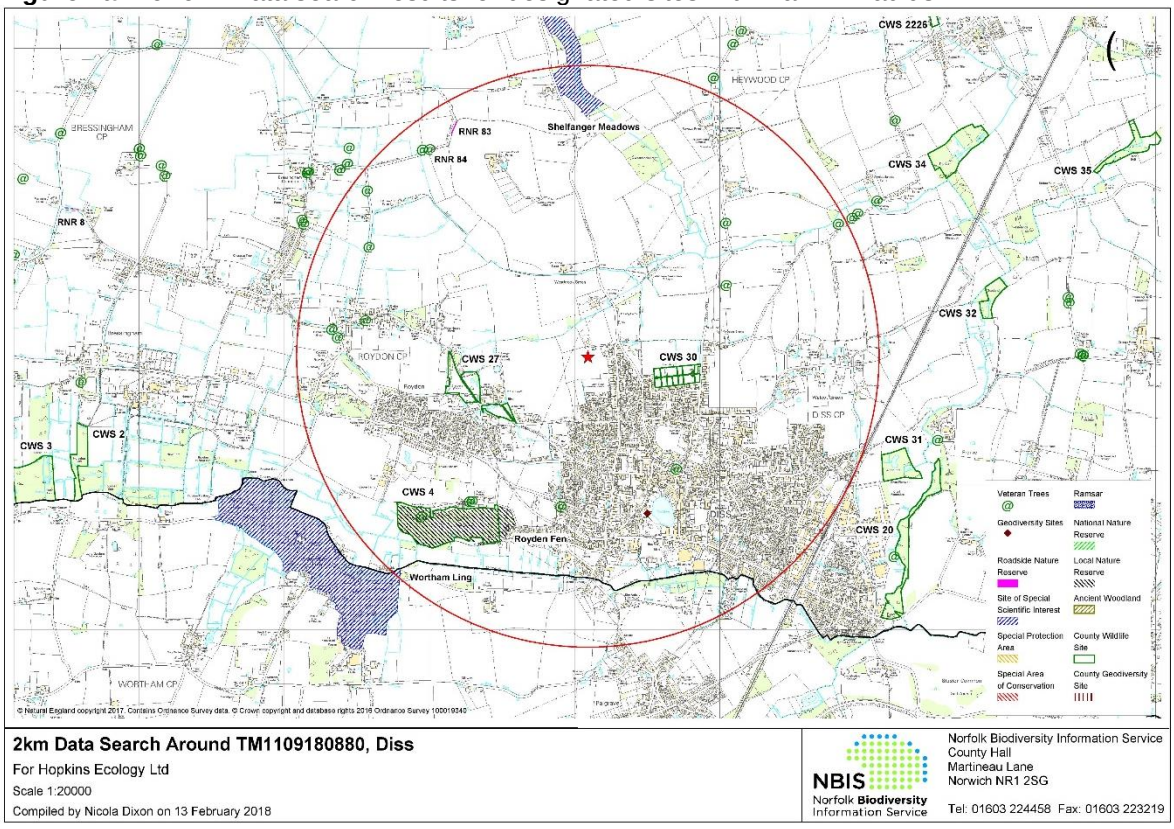
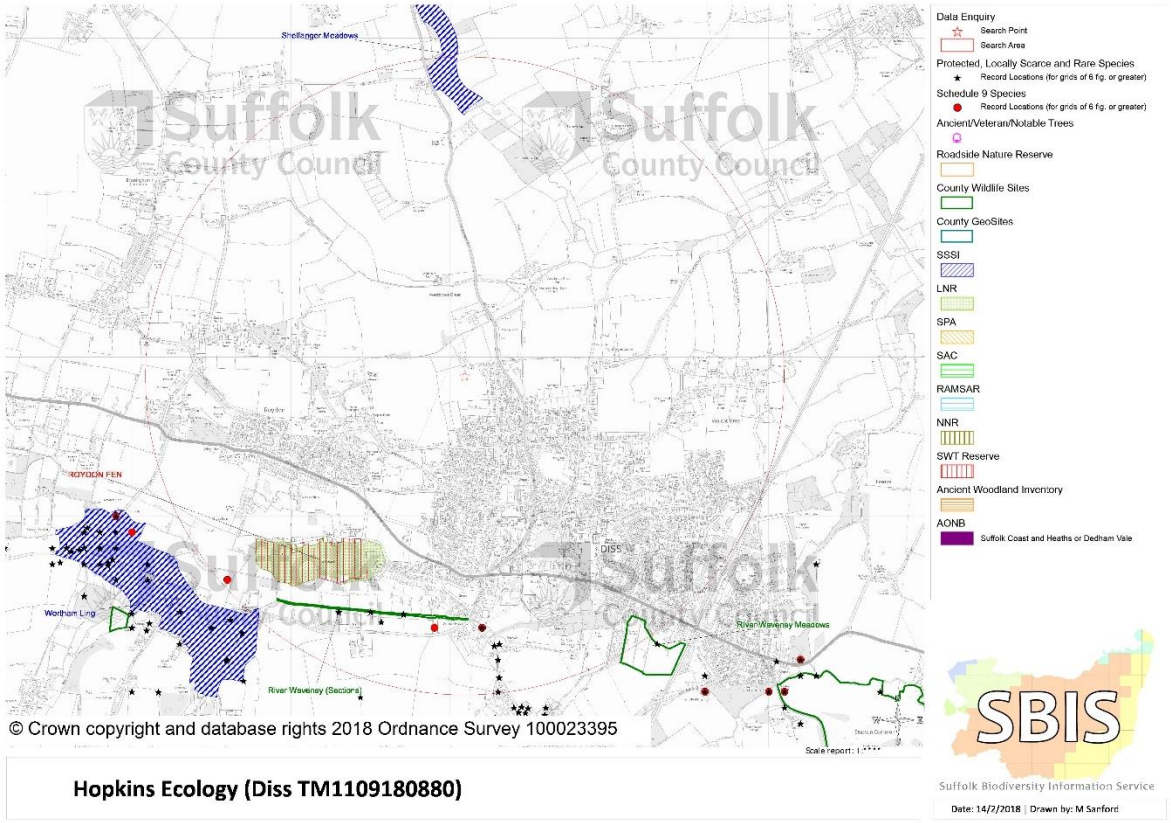


Figure 1b. *Suffolk:* Data search results for designated sites within a 2km radius.



NON-STATUTORY SITES

3.4 Included as a non-statutory site is Roydon Fen Local Nature Reserve (LNR), although the designation is statutory in the sense that it is via national legislation[7]. The protection of such sites is typically via local planning policies.

3.5 Including Roydon Fen there are a total of five County Wildlife Sites (CWSs) within 2km, of which two are within Suffolk (Table 2).

Table 2. CWSs within 1km.

Proximity		Name (CWS reference)	Description
Location	Distance		
Wider countryside	0.54km west	Brewer's Green (27)	A common, comprising semi-improved neutral grassland
	320m east	Diss Cemetery (30)	Neutral to basic species-rich grassland, part of which is a wildflower conservation area
River Waveney valley bottom	1.0kn south-west	Roydon Fen (4)	Roydon Fen is a mosaic of woodland, scrub and fen habitats
	1.4km south	River Waveney, sections (mid-Suffolk 88)	River with species-rich aquatic flora, also breeding kingfishers
	1.42km south	River Waveney Meadows (mid-Suffolk 106)	Three wet meadows adjacent to the River Waveney (south)

[7] The legal instrument being the National Parks and Access to the Countryside Act 1949.

4. Strategic Policies and Projects

GREEN INFRASTRUCTURE

4.1 A green infrastructure network has been proposed for the Greater Norwich Area, with the policy requirements originating in the Joint Core Strategy[8]. The spatial vision for these corridors is informed by a Green Infrastructure Strategy (CBA, 2007[9], updated 2011[10]) and associated studies (e.g. Green Networks: Norfolk Wildlife Trust, 2007[11]). The key feature relevant to this Site is:

- A sub-regional green infrastructure corridor is proposed to run northwards from Diss, passing within roughly 500m east of the Site. This is the South Norwich – Mulbarton – Diss corridor.

COUNTRYSIDE PROJECTS

4.2 Two countryside partnership schemes are of particular relevance:

- Living Landscapes, and
- B-Lines.

Living Landscapes

4.3 The Norfolk Wildlife Trusts promotes a 'Living Landscapes' scheme to encourage nature conservation and habitat management and improvement in high-value landscapes. The Site is within the:

- Claylands Living Landscape[12], which covers the entire South Norfolk DC area and has the following aspiration:

> *"The Claylands Living Landscape project aims to enhance the management of the area's wildlife habitats and expand its area of grassland and woodland – thereby creating a more joined-up ecological network – as well as to encourage the more sensitive management of farmland. To achieve this aim, (Norfolk Wildlife Trust) will be working closely with community groups and landowners in South Norfolk to raise wildlife awareness, as well as encouraging their active participation in conserving and enjoying the area's historic natural environment."*

[8] Greater Norwich Development Partnership (2014) *Joint Core Strategy for Broadland, Norwich and South Norfolk.* Available from: http://www.greaternorwichgrowth.org.uk/planning/joint-core-strategy/
[9] CBA (2007) *Greater Norwich Development Partnership. Green Infrastructure Strategy. A Proposed Vision for Connecting People, Places and Nature*. Available from: http://www.greaternorwichgrowth.org.uk/dmsdocument/201
[10] http://www.greaternorwichgrowth.org.uk/dmsdocument/1590
[11] Norfolk Wildlife Trust (2006) *Report of the Ecological Network Mapping Project for Norfolk.* Available from: http://www.norfolkbiodiversity.org/pdf/news/Final_report_of_indicative_map_July%202006.pdf
[12] https://www.norfolkwildlifetrust.org.uk/a-living-landscape/claylands

B-Lines

4.4 The Site straddles a B-Line ('bee-line'). The B-lines are promoted by Buglife – The Invertebrate Conservation Trust as a countryside project for pollinating insects[13]. This landscape scheme fits in the fit within the National Pollinator Strategy (DEFRA, 2015[14]) and is described as follows:

> *"The B-Lines are a series of 'insect pathways' running through our countryside and towns, along which we are restoring and creating a series of wildflower-rich habitat stepping stones. They link existing wildlife areas together, creating a network, like a railway, that will weave across the British landscape. This will provide large areas of brand new habitat benefiting bees and butterflies – but also a host of other wildlife"*

4.5 The Waveney B-Line runs along the Waveney Valley, connecting to The Brecks to the west and ultimately the coast to the south, with corridors running off the Waveney Valley including one that runs northwards towards Norwich parallel to the A140.

[13] https://www.buglife.org.uk/b-lines-hub/east-of-england

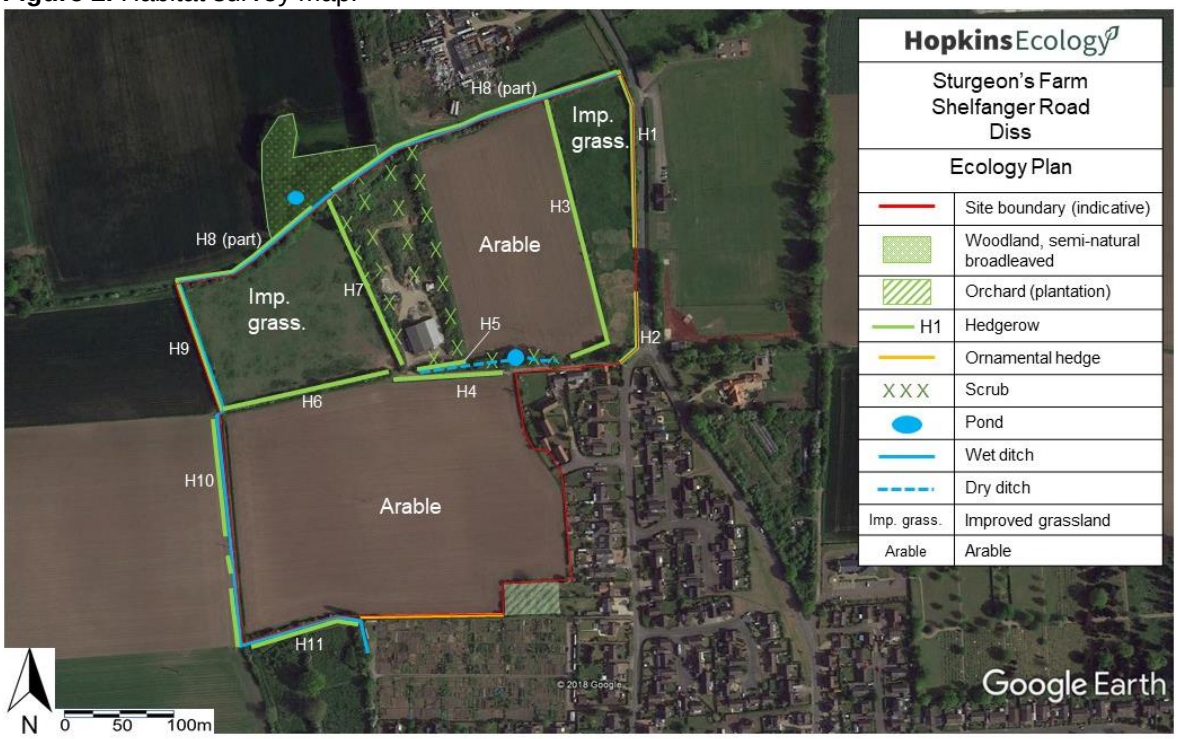
[14] DEFRA (2015) *National Pollinator Strategy: Implementation Plan*. Available from; https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/474386/nps-implementation-plan.pdf

5. Habitats and Botany

OVERVIEW

5.1 The Site comprises several fields, both arable and improved grass swards, with partial boundary hedgerows and scrub, ditches and a pond (Figure 2). There is a compound used for farm materials and this includes a large, modern barn. Off-Site is a block of woodland and an orchard. The soil is classed as a 'slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils'.

Figure 2. Habitat survey map.



ARABLE FIELD

5.2 The two arable fields comprise >60% of the Site. At the time of survey, the fields were under winter cereal. The arable margins are narrow and weed-free, with the crop extending to nearly the edge of the verges of permanent grass sward.

IMPROVED GRASS SWARDS

5.3 Improved grass swards are present as two fields and grass verges alongside hedgerows and field boundaries:

- Grass fields. Both fields are grazed by horses, although neither was grazed at the time of survey. The swards are short and improved and with some limited poaching around entranceways. Both swards are of agricultural grasses, those noted being: rye grass *Lolium* species, meadow grass *Poa* species, creeping bent *Agrostis stolonifera* common bent *A. capillaris* and Timothy *Phleum pratense*, with false oat grass *Arrhenatherum elatius* and cock's foot *Dactylus glomerata* on the periphery. Herbs are a minor component of the sward, those noted being: creeping buttercup *Ranunculus acris,* ragwort *Jacobaea vulgaris*, ground ivy *Glechoma* hederacea, lanceolate plantain *Plantago lanceolata*, dandelion *Taraxacum officinale*, forget-me-not *Myosotis* species, white clover *Trifolium repens*, common chickweed *Cerastium media*, greater stichwort

Cerastium holostea, tormentil *Potentilla erecta*, dove's foot cranesbill *Geranium mole* and yarrow *Achillea millefolium*.

- The field verges are likewise improved swards, dominated by false oat grass and cock's foot with patches of Yorkshire fog *Holcus lanatus*, red fescue *Festuca rubra* and couch *Elymus repens*. Herbs are a minor component and comprise a mix of tall ruderals such as nettle *Urtica dioica*, hogweed *Heracleum sphondylium*, broad-leaved cock *Rumex obtusifolius*, and cow parsley *Anthriscus sylvestris* with lower-growing herbs such as ground ivy and white dead nettle *Lamium album.*

HEDGEROWS

5.4 Most field boundaries have hedgerows, often with an associated ditch. The woody species mainly comprise hawthorn *Crataegus monogyna*, with bramble *Rubus fructicosus* agg, ivy *Hedera helix*, blackthorn *Prunus spinosa*, and oak *Quercus robur*; at lower frequency are occasional plants of elder *Sambucus nigra*, hazel *Corylus avellana*, small-leaved elm *Ulmus minor*, goat willow *Salix caprea* and field rose *Rosa arvensis*. Non-native butterfly bush *Buddleia davidii* is present as a singleton. The herb flora was little evident at the time of survey, and of the species typical of more wooded habitats only cow parsley and lords and ladies *Arum maculatum* were noted, the latter being the only species recorded that is listed as being relevant as an 'additional feature' under the Hedgerow Regulations.

5.5 The south-east boundary is to garden curtilages and is marked variously by fence panels, wire fences and hedging.

Table 3. Summary description of hedgerows.

Reference (see Figure 2)	Description	Woody species	Associated ditch
H1	Roadside hedgerow, tall and leggy	Hawthorn, blackthorn, elm, oak, ash and bramble	None
H2	Located alongside a public footpath and with a short length alongside Shelfanger Road Leggy and unmanaged	predominantly hawthorn with ash, elder, ivy and bramble	None
H3	Straggly hedgerow with patches of shrubs interspersed with bramble patches	Hawthorn, oak and bramble	None
H4	Defunct and trimmed to ~1m	Hawthorn, field rose, ivy and bramble	None
H5	Short length of unmanaged hedgerow with ditch, alongside the track	Hawthorn, oak, bramble goat willow and butterfly bush	Dry ditch alongside track
H6	Unmanaged, straggly	Hawthorn, ash, elder, field rose, bramble and goat willow	Dry ditch alongside track
H7	Unmanaged, straggly	Hawthorn, ash, oak, field rose, bramble and goat willow	None
H8	This hedgerow runs along the length of the north boundary located on the opposite side of a wet ditch	Hawthorn with patches of elm and buckthorn and bramble throughout At the western end where the ground is lower and wet goat willow and alder are present and also hazel	Wet ditch on the Site side of hedgerow

Reference (see Figure 2)	Description	Woody species	Associated ditch
H9	Tall hedgerow (~2m) with occasional management evident	Hawthorn, ash, oak, ivy, bramble, field rose and goat willow	Flowing ditch (south to north) on opposite side to the hedgerow and Site
H10	Tall hedgerow (~2m) with occasional management evident	Hawthorn, oak, bramble, ivy and field rose	Flowing ditch (south to north) on the side of the Site, with the hedgerow on the opposite side
H11	Tall unmanaged hedgerow (~2m) with some recent infill (within 10 years) of hawthorn whips	Hawthorn, bramble, hazel and oak	Flowing ditch on the Site side

SCRUB

5.6 Alongside the track running across the approximate centre of the Site is a patch of sparse scrub of oak, holly *Ilex aquifolium*, hawthorn, elder and bramble and also with non-native planting, including pampas grass *Cortaderia selloana*, *Forsythia* species, lilac *Syringia* species, non-native pine *Pinus* species, and butterfly bush.

5.7 Along the east boundary of the compound there is a thick band of bramble scrub with the occasional hawthorn bush and with tall ruderals along the margins. This does not appear to run along the line of a former hedgerow and is probably a post-1940s feature. Elsewhere within the compound there are dense patches of bramble scrub with occasional hawthorn and elder bushes and oak saplings. Associated with this scrub area are heaps of soil and rubble as well as hardstanding.

ORNAMENTAL HEDGE

5.8 Along part of the south boundary, separating the Site from adjacent allotments is a length of tall, dense Leyland cypress *Cupressus* × *leylandii* hedge.

PLANTED TREES

5.9 Alongside the track are a small number of planted mature trees: aspen or white poplar (either *Populus tremula* or *P. alba*) and also hybrid poplars *Populus* species.

DITCHES

5.10 Along the western boundary, running northwards and ultimately eastwards is a wet, flowing ditch that ultimately connects to a tributary of the River Waveney east of Shelfanger Road. Aquatic vegetation is absent throughout other than occasional patches of hairy willowherb *Epilobium hirsutum,* which is a species associated with damp soils. It is likely that the ditch is dry outside of periods of rainfall. There are also lengths of dry ditch on-Site.

BUILDINGS

5.11 Located within a compound with associated scrub is a large modern, pre-fabricated barn.

OFF-SITE

5.12 There are two Habitats of Principal Importance (also shown on MAGIC) located adjacent to the boundaries:

- Lowland Deciduous Woodland. There is a small block of this habitat alongside the north boundary. It is shown as woodland on the 1946 aerial photograph but is an open

field on the 1880 OS map. It has a high canopy of mature oak trees of relatively narrow stature and alder *Alnus glutinosa* is an occasional component. The ground flora appears to be nettle, but there was extensive open water at the time of survey.

- A Traditional Orchard is located adjacent to the south-east boundary of the Site. This is small (~0.13ha) and appears to be mainly mature apple trees, but bramble and hawthorn scrub is abundant around the trees as well as ivy on many stems. A small derelict shed is located on the boundary to the Site.

6. Scoping for Species of Conservation Concern

PLANTS

6.1 The broader landscape is considered to have a moderate diversity of arable margin species (Walker et al. 2012[15]). However, the data search returned records for few plants of conservation concern, the majority associated with the acid grassland and heath of Wortham Ling and the remainder being wetland species.

6.2 The extent and quality of habitat for arable species on the Site is, however, likely to be very low, with cropping close to the grassy field verges and only limited areas of 'field corners' with a reduced intensity of cultivation. The assemblage of arable flora is likely to be small.

BATS

6.3 Records for nine species of bat were returned by the data search: barbastelle, Daubenton's, Natterer's, Leisler's, noctule, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle, and brown long-eared. The majority of these records were obtained during field surveys for the Norfolk Bat Survey[16]; and no roost records were returned. This Site is classed as follows:

- Foraging. Much of the Site is open arable farmland with foraging habitat restricted to the boundary hedgerows, scrub and woodland. High quality foraging habitat, such as extensive wetlands, wet humus-rich soil, herb-rich grassland or extensive woodland are absent. The overall quality of the Site for foraging bats is therefore low, and the numbers of bats regularly foraging are likely to be low and the overall assemblage comprising a small number of species.
- Trees. None of the trees within the Site or on the boundary were considered to have potential roost features for bats, by virtue of their small stature. The off-Site woodland to the north appears to have trees with at least low potential suitability.
- Buildings. The building and structures within the compound are modern and pre-fabricated with negligible potential suitability for roosting bats.

6.4 In summary, extensive tracts of the Site are of low suitability for foraging with the boundary hedgerows and woodland being the main potential areas of habitat likely to be used by bats, albeit by low numbers. Two trees (one dead, one living) have low but not negligible potential suitability for roosting.

GREAT CRESTED NEWTS

6.5 There are no records of great crested newts from within 2km. A search radius of 250m is used to scope for potential breeding ponds (following English Nature, 2001[17]), and there appear to be two relevant ponds:

- One pond is on-Site, located in an area of sparse scrub; this is rated as having good potential suitability for great crested newts.
- A second pond is located in the off-Site woodland adjacent to the north boundary; this could not be viewed as the wider woodland areas was flooded at the time of survey.

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[15] Walker, H., Cunningham, S., Ellis, B., Neal, S. and Swan, E. (2012) *Important Arable Plant Areas in Norfolk.* Available from: http://www.nbis.org.uk/sites/default/files/documents/Important%20Arable%20Plant%20Areas%20in%20Norfolk_SCREEN.pdf

[16] http://www.batsurvey.org/

[17] English Nature (2001) *Great Crested Newt Mitigation Guidelines*. English Nature, Peterborough.

6.6 It is considered that great crested newts cannot be scoped-out and it is recommended that both ponds are directly surveyed for great crested newts. If great crested newts are present then it is likely that mitigation of impacts is feasible.

BIRDS

6.7 The data search returned a diverse range of species records, including a number unlikely to be relevant, such as osprey and species with strong association with wetland areas. Included on the search are species potentially likely to overwinter on arable farmland and utilise open fields, verges, hedgerows, scrub and woodland for nesting:

- Overwintering on open fields and margins: lapwing, skylark, reed bunting and yellowhammer;
- Nesting in open fields: skylarks;
- Nesting in scrub and hedgerows: turtle dove, nightingale, spotted flycatcher, reed bunting, dunnock, and song thrush;
- Margins: grey partridge; and
- Buildings: house sparrow and starling.

6.8 During the Site visit no wintering birds of note were recorded. The quality of the Site for wintering small (passerine) farmland species is generally low, lacking seed-rich margins or cereal stubbles. For species of open fields, such as lapwing, the Site is probably overly disturbed from nearby gardens, the footpath and informal walkers.

6.9 For nesting birds:

- The field margins are generally narrow and grassy rather than weed- and herb-rich, thus they are probably of lower value for species that nest or feed in such areas, e.g. grey partridge and yellowhammer.
- The hedgerows are scrub but are likely to be used by widespread but declining species such as dunnock, bullfinch and others. Although turtle dove and nightingale nest in scrub the likelihood of them being present is low: nightingales tend to use scrub within woodland and turtle doves feed on seed-rich arable margins that are not present on-Site.
- The open field habitat is of potential value to skylark, but at most one or two pairs based on average territory size in winter cereals of 4.5ha[18].

6.10 In summary, for most typical farmland species the Site is probably of lower value based on the general absence of weed- and herb-rich field margins. The hedgerows, scrub and woodland are likely to support a small assemblage of widespread, declining species as well as common species.

REPTILES

6.11 The only reptile record from within 2km is of a common lizard from Roydon Fen, >1.5km distant. The arable areas and margins are of very low suitability for reptiles and with little habitat in total. The scrub and scrub margin areas associated with the compound are suitable

[18] Based on territory sizes of 4.5ha in winter cereals and 2.5ha in other arable types, taken from: Poulsen, J.G., Sotherton, N.W., & Aebischer, N.J. (1998) Comparative nesting and feeding ecology of skylarks *Alauda arvensis* on arable farmland in southern England with special reference to set-aside. *Journal of Applied Ecology*,*35*(1), 131-147.

for common reptiles and direct surveys are recommended. If reptiles are present then impacts can be mitigated.

SMALL MAMMALS

6.12 Small mammals are assessed as follows:

- Badgers, there are no records within 2km and no evidence on-Site. They are considered absent.
- Brown hares are only recorded from a single record from almost 2km distant. The Site is potentially suitable but subject to some disturbance from the footpath. At most they would be present in low numbers.
- Hedgehogs are known widely locally. The hedgerows and scrub areas offer shelter and foraging habitat and they are probably present in low numbers.
- Otters and water voles are reported from the River Waveney. The on-Site ditches are of very low suitability, being shallow and lacking aquatic vegetationa, and likely to be only seasonally wet. Both species are considered absent.

INVERTEBRATES

6.13 Records for a suite of 15 moths and one butterfly were returned from within 2km, many from a regular garden trapping station in suburban Diss. Other than two Breckland specialists that are assumed to be present as vagrants, all are widespread but declining moths with the status of Species of Principal Importance (Butterfly Conservation, 2007[19]). As analysed using Natural England's 'Invertebrate Species-habitat Information System,' (Drake et al., 2007[20]) these species are almost all generalists or with only broad habitat associations (to arboreal foliage or scrub-grass matrix), the exception being the small heath butterfly *Coenonympha pamphilus* (Lepidoptera: Satyridae) that is a specialist of 'open short sward' grassland, a habitat that is not present.

6.14 The site offers little specialist habitat and resources for invertebrates, largely lacking high quality features typically associated with species of conservation concern in the respective habitats:

- The arable margins are narrow and weed-free, thus not offering seed-rich periodically disturbed conditions, and the verges are not 'open short sward'; and
- The hedgerows and scrub are small in area, lacking dead wood and without association with transition habitats such as grassland-scrub matrix or flower-rich areas. The off-Site woodland and orchard are potentially of greater value for woodland species, mainly associated with dead wood.

6.15 The Site is likely to be of low value for invertebrates, and at most it may support a small assemblage of generalist moths that include a number of Species of Principal Importance that have undergone national declines but remain widespread.

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[19] Butterfly Conservation (2007) *Biodiversity Action Plan – Moths*. Available from: http://butterfly-conservation.org/files/uk-bap-species-moths-research-only.pdf

[20] Drake C.M., Lott, D.A., Alexander, K.N.A. & Webb, J. (2007) Surveying *Terrestrial and Freshwater Invertebrates for Conservation Evaluation.* Natural England, Sheffield.

7. Evaluation

HABITATS OF PRINCIPAL IMPORTANCE

7.1 The only on-Site habitat that qualifies as a Habitat of Principal Importance (Maddock, 2011[21]):

- Hedgerows. The only hedgerow is along the east boundary of the main arable field and qualifies due to its woody composition being >80% native species. It is thought unlikely to qualify as an Important Hedgerow under the Hedgerow Regulations.

7.2 Off-Site adjacent to the boundary there is:

- Lowland Mixed Deciduous Woodland. The block of woodland to the north qualifies as a Habitat of Principal Importance. It contains mature trees but appears to be of post-1946 origin.
- Traditional Orchard. The orchard qualifies as the Traditional Orchard Habitat of Principal Importance.

SCOPING FOR SPECIES OF CONSERVATION CONCERN

7.3 The Site appears to be 'typical' of farmland habitat, with some extensive tracts of open arable fields and limited lengths of boundary hedgerows and other habitats. The assemblages of species of conservation concern are likely to be relatively species-poor and with low numbers. Notwithstanding any legal protection to individual species, it is likely that the Site is of relatively low ecological value and with species present likely to be present in low numbers and as part(s) of larger local population(s). The protected species scoping is summarised below (Table 4).

Table 4. Summary of ecology assessment.

Feature	Description	Assessment
Bats	No potential roost feature son-Site or boundaries Habitat for foraging limited to boundary hedgerows and scrub	Likely of low importance for foraging
Great crested newts	None recorded locally but an on-Site pond rated as being of 'average' potential suitability, and a second pond off-Site within woodland	Direct surveys recommended of both ponds
Birds	Hedgerows, scrub and verges relatively sparse and not suitable for some farmland species in particular lacking seed-rich margins	Nesting likely in hedgerows and scrub. Assemblage likely restricted to common and also widespread, declining species. The assemblage is likely to be small and with low densities
Reptiles	Common lizard recorded from Roydon Fen Scrub ad scrub edge habitat with associated rubble etc present	Direct surveys recommended
Badgers	No records from within 2km and no evidence on-Site	Considered absent
Water vole and otter	Only recorded from the River Waveney On-Site habitat likely to be unsuitable	Considered absent

[21] Maddock, A. (2011) *UK BAP Priority Habitat Descriptions*. Available from: http://jncc.defra.gov.uk/PDF/UKBAP_PriorityHabitatDesc-Rev2010.pdf

Feature	Description	Assessment
Brown hare	Single record from within 2km Site with suitable habitat but possible disturbance from the footpath	Potentially present in low numbers
Hedgehogs	Known to be present locally and hedgerows and scrub offer shelter and foraging habitat	Potentially present
Invertebrates	Records of widespread but declining moths local Specialist microhabitats generally absent	Only widespread species likely to be present but including declining moths. Assemblage small and in low numbers

RECOMMENDATIONS FOR ADDITIONAL SURVEYS

7.4 The baseline described here is considered to be robust in terms of describing the likely value of the Site. For the purposes of the ensuring legal compliance and further informing impacts the following surveys are recommended:

- Direct surveys for great crested newts in the on-Site and off-Site ponds; and
- Reptile surveys of the scrub-edge habitat associated with the compound.

8. Impacts, Mitigation and Enhancements

IMPACTS

International Sites

8.1 Redgrave and Lopham Fen has international, European and national designations, as:

- Redgrave and South Lopham Fens Ramsar site;
- Waveney and Little Ouse Valley Fens Special Area of Conservation; and
- Redgrave and Lopham Fen SSSI.

8.2 Redgrave and Lopham Fen is located upstream in the River Waveney catchment and is ~4.9km distant (Euclidean). It is thought very unlikely that a scheme on this Site would impact its site integrity, by virtue of:

- The downstream location, such that any surface run-off or water borne contaminants would flow away;
- Recreational impacts are unlikely due to distance, the small size of the scheme and the substantial visitor infrastructure at Redgrave and Lopham Fen, such as boardwalks and management by Suffolk Wildlife Trust[22], as also concluded within the *Habitats Regulations Assessment for the Site Specific Allocations and Policies Document* (South Norfolk DC, 2013[23]).

National Sites

8.3 The assessment of impacts on Redgrave and Lopham Fen SSSI is the same as described for the site in terms of its international and European designations.

8.4 There are two sites with national designation within 2km:

- Wortham Ling SSSI is located on the other side of the River Waveney 1.9km distant (Euclidean) and separated by the Diss conurbation. Any increase in recreational use by residents is likely to be very low in absolute and relative terms, and consequently recreational impacts are likely to be negligible.
- Shelfanger Meadows SSSI is located 0.88km north-east, straddling an unnamed tributary of the River Waveney, upstream of its confluence with the ditch exiting the Site. It does not have public access. It is considered that impacts will therefore be negligible.

County Wildlife Sites

8.5 County Wildlife Sites within 2km are thought unlikely to experience substantial increases in recreational pressure and none are connected via surface water flows:

- Roydon Fen LNR and CWS is distant, and separated from the Site by the conurbations of Roydon and Diss as well as having existing visitor infrastructure;
- Brewers Green CWS is accessible by footpath from the Site, ~0.5km west. It has open access but is on the edge of Roydon and any increase in visitor numbers is likely to be

[22] http://www.suffolkwildlifetrust.org/redgrave

[23] South Norfolk DC (2013) *Habitats Regulations Assessment of the Site Specific Allocations and Policies Document, Wymondham Area Action Plan, Long Stratton Area Action Plan and Cringleford Neighbourhood Development Plan, Undertaken for South Norfolk District Council. October 2013.* Available from: https://www.south-norfolk.gov.uk/sites/default/files/Habitat%20Regulations%20Assessment.pdf

relatively low, and Brewers Green itself is on a road-side location and is small and unlikely to offer a 'destination' for walkers from the Site.

- Diss Cemetery CWS is ~300m east but it is thought unlikely that it will be used for recreation.

MITIGATION OF CONSTRUCTION IMPACTS

8.6 Generic guidance to mitigate construction impacts will likely comprise:

- Undertaking general site clearance works outside of the nesting bird season; and
- Ensuring good practice with respect to potential pollutants entering ditches (e.g. SEPA, 2017[24]).

8.7 Recommendations with respect to any mitigation requirements for reptiles and great crested newts will await the results of direct surveys. In broad terms any such requirements will involve phased displacement of reptiles and exclusion and / or translocation of great crested newts. Scheme design will also need to include suitable areas of greenspace in relevant locations to retain these species. Mitigation of impacts on both reptiles and great crested newts are considered feasible and realistic.

ENHANCEMENTS AND OPPORTUNITIES

Strategic Context

8.8 As noted, the Site is within or close to three landscape-scale countryside enhancement schemes:

- The Claylands Living Landscape (Norfolk Wildlife Trust),
- The Waveney B-Line (Buglife), and
- A sub-regional green infrastructure corridor (Greater Norwich Area) running north-south roughly 500m east of the Site.

8.9 Also, there are two blocks of Habitat of Principal Importance adjacent to the boundaries:

- Lowland Deciduous Woodland to the north, and
- Traditional orchard to the south.

8.10 In terms of providing habitat relevant to all of these, appropriate measures comprise:

- The creation of new areas of structural and wildflower planting;
- On-Site orchard or fruit tree planting;
- Buffering the off-Site woodland and orchard with areas of informal greenspace; and
- Strengthening the north-south linear corridor of semi-natural habitat, where presently there are only relatively narrow hedgerows.

Generic Soft Landscaping

8.11 Soft landscaping is the most appropriate Site-wide enhancement, using native species and species of known wildlife value. Key points for many species groups is the need for insect prey, for bats and also for the chicks and fledgling birds of many species. Thus, a range of

[24] SEPA (2017) *Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5 January 2017.* Available from: http://www.netregs.org.uk/media/1418/gpp-5-works-and-maintenance-in-or-near-water.pdf

native plant types should be planted to provide a range of resources across the seasons from spring to autumn (insects and their predators), and also fruit and berry producing species in autumn and winter (birds).

8.12 In terms of habitat for reptiles and great crested newts, if present, the key measures will be to include areas of greenspace in close association with the on-Site pond and maintaining connectivity to the woodland to the north. The terrestrial habitat required by both reptiles and great crested newts are broadly similar, comprising a mosaic of grassland and scrub with areas of cover provided by habitat piles.

8.13 For woody species appropriate for structural planting, those typical of local hedgerows (Norfolk County Council, undated[25]) are:

- Hawthorn, blackthorn, ash, maple, dogwood *Cornus sanguinea*, elm and hazel, with lesser amounts of crab apple *Malus sylvestris*, hornbeam *Carpinus betulus* and holly, and scattered examples of privet *Ligustrum vulgare*, oak, spindle *Euonymus europaeus*, wild cherry *Prunus avium* and guelder rose *Viburnum opulus*.

8.14 Shrubs suitable for planting within the scheme include most of the species listed for hedgerows. Small trees of value include silver birch *Betula pendula*, rowan *Sorbus aucuparia*, whitebeams *Sorbus* species, and fastigiate forms of hornbeam. Trees allowed to develop open growth forms typical of parkland trees would be of particular value in the medium- and long-term, with oak and beech *Fagus sylvatica* of very high value in such contexts.

8.15 Within areas of grassland and SUDS features a number of wildflower seed mixes are available from commercial suppliers, including wetland and pond planting (e.g. Emorsgate EM8 meadow mixture for wetlands), wildflower swards on heavy soils (e.g. EM4 meadow mixture for clay soils and EM10 tussock mixture) and flowering lawns for areas with more intensive use and management (e.g. EL1 flowering lawn mixture).

Additional Measures

8.16 Additional measures could include:

- Bat boxes to be erected on buildings, either as integral ‘bat tubes’ embedded within walls or as external boxes, and also on the on-Site trees and larger hedgerow stems. A wide range of types are suitable[26].
- Bird boxes should be erected for locally relevant species, including swifts and house sparrows.
- The scheme should allow for the continued movements of hedgehogs, with garden gates raised to allow them to pass under and holes within gravel boards to allow them to pass through[27].

[25] Norfolk County Council (undated) *Planting Hedges in Norfolk – Maintaining Regional Character*. Available from: http://www.norfolkbiodiversity.org/pdf/reportsandpublications/HedgeBookletPROOF4.pdf

[26] http://www.wildlifeservices.co.uk/batboxes.html

[27] https://www.jacksons-fencing.co.uk/News/outdoor-living/new-hedgehog-friendly-gravel-boards-winter-news-topical-treats-and-more-6511.aspx

9. Conclusion

9.1 The main part of the Site is considered to be relatively typical of farmland, with arable fields and improved grassland, with hedgerows, ditches and scrub. The species of conservation concern likely or potentially present mostly comprise widespread but declining species and as components of larger local populations. Further surveys are recommended to establish the local presence-absence of great crested newts in two ponds and reptiles in the scrub-edge habitat.

9.2 If reptiles and / or great crested newts are present then specific mitigation will be required, and it is considered likely that this will be able to mitigate for impacts on both species. Other measures to mitigate for impacts of construction include the timing of works to avoid the nesting bird season and following good practice to avoid pollutants, including soil, from entering ditches.

9.3 The likely loss of semi-natural habitat for any scheme will likely be low and mitigation via soft landscaping is the most appropriate. At a strategic level such landscaping would offer new habitat area potentially relevant to: local green infrastructure proposals; the landscape conservation projects of the Claylands Living Landscape and the Waveney B-Line for pollinating insects; and also to buffer and improve the landscape connectivity for two adjacent habitats of note, namely a block of woodland and a traditional orchard.

9.4 Impacts on designated sites are considered to be negligible, by virtue of distance and also the downstream location of the Site within the river catchment.

9.5 In conclusion, it is considered likely that the impacts on the majority of species can be mitigated, and appropriate landscaping and scheme design with have the potential to deliver net ecological enhancement.

10. Appendix 1: Photographs

Figure 3.
Improved grass field (east).

Figure 4.
Improved grass field (west).

Figure 5.
Open arable field, looking towards the south boundary.

Figure 6.
Hedgerow H9, looking north off-Site.

Figure 7.
Hedgerows H2 and H1 (near and far distance respectively), looking north on Shelfanger Road.

Figure 8.
On-Site pond.

Figure 9.
Off-Site woodland with flooding.

Figure 10.
Off-Site orchard.

11. Appendix 2: Legislation

Non-technical account of relevant legislation and policies.

Species	Legislation	Offence	Licensing
Bats: European protected species	Conservation of Habitats and Species Regulations 2010 (as amended) Reg 41	Deliberately capture, injure or kill a bat; deliberate disturbance of bats; or damage or destroy a breeding site or resting place used by a bat. [The protection of bat roosts is considered to apply regardless of whether bats are present.]	A Natural England (NE) licence in respect of development is required.
Bats: National protection	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally or recklessly obstruct access to any structure or place used for shelter or protection or disturb a bat in such a place.	Licence from NE is required for surveys (scientific purposes) that would involve disturbance of bats or entering a known or suspected roost site.
Birds	Wildlife and Countryside Act 1981 (as amended) S.1	Intentionally kill, injure or take any wild bird; intentionally take, damage or destroy the nest of any wild bird while that nest is in use or being built. Intentionally or recklessly disturb a Schedule 1 species while it is building a nest or is in, on or near a nest containing eggs or young; intentionally or recklessly disturb dependent young of such a species [e.g. kingfisher].	No licences are available to disturb any birds in regard to development.
Great crested newt: European protected species	Conservation of Habitats and Species Regulations 2010 (as amended) Reg 41	Deliberately capture, injure or kill a great crested newt; deliberate disturbance of a great crested newt; deliberately take or destroy its eggs; or damage or destroy a breeding site or resting place used by a great crested newt.	Licences issued for development by Natural England.
Great crested newt: National protection	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally or recklessly obstruct access to any structure or place used for shelter or protection or disturb it in such a place.	A licence is required from Natural England for surveying and handling.
Adder, common lizard, grass snake slow worm	Wildlife and Countryside Act 1981 S.9(1) and S.9(5)	Intentionally kill or injure any common reptile species.	No licence is required. However, an assessment for the potential of a site to support reptiles should be undertaken.
Scientific Interest (SSSI) It is an offence	Wildlife and Countryside Act 1981 (as amended)	To carry out or permit to be carried out any potentially damaging operation. SSSIs are given protection through policies in the Local Development Plan.	Owners, occupiers, public bodies and statutory undertakers must give notice and obtain the appropriate consent under S.28 before undertaking operations likely to damage a SSSI. All public bodies to further the conservation and enhancement of SSSIs.

Species	Legislation	Offence	Licensing
County Wildlife Sites	There is no statutory designation for local sites.	Local sites are given protection through policies in the Local Development Plan.	Development proposals that would potentially affect a local site would need to provide a detailed justification for the work, an assessment of likely impacts, together with proposals for mitigation and restoration of habitats lost or damaged.