Ecological Impact Assessment

Land behind Broadfields
Wivenhoe

On Behalf of:
Taylor Wimpey

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www.ses-eco.co.uk

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Executive Summary

1. This report presents the findings and recommendations of ecological surveys undertaken for Land behind Broadfields, Wivenhoe Essex. The proposal for the site is for residential development of 120 dwellings. The site extends to approximately 15ha in total, of which approximately 3.5ha is proposed for development, with the remainder retained or utilised to accommodate policy conditions which include the provision of new sports fields and public open space to the north.

2. The site is comprised of a fallow arable field to the west and an ex-arable field now comprised of scrub and grassland habitats to the east. The site is bordered by existing residential to the west, Wivenhoe Football Club to the north, arable to the east, and scrub, woodland and open water habitats to the south. To the south is the main settlement of Wivenhoe and the River Colne Estuary. To the north west lies the larger town of Colchester. To the east the local landscape is predominantly rural-arable in nature.

3. The site is within the ZoI of four Essex coastal sites considered to be of **international** importance under the Conservation of Habitats and Species Regulations (2017, as amended) and Essex RAMS. The site also falls within an Impact Risk Zone that relates to residential development for two SSSIs of **national** importance; Upper Colne Marshes SSSI and Colne Estuary SSSI. Finally, there is one LNR and 11 LoWS within 2km, considered to be of **local** importance. Wivenhoe Cross Pit LoWS lies partially within the site boundary and forms part of the land holding and study area for surveys conducted.

4. Increases in recreational pressure on designated sites can be expected to result from the proposed development. Potential impacts on European sites will be mitigated via a contribution of £125.58 per dwelling to the Essex RAMs and delivery of on-site semi-natural open space designed in accordance with Natural England SANGs guidance.

5. As Wivenhoe Cross Pit LoWS lies partially within the site and is directly adjacent to the proposed development area, direct impacts on this site such as pollution events, noise and lighting disturbance during construction are possible. This will require mitigation guided by the production of a CEMP: Biodiversity, recommended to be secured by planning condition. Due to the ecological sensitivity of this part of the site, the existing treeline boundary feature between the arable field and LoWS will be retained and the layout design includes a minimum 10m buffer between the treeline and the edge of the built development. It is further recommended that a Biodiversity Mitigation & Enhancement Strategy (BMES) is secured via planning condition and prepared prior to occupation; the BMES should include provisions for the LoWS area, detailing measures to minimise disturbance to sensitive features and enhance the site for wildlife long term.

6. Surveys have demonstrated that the site supports a foraging/commuting bat assemblage of local to district value, a breeding and wintering bird assemblage of local value, and a low population of grass snake of site value. Hedgehog are also known to be present on site. Mitigation and enhancement measures are proposed for these species, including precautionary working methods, retention and protection of existing habitats and new habitat creation.

7. Through implementing the recommended mitigation and enhancements, it is considered that all significant negative impacts from the proposed development upon protected and notable habitats and species will be fully be mitigated in line with relevant wildlife legislation and national and local planning policy related to biodiversity. Measurable biodiversity net gain will be achieved through implementation of a wildlife friendly soft landscaping scheme and retention/enhancement of the LoWS area to the east. The net gain to be achieved has been quantitatively demonstrated utilising the Defra 2.0 biodiversity metric calculator.

Contents

Appendices

1.0 Introduction

1.1 Southern Ecological Solutions Ltd. (SES) was commissioned by Taylor Wimpey to undertake a suite of ecological surveys and produce an Ecological Impact Assessment Report for Land behind Broadfields, Wivenhoe, Essex, located at Ordnance Survey Grid Reference TM04642331. The assessment was undertaken to support a planning application for construction of residential development (Use Class C3), access, landscaping, public open space, and associated infrastructure works.

1.2 The study area for assessment extended to approximately 15ha and comprised a fallow arable field to the west and an ex-arable field now comprised of scrub and grassland habitats to the east, each surrounded by established boundary treelines. The site is bordered by existing residential to the west, Wivenhoe Football Club to the north, arable to the east, and scrub, woodland and open water and habitats to the south. To the south is the main settlement of Wivenhoe and the River Colne Estuary. To the north west lies the larger town of Colchester. To the east the local landscape is predominantly rural-arable in nature.

1.3 The site has been allocated for residential development within the Wivenhoe Neighbourhood Plan. This plan has been adopted by Colchester Borough Council and is incorporated in the new emerging Colchester Borough Local Plan, of which Section 1 has now been formally adopted. Of the total site area of 15ha, approximately 3.5ha is proposed for residential development of 120 dwellings, with the remainder to be retained, enhanced through semi-natural landscaping and ongoing management and/or utilised to accommodate policy conditions, which include the provision of new sports fields (2ha) and public open space. The eastern section of the site forms part of the non-statutory designated Wivenhoe Cross Pit Local Wildlife Site (LoWS) and will be retained as a wildlife corridor. A site location plan is provided in Appendix 1. Details of relevant planning policies are provided in Appendix 2.

1.4 A preliminary ecological appraisal (PEA) was undertaken in November 2019. This survey aimed to:

- Map the main ecological features within the site and compile a plant species list for each habitat type;
- Make an initial assessment of the presence or likely absence of species of conservation concern
- Identify any legal and planning policy constraints relevant to nature conservation which may affect the development (see Appendix 2);
- Determine any potential further ecological issues;
- Determine the need for further surveys and mitigation; and
- Make recommendations for minimising impacts on biodiversity and providing net gains in biodiversity where possible in accordance with Chapter 15: *Conserving and Enhancing the Natural Environment*, of the National Planning Policy Framework (MHCLG, 2019), and relevant nature conservation policies within the adopted and emerging Colchester Local Plan.

1.5 The following further surveys were subsequently carried out between April 2020 to February 2021:

- Detailed botanical survey;
- Bat ground level tree assessment;
- Bat activity surveys;

- Breeding and wintering bird surveys;
- Reptile presence / absence surveys and;
- Notable mammal species assessment.

1.6 This report sets out the results of the above surveys. Features are evaluated using the evidence from the desk study, field surveys and relevant literature. The proposals for development are set out and the impacts on features are assessed. Mitigation proposals in relation to legal and planning policy obligations and suitable enhancements to be implemented are discussed, allowing likely residual effects to be determined.

2.0 Methods

2.1 The approach taken follows guidance and methods as prescribed by the Chartered Institute for Ecology and Environmental Management (CIEEM), specifically the Guidelines for Ecological Appraisal 2nd edition (2017) and the Guidelines for Ecological Impact Assessment (2019). Following these methods, a baseline of rare and/or noted ecological receptors (species and habitats) was established and valued. Predicted significant impacts upon these receptors and constraints and opportunities have then been identified. This step-wise assessment process has informed proposed mitigation and enhancement measures. Phase 2 ecological survey requirements have been identified and implemented to fully inform the predicted impacts of the scheme in accordance with the National Planning Policy Framework (NPPF) (MHCLG, 2019), local planning policy and relevant wildlife legislation as summarised in Appendix 2.

Desk Study

2.2 SES commissioned a data search for records of protected and notable species from Essex Field Club. The data search encompassed the study area, and up to 2km from the boundary. This data was received on 21 November 2019.

2.3 Hazel dormouse *Muscardinus avellanarius* records were also sought from the National Biodiversity Network (NBN) Atlas www.nbnatlas.org, which holds data from the People's Trust for Endangered Species (PTES). As dormouse are particularly under-recorded, the data search for this species encompassed an area of up to 10km from the site boundary.

2.4 A web-based search for statutory designated sites via the Multi Agency Geographic Information for the Countryside (MAGIC) spatial data resource www.magic.gov.uk was undertaken on 27 November 2019 for the following designations: European (up to 22km from the site boundary, as per the maximal Zone of Influence (ZoI) for Essex coastal internationally designated sites, see 2.5); National (5km from the site boundary) and Local (2km from the site boundary). MAGIC was also used to view the network of public footpaths links in the vicinity of the site.

2.5 The Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS) Habitats Regulations Assessment Strategy document for 2018-2038 (Place Services, 2019) was referred to in order to determine the Zone of Influence (ZoI) for coastal European Designated sites and hence the requirement for off-site mitigation (Table 1).

Table 1: Zones of Influence of Essex Coast European Designated Sites (Place Services, 2019)

European designated site	Underpinning SSSIs*	ZoIs (km)
Stour and Orwell Estuaries SPA and Ramsar	Orwell Estuary SSSI Stour Estuary SSSI Cattawade Marshes SSSI	13
Hamford Water SPA and Ramsar	Hamford Water SSSI	8
Colne Estuary SPA and Ramsar	Colne Estuary SSSI	9.7
Blackwater Estuary SPA and Ramsar	Blackwater Estuary SSSI	22
Dengie SPA and Ramsar	Dengie SSSI	20.8
Crouch and Roach Estuaries Ramsar and SPA	Crouch and Roach Estuaries SSSI	4.5
Foulness Estuary SPA and Ramsar	Foulness SSSI	13
Essex Estuaries SAC	Blackwater Estuary SSSI Colne Estuary SSSI	-**

European designated site	Underpinning SSSIs*	ZoIs (km)
	Crouch and Roach Estuaries SSSI Dengie SSSI Foulness SSSI	
Benfleet and Southend Marshes SPA and Ramsar	Benfleet and Southend Marshes SSSI	4.3
Thames Estuary and Marshes SPA and Ramsar	Mucking Flats and Marshes SSSI	8.1
*Underpinning SSSIs are listed for Essex sites as these are what the Impact Risk Zones (IRZs) are aligned to. **The Essex Estuaries SAC comprises the Colne Estuary, Blackwater Estuary, Dengie, Crouch and Roach Estuaries and Foulness Estuary and so follow the respective ZoIs throughout.		

SPA = Special Protection Area; SSSI = Site of Special Scientific Interest; SAC = Special Conservation Area

2.6 SES also requested details of non-statutory designated sites within 2km of the site boundary from Essex Wildlife Trust. This data was received on 29 November 2019.

2.7 Maps of the site and wider area, using the MAGIC online spatial data resource and aerial photographs on Google Earth (Google Inc., 2011), were examined to determine the possible habitats present on and adjacent to the area of assessment and their context in the surrounding landscape, searching in particular for waterbodies (within 500m of the site boundary), watercourses and other landscape features that may be of ecological significance to protected species, notably great crested newt and mobile species such as bats and birds.

2.8 In addition, the Natural England Essex GCN Risk Zones map, developed for the Essex GCN district licensing scheme, was referred to in order to determine the likelihood of great crested newt presence within the local landscape.

Extended Phase 1 Habitat Survey

2.9 An extended Phase 1 habitat survey was carried out on 27 November 2019 by suitably qualified ecologist Sarah Wiltshire BSc (Hons) MSc ACIEEM. Survey methods are detailed in Appendix 3.

Protected and Notable Species

Rare & Notable Flora

2.10 The Phase 1 was undertaken in November, which is a sub-optimal time of year for botanical survey. Part of the Wivenhoe Cross Pits LoWS lies within the site, is directly adjacent to the proposed development area, and is cited as 'supporting a flower-rich community of tall ruderals', therefore this was considered to represent a significant constraint on the survey information. Hence further botanical survey within the optimal window was undertaken, comprising one site visit on 2 May 2020. This survey was undertaken by Sven Wair of SES, a highly experienced botanist. Survey methods are detailed in Appendix 3. Surveys covered the whole site as shown on the site location plan in Appendix 1.

Badger

2.11 An initial assessment was undertaken as part of the extended Phase 1 survey to identify areas that might be used by badger *Meles meles* for foraging, commuting and sett creation, such as earth banks, woodland, hedgerows and rough grassland. This assessment also included the recording of signs such paths, hairs, latrines and setts.

Bats

Preliminary Assessment

2.12 The site was initially assessed for its suitability to support roosting, foraging and commuting bats during the extended Phase 1 survey. Habitats were assessed for suitability for bats using guidelines issued by the Bat Conservation Trust (Collins, 2016); detailed methodology is provided in Appendix 3.

2.13 All trees within and bounding the western arable field were subject to detailed assessment from ground level to determine their suitability for roosting bats on either 27 November 2019 or 14 August 2020. A high-level assessment of suitability for roosting was additionally undertaken for the LoWS area to the east, however the LoWS was not assessed in detail beyond where it directly bordered the proposed development area, as trees within this section of the site will remain unimpacted by the development.

Bat Activity Surveys

2.14 The site was determined to have moderate suitability for foraging and commuting bats thereby further activity surveys were undertaken in accordance with the latest best practice guidelines (Collins, 2016), comprising one walked transect per month in tandem with two five-night static bat detector deployments between April-October 2020. The transect route/ static sampling locations were devised to cover all suitable habitats within and adjacent to the proposed development area, including habitats along the western boundary of the LoWS. All surveys were led by bat licensed ecologist Sarah Wiltshire BSc (Hons) MSc ACIEEM. Detailed methods are provided in Appendix 3.

Birds

Preliminary Assessment

2.15 The sites' suitability to support a notable bird assemblage was initially assessed during the extended Phase 1 survey. Suitable breeding habitat generally includes scrub, hedgerows, trees and ruderal vegetation but can also include buildings, open ground, grassland, arable cropland and piles of debris. The site was also assessed at this time for its potential to support significant wintering and/or migratory bird populations.

Breeding Bird Survey

2.16 Breeding bird surveys (BBS) were undertaken by Sarah Wiltshire BSc (Hons) MSc ACIEEM, comprising four visits between April-June 2020. The survey method comprised a cut-down version of the standard Common Bird Census (CBC) method, devised by the British Trust for Ornithology (BTO) (Marchant, 1983; Bibby et al.,1992). Detailed methods are provided in Appendix 3. Surveys covered the whole site as shown on the site location plan in Appendix 1. Birds were also recorded in adjacent habitats where visible/audible from the site.

Wintering Bird Survey

2.17 Wintering bird surveys (WBS) were undertaken by Sarah Wiltshire BSc (Hons) MSc ACIEEM following a modified version of the wetland bird survey core counts methodology (Gilbert et al. 1998). The survey comprised four visits between November 2020 to February 2021. Detailed methods are provided in Appendix 3. Surveys covered the whole site as shown on the site location plan in Appendix 1. Birds were also recorded in adjacent habitats where visible/audible from the site.

Great Crested Newt

2.18 Aquatic habitats within 500m of the site (where accessible) were assessed for their suitability to support breeding great crested newt *Triturus cristatus* (as well as other amphibians) using the Habitat Suitability Index (HSI). Further detail on the HSI method is provided in Appendix 3.

2.19 Terrestrial habitats on site were also assessed for their suitability for great crested newt as part of the extended Phase 1 survey. Suitable terrestrial habitat generally includes rough grassland and woodland where they can forage and hibernate, with good links to the ponds where they breed.

Hazel Dormice

2.20 Habitats were assessed for their general suitability for hazel dormouse *Muscardinus avellanarius* as part of the extended Phase 1 survey. This species generally uses areas of dense woody vegetation and is more likely to be found where there is a wide diversity of woody species contributing to a three-dimensional habitat structure, a number of food sources, plants suitable for nest-building materials and good habitat connectivity.

Invertebrates

2.21 The site was assessed for its potential to support rare or notable invertebrate species as part of the extended Phase 1 survey. This assessment was made on the basis of the habitats present and their structural complexity and diversity, giving particular consideration to rare and notable species recorded in the local vicinity.

Reptiles

Preliminary Assessment

2.22 The site was assessed for its suitability for the four commoner reptile species during the extended Phase 1 habitat survey; common lizard *Zootoca vivipara*, slow-worm *Anguis fragilis*, grass snake *Natrix natrix* and adder *Vipera berus*. Specific habitat requirements vary between species. Common lizard favour rough grassland, however they can be found in a variety of habitats ranging from woodland glades to walls and pastures. Slow-worms use similar habitats to common lizards and are often found in gardens and derelict land. Grass snake have similar habitat requirements to common lizards but have a greater reliance on ponds and wetlands where they hunt amphibians. Adders occupy areas of rough, open countryside and are often associated with woodland edge habitats.

Presence / Likely Absence Survey

2.23 A seven-visit reptile presence/absence survey was carried out by Sarah Wiltshire BSc (Hons) MSc ACIEEM between April to July 2020. These surveys involved the placement of reptile refugia (0.5m x 0.5m felt and corrugated iron squares) laid in transects in suitable habitats on site in accordance with published guidelines (Froglife, 1999; Gent & Gibson, 2003) which were then checked over seven subsequent survey visits. The route and refugia locations were devised to cover all suitable habitats within and adjacent to the proposed development area, including habitats along the western boundary of the LoWS. Detailed survey methods are provided in Appendix 3.

Other Notable Species

2.24 The extended Phase 1 survey included a first stage assessment of the suitability of habitats on site to support NERC Act 2006 species of principle importance which are likely to occur in the local area, including hedgehog *Erinaceus europaeus*, brown hare *Lepus europaeus*, harvest mouse *Micromys minutus*, polecat *Mustela putorius* and common toad *Bufo bufo*.

2.25 In combination with the above further surveys, incidental sightings of any other notable species have been recorded.

Assessment of Nature Conservation Value

2.26 CIEEM guidelines for Ecological Assessment in the United Kingdom (2019) have been utilised to assess the impacts upon habitats within the zone of influence of the site. CIEEM suggests that it is best to use the geographical scale (i.e. international, national, regional etc.) at which a feature (i.e. a habitat, species or other ecological resource) may or may not be important as the appropriate measure of value. As such, data from the data search, extended phase 1 habitat survey and subsequent species-specific surveys has been reviewed and the likely occurrence of protected and notable species/species groups assessed. This has allowed predictions of impacts to be made along with recommendations for mitigation, compensation and enhancement. Further detail on the assessment methods utilised in this report is provided in Appendix 4.

2.27 The following geographical scale categories are considered appropriate:

- International;
- National (England);
- Regional (South-east);
- County (Essex);
- District (Colchester);
- Local (Wivenhoe); and
- Site.

Biodiversity Net Gain

2.28 An assessment of the development's potential to deliver measurable biodiversity net gain (in accordance with the NPPF) was undertaken using the Defra 2.0 Biodiversity Metric.

2.29 Habitat types were mapped and approximate measurements (lengths and areas) calculated using QGIS. Pre-development habitats were mapped from Phase 1 Survey data aided by use of a Google Maps Satellite basemap. Post-development habitats were mapped from landscaping proposals available at the time of submission.

Constraints

2.30 Desktop data searches are a valuable tool in evaluating a site's potential to hold rare and protected species, it is not however an absolute in confirming presence or absence of notable species due to the nature of how the records are collected.

2.31 Three waterbodies within 500m of the site could not be accessed for HSI survey. However this was not considered a significant constraint on the survey information as these were approximately 310m (P3) 430m (P4) and 340m (P5) from the site respectively and the only waterbody within 250m of the site (P1, 150m south) was accessed. Studies suggest a routine migratory range of up to 250m for great crested newts (Cresswell & Whitworth, 2004), though Jehle (2000) determined a smaller terrestrial radius of 63m within which 95% of summer refuges were located.

2.32 The site was subject to light spill from floodlighting at the adjacent Wivenhoe Town Football Club during the August dusk bat transect survey. However, bat activity was still recorded on site during this survey and as the Football Club is in regular operation, survey findings are considered reflective of existing site conditions. Given this and the level of overall survey effort expended across the season of sampling, this is not considered a significant constraint on the survey information.

2.33 For bat activity surveys using static detectors, sampling locations were biased towards the eastern and southern development area boundaries due to the limited number of suitable trees to attach the detectors to within the boundary to the west. Nonetheless, transects indicated the eastern boundary to be the area of highest bat activity, and therefore the bat assemblage recorded during these surveys is considered to be representative of the site.

3.0 Baseline Ecological Conditions

Designated Sites

3.1 The site is within the ZoI of four Essex coastal sites designated under the Conservation of Habitats and Species Regulations (2017, as amended) and Essex RAMS. The site is also within 10km of Abberton Reservoir SPA and Ramsar. These sites are considered to be of **international** importance.

3.2 There are six Sites of Special Scientific Interest (SSSI) considered to be of **national** importance within 5km. The site falls within a Natural England SSSI Impact Risk Zone that relates to residential development for two of these sites; Upper Colne Marshes SSSI and Colne Estuary SSSI.

3.3 There is additionally one statutory designated Local Nature Reserve (Colne LNR) and 11 non-statutory designated Local Wildlife Sites (LoWS) within 2km; these sites are considered to be of **local** importance. Wivenhoe Cross Pit LoWS is directly adjacent to the east of the proposed development site and falls partially within the blue line boundary of the wider land parcel.

Table 2. Habitat Regulations (2019) Designated Sites within 22km, Nationally Designated Sites within 5km and Statutory and Non-Statutory Locally Designated sites within 2km of the site.

Site Name	Distance & Direction	Size (ha)	Description & Reason for Designation
European Statutory Designated Sites			
Colne Estuary SPA & Ramsar *Part of* **Essex Estuaries SAC**	1.9km South	2714	The Colne Estuary is a comparatively short and branching estuary, with five tidal arms that flow into the main channel of the River Colne. There is a wide variety of coastal habitats which include mud-flat, saltmarsh, grazing marsh, sand and shingle spits, disused gravel pits and reedbeds which provide feeding and roosting opportunities for the large numbers of waterbirds that use the site. The estuary is of international importance for breeding little tern *Sterna albifrons*, and also supports internationally important wintering populations of avocet *Recurvirostra avosetta*, golden plover *Pluvialis apricaria*, hen harrier *Circus cyaneus,* dark-bellied brent goose *Branta bernicla bernicla* and redshank *Tringa totanus*.
Abberton Reservoir SPA & Ramsar	6.2km South west	726	Abberton Reservoir is located close to the coast of Essex in eastern England. It is a large, shallow, freshwater storage reservoir built in a long, shallow valley and is the largest freshwater body in Essex. It is one of the most important reservoirs in Britain for wintering wildfowl, with a key role as a roost for wildfowl and waders feeding in adjacent estuarine areas. The site is also important for winter feeding and autumn moulting of waterbirds. The margins of parts of the reservoir have well-developed plant communities that provide important opportunities for feeding, nesting and shelter. Abberton Reservoir is important especially as an autumn arrival area for waterbirds that subsequently spend the winter elsewhere.
Blackwater Estuary SPA & Ramsar *Part of* **Essex Estuaries SAC**	8.3km South west	4403	The Blackwater Estuary is the largest estuary in Essex and one of the largest estuarine complexes in East Anglia. This site qualifies by supporting breeding and wintering bird assemblages of European importance, including a breeding population of little tern, and wintering populations of avocet, golden plove, hen harrier, black-tailed godwit and dark-bellied brent goose.

Site Name	Distance & Direction	Size (ha)	Description & Reason for Designation
Stour & Orwell Estuaries SPA & Ramsar	10.4km North	3673	The Stour and Orwell Estuaries include extensive mudflats, low cliffs, saltmarsh and small areas of vegetated shingle. The site is designated as a wetland of international importance, and for supporting overwintering populations of European importance of several bird species.
Dengie SPA & Ramsar *Part of* **Essex Estuaries SAC**	13.8km South	3134	Dengie is a large and remote area of tidal mudflat and saltmarsh at the eastern end of the Dengie peninsula, between the Blackwater and Crouch Estuaries. The saltmarsh is the largest continuous example of its type in Essex. Foreshore, saltmarsh and beaches support an outstanding assemblage of rare coastal flora.
UK Statutory Designated Sites			
Wivenhoe Gravel Pit SSSI	0.3km North east	1	Designated for geological interest.
Upper Colne Marshes SSSI	1.3km West	113	The Upper Colne Marshes lie along both sides of the River Colne and Roman River, south east of Colchester. The site consists of grazing marshes with associated ditch and open water habitats, a series of tidal salt marshes behind old flood defence walls following a number of breaches, the sea walls themselves, and a small area of intertidal mud. It is considered to be of special interest as it supports an outstanding assemblage of nationally scarce plants and an unusual diversity of brackish ditch-types. Additional interest is provided by the terrestrial and aquatic invertebrates found within the site, and breeding and wintering birds.
Colne Estuary SSSI	1.9km South	2986	Underpinning the Colne Estuary SPA and Ramsar. Unit 18 (closest to the site) was assessed as 'unfavourable recovering' in 2010 due to net loss of saltmarsh through erosion.
Roman River SSSI	2.9km South west	282	The site is a complex mosaic of woodland, scrub, heath, grassland and fen, comprising Donyland and Friday Woods and Berechurch Common. It is located on glacial sands and gravels overlying London Clay with spring lines arising at the junction of these two soil types. The unimproved acid grassland is one of the few sizeable areas remaining in Essex, which together with the other habitats supports a diverse breeding bird population and over a thousand species of moths and butterflies.
Bullock Wood SSSI	4.7km North west	23	Bullock Wood is an ancient coppice-with-standards woodland with a wide range of tree species. The principal woodland type is the nationally rare Lowland Hazel-Sessile Oak woodland type modified in places by the presence of Sweet Chestnut *Castanea sativa*. The wood is situated on an almost level plateau with acidic soils developed over Brickearth, and lies within the former Royal Forest of Kingswoode. Water Avens *Geum rivale*, a very uncommon plant in Essex, has also been recorded.

Site Name	Distance & Direction	Size (ha)	Description & Reason for Designation
Ardleigh Gravel Pit SSSI	4.8km North	1	Designated for geological interest.
Local Statutory Designated Sites			
Colne LNR incorporating Wivenhoe Wood LoWS	1km West	35	The Colne LNR lies on the north side of the river Colne on rising ground between Essex University and Wivenhoe. It consists of 3 main areas. Wivenhoe Woods is a mixed coppice and secondary woodland, dominated by sweet chestnut *Castanea sativa*. Lower Lodge is mainly managed as grassland with sections cut every 3 years to prevent scrub from encroaching. It has been used as a receptor site for common lizard translocated from land that was developed in Colchester. Ferry Marsh is a former grazing marsh to the south. The marsh supports a variety of birds, plants and aquatic invertebrates. There is a good water vole population in the ditch system.
Non-Statutory Designated Sites			
Wivenhoe Cross Pit LoWs	Adjacent to East	29	This site is a complex mosaic of scrub, woodland and grassland habitats on land mostly affected by aggregate extraction, centred on a stream valley. The northernmost field is former arable land now supporting a flower-rich community of tall ruderals (this is the field directly adjacent to the site and within the blue line boundary). To the southwest is an area of uneven, disturbed ground with exposed banks and damp hollows, within which the digger wasp *Cerceris quinquefasciata* and its brood parasite cuckoo-wasp have both been recorded. A number of other Nationally Rare and Scarce invertebrates have also been observed here. The stream valley supports a belt of wet willow (*Salix sp.)* and Alder (*Alnus glutinosa*) scrub and woodland. Flooded gravel pits on either side of the stream valley are used for fishing and fringed with mature willows. At the southern end of the site is Gravel Pit Grove, an area of old woodland occupying a lowlying gravel working. The majority of the site is under mixed private ownership. Apart from an area of public open space associated with the disturbed ground in the northwest, the only official public access is via a public footpath that runs along the western edge of the site, from the allotments northward, before turning east and crossing the stream valley to join Keelars Lane.
Wivenhoe Park LoWs	0.9km North west	40	Selected for: HC2 – Lowland Mixed Deciduous Woodland on Non-ancient Sites, HC4 – Wood-pasture and Parkland, HC13 – Heathland and Acid Grassland
Palegate Wood LoWs	1.3km East	6	Selected for: HC1 – Ancient Woodland Sites
Villa Farm Quarry LoWs	1.3km South east	26	Selected for: HC1 – Ancient Woodland Sites, HC2 – Lowland Mixed Deciduous Woodland on Non-ancient Sites, HC13 – Heathland and Acid Grassland, HC27 – Post-industrial Sites, SC18 – SPIE Invertebrates
Hythe Lagoons LoWs	1.6km West	22	Selected for: HC11 – Other Neutral Grasslands, HC27 – Post-industrial Sites, SC1 – Vascular Plants, SC5 – Notable Bird Species, SC20 – Notable 'Flagship' Macro-invertebrates

Site Name	Distance & Direction	Size (ha)	Description & Reason for Designation
University Marshes LoWs	1.7km West	22	Selected for: HC15 – Reedbeds & HC21 – Coastal Grazing Marsh
Home Wood LoWS	1.7km North west	7	Selected for: HC1 – Ancient Woodland Sites
Ferry Marsh LoWS	1.8km South east	1.5	Selected for: HC28 – Small-component Mosaics
Park Wood LoWs	1.8km East	1.4	Selected for: HC1 – Ancient Woodland Sites
Pyecats Corner Verges LoWs	1.9km North	1.1	Selected for: HC11 – Other Neutral Grassland & SC1 – Vascular Plants

Habitats

3.4 A Phase 1 habitat map of the site and target notes are provided within Appendix 4. Site photographs are illustrated in Appendix 5. Plant species recorded per habitat type are tabled in Appendix 6.

3.5 The Phase 1 Habitat types (JNCC, 2010) within the site were:

- Arable;
- Poor semi-improved grassland;
- Broadleaf trees;
- Tall ruderal;
- Scattered and dense scrub; and
- Dry ditches;

Arable

3.6 The west of the site comprised a fallow arable field, most recently sown with a barley *Hordeum vulgare* crop. At the time of Phase 1 survey, the field had not been re-ploughed following harvest and the crop stubble was still in place. Amongst this a number of annual/perennial weeds had established, dominated by sow thistles (*Sonchus sp.*) and also including occasional thistle *Cirsium sp.*, fleabane *Conyza sumatrensis,* hedge mustard *Sisymbrium officinale* and scentless mayweed *Tripleurospermum inodorum.* Oilseed rape *Brassica napus subsp. napus* was also present indicating the cropping history of the site. The field remained in a fallow state until late August/early September 2020, when the weed growth was removed.

3.7 Due to a history of conventional arable management incorporating regular spraying, soil improvement and periodic soil disturbance, this habitat was considered to be of only **site** level importance. However left fallow it was considered to be of greater value to a range of fauna considered likely to utilise the site.

Poor Semi-Improved Grassland

3.8 At the boundaries of the arable field was a strip of poor semi-improved grassland ranging from approximately 1.5m-2m in width. The distribution of grass species was locally patchy and included

perennial rye grass *Lolium perenne*, cock's foot *Dactylis glomerata* annual meadow grass *Poa annua* soft brome *Bromus hordeaceus* and false oat grass *Arrhenatherum elatius*.

3.9 Frequently observed intermixed herb and ruderal species included cleavers *Galium aparine*, common nettle *Urtica dioica* and cow parsley *Anthriscus sylvestris.*

3.10 No evidence of management of this arable boundary habitat specifically to benefit wildlife was observed and the boundary was of a limited width throughout. These factors drove an assessment of only **site** level importance for this habitat.

3.11 Further areas of semi-improved grassland were present within the LoWS field to the east; details regarding this area are provided at 3.24 below.

Scattered Broadleaf Trees

3.12 Broadleaf trees defined the majority of boundaries throughout the site.

3.13 To the south of the western boundary these were occasional and comprised of scattered individual English oak *Quercus robur* and purple leaf plum *Prunus cerasifera*. Further north along the western boundary a continuous treeline of oak was present in adjacent residential gardens.

3.14 An oak treeline also defined the boundary to Elmstead Road, and the northernmost section of the boundary to the adjacent Football Club.

3.15 The central boundary dividing the arable field and LoWS was marked with a more significant continuous line of early mature sessile oak *Quercus petrea*. The eastern LoWS boundary was defined by a similar feature.

3.16 The trees on site were considered to be of up to **local** importance, with this primarily driven by the early mature and mature oak specimens present. The boundary oak treeline dividing the arable field and LoWS was considered to have particular value as connecting habitat for fauna.

Tall Ruderal

3.17 Tall ruderals were present along the boundaries of the arable field occasionally interspersed with grasses and at the bases of the boundary treelines. However, they were only dominant along some sections of the western field margin, where a near monoculture of common nettle was present.

3.18 While this habitat was considered to have some ecological value due to opportunities present for fauna (e.g. egg laying habitat for butterflies), its limited extent and species diversity again drove an assessment of only **site** level importance.

3.19 Further tall ruderals were present within the LoWS field to the east; details regarding this area are provided at 3.24 below.

Scattered Scrub

3.20 Scattered scrub was present on all boundaries of the western arable field and dominated sections of the western boundary. The scrub was predominantly bramble *Rubus fructicosus agg*., with dog rose *Rosa canina,* blackthorn *Prunus spinosa* and hawthorn also present.

3.21 This habitat was again considered to be of **site** level importance, being very limited in its extent. Extensive areas of scrub were present in the LoWS area to the east, and outside the red line area to the south, indicating that the scrub within and adjacent the proposed development area does not provide a unique habitat resource within the immediate area.

3.22 Further areas of scrub were present within the LoWS field to the east; details regarding this area are provided at 3.24 below.

Dry Ditches

3.23 Dry ditches were present along the central boundary of the site dividing the arable field and LoWS, and the boundary dividing the arable field and Football Club to the north, associated with the oak treelines. These were generally sparsely vegetated due to shading.

Wivenhoe Cross Pit LoWS

3.24 Adjacent to the east of the proposed development area and forming part of the site was an ex-arable field that is part of Wivenhoe Cross Pit LoWS. This field was also bordered by lines of mature broadleaf oak trees, with the field itself comprising a mosaic of semi-improved grassland, tall ruderal and young scrub (both dense and scattered). These habitats were considered to be of **local** importance, with the boundary treelines providing connectivity to the wider landscape, and the early-successional scrub, grassland and ruderal habitats offering foraging resource and refuge for a wide variety of fauna likely to occur locally.

Other Adjacent Habitats

3.25 Beyond the southern boundary of the development area was a native species-poor hedgerow, dominated by hawthorn *Crataegus monogyna*, with occasional field maple *Acer campestre* and ash *Fraxinus excelsior*. Although a relatively recent planting and in fairly poor condition, having become leggy/outgrown through lack of management, this habitat was considered to be of **local** importance, on the basis that hedgerows extending 20m+ in length and comprised of at least 80% one native woody species qualify as HoPI under the NERC Act 2006.

Summary

3.26 Habitats were considered to be common within the wider landscape but with potential to support protected species and those of conservation concern. Habitats within and adjacent the proposed development area were generally considered to be of importance at the **site** level only, with the exception of the existing trees, considered to be of **local** importance. While arable field boundaries may be designated as Habitats of Principal Importance (HoPI) under the NERC Act 2006, those on site

were not considered to qualify as there was no evidence that they were actively managed for wildlife. Habitats within the LoWS were considered to be of **local** importance.

Protected and Notable Species

3.27 European protected species are animals and plants listed on the European Habitats Directive 1992 which receive protection in the UK under the Conservation of Habitats and Species Regulations 2017 as amended. UK protected species are animals and plants protected within The Wildlife and Countryside Act as amended (WCA) 1981, The Protection of Badgers Act 1992, or listed in Section 40 or 41 of the NERC 2006. Protected and notable species with existing records within 2km of the site are detailed below.

Flora

Desk Study

3.28 Thirty-seven records of Schedule 8 protected plant species were obtained from the data search; all for English bluebell *Hycanthoides non-scripta*. Annual knawel *Scleranthus annuus*, a red list endangered species associated with arable habitats, has also been recorded locally.

Records of Schedule 9 invasive plant species relevant to the site habitats included four for Japanese knotweed *Fallopia japonica* and one for false acacia *Robinia pseudoacacia*.

On-site Assessment

3.29 During the extended Phase 1 survey, one invasive species listed under Schedule 9 of the WCA 1981 was recorded; false acacia was observed growing on the western boundary of the arable field near to the pedestrian access from Richard Avenue (see Appendix 4 Phase 1 Map, TN1).

3.30 During the detailed botanical survey, one species protected under Schedule 8 of the WCA 1981 was recorded; English bluebell. This was located growing along the eastern boundary of the LoWS area. No other protected, rare or notable species were recorded however given the fallow nature of the arable land, a community of common arable weeds and flowering species was observed.

Importance

3.31 The botanical assemblage of the proposed development area was considered to be of **site** value only, as no red list arable weed species or protected flora were recorded.

Badger

Desk Study

3.32 There were 41 records of badger within 2km. The closest records were 0.6km distant from the site, and the most recent from 2017.

On-site Assessment

3.33 No signs of badger such as setts, foraging signs (snuffle holes) or latrines were observed on site during the Phase 1 survey. However, several mammal paths were observed along the boundaries. These were considered likely to be utilised by a range of species including fox *Vulpes Vulpes*, for which ample evidence of presence was observed on site.

3.34 Mammal holes were present along the central boundary dividing the arable field and the LoWS within a dry ditch, the majority of which were small and had evidently been dug by rabbit *Oryctolagus Cuniculus.* Among these were two holes of a slightly larger size, however they lacked any features indicating use by badgers such as a 'D' shape, significant spoil heap or the presence of bedding. Rabbit footprints were also observed outside one of the holes. Despite the larger entrance size, an investigation of the interior of both holes also highlighted the presence of tree roots within that would impede access for an animal of badger size.

3.35 Although no evidence of badger presence was recorded, the boundaries of the fields and the adjacent LoWS grassland habitats were considered to provide opportunities for foraging and dispersal. The dry ditches were also considered to provide opportunities for sett-building within the banks. Badger foraging signs were also observed along Keelars Lane approximately 500m to the east when seeking to visit local waterbodies, evidencing the current presence of badgers locally to the site.

Importance

3.36 In summary, badgers have been recorded locally and the site provided suitable habitat for this species along the boundaries of the proposed development area and within the LoWS to the east. However, the lack of any evidence of badger presence, and specifically the absence of setts, suggested the site was unlikely to be of anything greater than **site** level importance for the local population.

Bats

Desk Study

3.37 Records of bats identified within 2km of the site are summarised in Table 3 below.

Table 3. Summary of bat records within 2km of the site.

Species	Nearest approximate distance to site (km)	Total No. of Records	Date of Most Recent Record
A bat species	3	2.2	2013
Pipistrelle species	29	0.9	2012
Common pipistrelle *Pipistrellus pipistrellus*	56	0.8	2016
Soprano pipistrelle *Pipistrellus pygmaeus*	63	0.8	2016
Noctule *Nyctalus noctula*	41	1.2	2015
Serotine *Eptesicus serotinus*	12	1.2	2006
Brown long-eared bat *Plecotus auritus*	8	0.8	2016
Daubenton's bat *Myotis daubentonii*	3	1.7	2015
Myotis species	1	1.6	2016

3.38 There were no existing buildings that could potentially support roosting bats.

3.39 Fifteen trees within or bounding the western arable field were identified with low to moderate suitability to support roosting bats, with features such as splits, wounds, lifting bark or dense ivy observed. Results are detailed in Table 4 below, with tree locations mapped in Appendix 7. Trees are numbered with respect to the Tree Survey & Constraints Plan for the site (Haydens, 2020).

Table 4. Trees with suitability for roosting bats within the site.

Tree #	Species	Features	Suitability
G012_1	Oak	Ivy clad from ground level into crown - not dense enough to be a feature in itself but could obscure other features from view. Small tear out at 8m facing NW, but appears closed from ground.	Low
G012_2	Oak	Low level decay facing southeast. Small hollow at 1m. Entrance cobwebbed, does not extend upward internally.	Low
G012_3	Oak	Ivy clad from ground level into crown - large matted stems on north side that could be a feature in itself. Cavity at base open to 1m to NE. Appears to extend upward into tree with small gap. Entrance cobwebbed.	Moderate
T20	Oak	Twin stem, dead from 3m AGL on south stem. Missing bark up to 7m but appears no usable lifted bark crevices present from ground. Decay could advance forming suitable features before works, therefore precautionary soft fell recommended.	Low
G014_1	Oak	2 x low suitability features facing SE; 2 x knotholes forming with dead branches still attached, possible crevices, at 5m	Low
G004_1	Oak	Snap in branch, open to rain, facing N at 4.5m, 2nd stem with tear out wound at top, appears not to extend internally	Low
N/A	Dead tree	Dead tree with small plates of lifting bark on lower main stem to approx. 2m height. Lowest part of stem inaccessible to bats due to dense bramble around base to 1m height. Likely to have been highly suitable in the past, but most bark has now already flaked off leaving limited remaining opportunity.	Low
A004_1	Oak	Small hazard beam 30L x 3W facing W at 6m. In thin limb, considered unlikely to extend to crevice internally.	Low
T4	Oak	Large old knothole cavity on main stem at approx. 3m height facing N.	Moderate
T3	Oak	Ivy extending upward into crown; not dense enough to form a suitable roost feature in itself, however tree is of sufficient maturity that suitable features could have developed and be obscured from view by the ivy. May be possible to downgrade to negligible potential if ivy severed and tree then re-inspected.	Low
G007_1	Oak	Ivy stems from ground to crown, quite dense and matted on east side, though appears cut and now dead, could provide feature in itself.	Low
G011_1	Oak	Group of three trees, all three ivy clad from ground level into crown - not dense enough to be a feature in itself but could obscure features from view.	Low

3.40 Within the LoWS area, trees were generally in a healthy condition and lacked significant storm damage or decay features. Only occasional trees were noted with potential to support roosting bats and where these occurred features were typically of low suitability. The most notable specimen was a high suitability oak tree on the southern boundary of the LoWS field, supporting multiple woodpecker holes and decay features.

Preliminary Assessment for Foraging/Commuting Bats

3.41 The treelines and scrub along the boundaries of the site were considered to offer opportunities for foraging and commuting bats, particularly the well-established oak treelines which act as windbreaks (attractive to bats invertebrate prey) as well as strong connecting features through the landscape. The presence of extensive highly favourable foraging habitats adjacent the proposed development area to the east and further south into Wivenhoe Cross Pits LoWS (scrub, woodland and open water) was considered to further increase the likely value of the boundary treelines, which provide direct linkage to these habitats.

3.42 The majority of the proposed development area as open arable land was considered to be of low suitability for foraging and commuting. However left fallow the value was considered to be greater than for arable land in active management.

3.43 Habitats with the potential to be impacted by the proposed development were valued as being of **moderate suitability** for foraging and commuting bats following current guidance (Collins, 2016; see Appendix 3).

Activity Surveys

3.44 Results from transect surveys and static deployments are tabulated in Appendix 7, with key findings summarised below.

3.45 Surveys recorded an assemblage of eight bat species on site; common pipistrelle, soprano pipistrelle, noctule, serotine, brown long-eared bat, Daubenton's bat, Natterer's bat *Myotis nattereri* and barbastelle. Observed activity levels were highest in June, with a high number of bat registrations recorded during both the transect survey and static detector deployments.

3.46 The majority of activity was from common and soprano pipistrelle (peaking in June, with 536 and 348 mean registrations per night of static recording respectively), followed by noctule (peaking in August, with 69 mean registrations per night of static recording). Peaks in activity appeared to be driven by use of the site for foraging; during monthly transect surveys, particularly between June to August, both species were frequently observed feeding along the arable field boundaries, over the LoWS and to a lesser extent over the fallow arable field.

3.47 Other species were typically recorded regularly over several months of sampling though in lower numbers (i.e. only single registrations or a handful of registrations). This was with the exception of Natterer's bat, recorded only during the August transect, and serotine, recorded only during September static surveys. Barbastelle was recorded in all months of sampling between April-October, with a maximum of six registrations recorded during the May transect survey.

3.48 Bats were recorded along all boundaries surveyed with highest levels of activity along the central treeline dividing the arable field and LoWS, and to a lesser extent, along treelines in the far north of the site adjacent to Elmstead Road and the pedestrian access from Alexandra Drive. These areas were frequently used as foraging habitats but strong evidence was also found to support the supposition that they were used as movement corridors. The southern section of the western boundary (adjacent to residential) and the northern section bordering Wivenhoe Town Football Club were used less

frequently by low numbers of foraging/commuting individuals. Pipistrelle species and noctule were also observed foraging over the fallow arable field in the south of the site. A heatmap of bat activity as recorded during transect surveys is provided in Appendix 7.

Importance

3.49 The majority of trees assessed were in a healthy condition and lacked suitable features for roosting bats. Only a limited number of potentially suitable trees were identified via ground level assessment, considering the extent of the site and high number of established trees present along the boundaries. Where such features were noted, these were typically limited in both size and suitability e.g. due to likely exposure to rain and wind. The likelihood of a roost of high conservation significance (maternity/hibernation) being present was therefore considered to be low and the site likely to be of no greater than **site** importance for roosting bats. However, it is important to note that no further surveys to establish the presence or likely absence of roosts have been conducted as all moderate suitability trees identified are to remain unimpacted by the proposed development works.

3.50 Activity surveys established the site was used by a high diversity and density of bats including one species defined by Wray et al. (2010) as among the 'rarest' in England (barbastelle) and four defined as 'rarer' (Daubenton's, Natterer's, noctule and serotine) in terms of their population status. Information on the distribution of the recorded bat species in Essex specifically is provided in Table 5.

Table 5. Distribution of bats in Essex (combining information from Dobson & Tansley (2014) & The Essex Bat Group website)

Bat species	Status in Essex
Common pipistrelle	Widespread, occasionally common. One of the two species most likely to be encountered and regularly seen at dusk around gardens.
Soprano pipistrelle	Widespread, occasionally common. One of the two species most likely to be encountered and regularly seen at dusk around gardens.
Barbastelle bat	A scarce woodland bat, though possibly more widespread than appreciated in Essex.
Brown long-eared bat	Widespread, relatively frequent, but not often encountered outside of roosts.
Noctule	Widespread, but relatively scarce.
Serotine	Widespread, but scarce. Thought to have declined greatly in the last thirty years.
Daubenton's	Widespread, relatively frequent near still water.
Natterer's	Widespread, relatively scarce.

3.51 The diverse bat assemblage recorded at the site is notable given its relatively small scale, including eight of the ten species that regularly occur in Essex. In particular, regular use of the site by barbastelle (an Annex II species) throughout the active season is of interest and demonstrates the value of the site to a bat assemblage that includes more notable species.

3.52 The development site's position in the landscape in relation to off-site bat habitats was considered a strong driver its of value for foraging and commuting bats, with Wivenhoe Cross Pit LoWS extending south of the site containing wooded areas likely to support a number of roosts and high-suitability foraging habitat including woodland, large areas of established scrub and large waterbodies. Beyond this to the south and east are a number of other pockets of connected woodland and further large waterbodies, reflecting the industrial history of use of the surrounding landscape for aggregate extraction.

3.53 The treelines bordering the site, particularly that dividing the arable field and LoWS, provide a direct link to these highly favourable off-site bat habitats and hence act as suitable movement corridors.

Transect surveys provided strong evidence to support this utilisation, with regular observations of bats commuting along the treelines. Given the diversity of bat species recorded utilising the central treeline as a movement corridor, including the rare barbastelle, this feature in particular was considered to be of **district** importance for commuting bats.

3.54 The level and regularity of foraging activity observed on site suggested an assignment of at least **local** importance for foraging bats was appropriate. A higher level of importance (e.g. district) was not assigned due to the limited scale of the site, the poorer quality of foraging habitat dominating the majority of the development site (arable), and the extent of alternative highly suitable foraging habitat available off-site (multiple patches of woodland, extensive scrub, and various bodies of open water). Based on these factors it was considered highly unlikely that the habitats on site were of core importance for foraging to the local bat population, with the relatively high levels of foraging activity observed considered most likely to reflect the favourable status of bats at a broad local level.

Birds

Desk Study

3.55 The data search returned records for thirty-nine bird species listed under Schedule 1 of the WCA 1981 within 2km. Species most relevant to the site habitats and context included red kite *Milvus milvus,* redwing *Turdus iliacus*, fieldfare *Turdus pilaris*, hobby *Falco subbuteo,* brambling *Fringilla montifringilla* and barn owl *Tyto alba*. A large number of records for wildfowl and waders were also returned, reflecting the sites position in proximity to the River Colne Estuary. These included records for Schedule 1 species black-tailed godwit *Limosa limosa*, green sandpiper *Tringa ochropus* and wood sandpiper *Tringa glareola*, as well as red list species curlew *Numenius arquata*, lapwing *Vanellus vanellus* and white fronted goose *Anser albifrons*. The majority of these species have been recorded within 2km of the site in 2018. Redwing, fieldfare and brambling are migrants that winter in the UK, while hobby breed here in summer. Barn owl are resident throughout the year.

3.56 Records were also obtained for 33 red-listed Birds of Conservation Concern (BoCC) (Eaton et al. 2015), with species relevant to the sites habitats and context including turtle dove *Streptopelia turtur,* skylark *Alauda arvensis*, cuckoo *Cuculus canorus*, corn bunting *Emberiza calandra*, linnet *Linaria cannabina*, yellowhammer *Emberiza citrinella*, starling *Sturnus vulgaris*, nightingale *Luscinia megarhynchos*, song thrush *Turdus philomelos* and mistle thrush *Turdus viscivorus*. All of these species are known to breed in the UK and have been recorded within 2km of the site in 2018.

Preliminary Assessment

3.57 Preliminary assessment suggested the site was likely to be of value for farmland species of conservation concern, with linnet observed feeding on site during the Phase 1 survey and large numbers of starling also seen perching on the power lines overhead. Flocks of greenfinch *Carduelis chloris* and goldfinch *Fringilla carduelis* were also recorded over the arable field and in the LoWS field to the east.

3.58 The site was also considered to have potential to be of value to wintering birds, in particular red-listed arable seed feeding species. The presence of winter crop stubble at the time of Phase 1 survey was considered to increase the value of the site to red-listed species typically associated with farmland

habitats such as linnets and corn buntings. Suitability for nesting waterbirds was considered to be limited by the relatively enclosed nature of the site (surrounded by treelines); however due to the proximity of the site to the River Colne estuary potential use of the arable habitats on site for winter feeding by such species could not be fully discounted.

3.59 The treelines and scrub on site were considered to offer suitable nesting habitat. In addition, the arable cropland forming the majority of the west of the site was considered to provide suitable habitat for ground-nesting species such as skylark.

3.60 The LoWS field to the east (containing long sward grassland and dense scrub) was considered suitable nesting and foraging habitat for a variety of notable bird species, such as turtle dove, cuckoo and nightingale. Due to the presence of this highly favourable habitat, it was considered more likely that notable bird species would nest within and/or feed within the proposed development area to the west.

3.61 The extent of the site was considered to limit the potential for notable wintering and breeding bird assemblages to be present. However, at the time of survey the western portion of the site offered a relatively unique habitat resource within the surrounding landscape (arable land with winter stubble). When considered together with the LoWS land to the east, the site clearly formed part of a wider favourable habitat mosaic for birds.

Breeding Bird Surveys

3.62 Breeding bird surveys recorded a total of 39 species, of which 35 were using habitats within the study area, either within the arable field and/or the LoWS (not flying over). Recorded species included nine red-list species and seven amber-list species. Of those species recorded, 24 were considered confirmed, probable or possible breeders within the site and/or surrounding habitats, including eight red list species and one amber list species. A high concentration of probable nesting territories were identified, particularly within the LoWS area and the boundary treeline between this and the western arable field. The complete list of species recorded is provided in Appendix 8. Results for notable species are summarised in Table 6 below.

Table 6. Notable species recorded during breeding bird surveys.

Species	Status	Probable Territories	Possible Territories	Locations
Cuckoo *Cuculus canoris*	Red	0	1	Heard singing from treeline dividing LoWS and arable field during one survey visit.
Herring gull *Larus argentatus*	Red	0	0	Flying over site only.
House sparrow *Passer domesticus*	Red	2	0	Breeding colonies likely located in houses to west of site. Observed in boundary vegetation throughout site.
Linnet *Linaria cannabina*	Red	1	3	Territories in LoWS and along northern boundary of arable field. Small flocks feeding in fallow arable.
Nightingale *Luscinia megarhynchos*	Red	2	0	Territories centred off-site in scrub to south, though also heard singing from within site boundary vegetation and LoWS scrub.
Skylark *Alauda arvensis*	Red	5	0	Two territories within arable field on site, three further on neighbouring arable fields.
Song thrush *Turdus philomelos*	Red	1	2	Territories in LoWS and off-site scrub to south.

Species	Status	Probable Territories	Possible Territories	Locations
Starling *Sturnus vulgaris*	Red	0	1	Possible territory in houses to west of site. Flocks feeding on fallow arable.
Yellowhammer *Emberiza citrinella*	Red	2	0	Territories recorded in LoWS only.
Black-headed gull *Chroicocephalus ridibundus*	Amber	0	0	Flying over site only.
Bullfinch *Pyrrhula pyrrhula*	Amber	0	0	Calling from treeline to east of LoWS on one survey occasion.
Common gull *Larus canus*	Amber	0	0	Perched on houses to west and flying over LoWS.
Dunnock *Prunella modularis*	Amber	0	2	Territories along eastern boundary of arable field and in LoWS.
Greylag goose *Anser anser*	Amber	0	0	Off-site, resting in arable field to east of LoWS.
Meadow pipit *Anthus pratensis*	Amber	0	0	Recorded moving through LoWS on one survey visit.
Swift *Apus apus*	Amber	0	0	Feeding over arable field and boundary with housing.

Wintering Bird Survey

3.63 Wintering bird surveys recorded a total of 27 species, including eight red-list species and three amber-list species. The complete list of species recorded in 2020 is provided in Appendix 8. Results for notable species are summarised in Table 7 below.

Table 7. Notable species recorded during wintering bird surveys.

Common name	Status	Max Count	Locations
Fieldfare *Turdus pilaris*	Schedule 1/ Red	6	Along the northern boundary of the arable field.
House sparrow *Passer domesticus*	Red	10	Along the boundaries of the arable field.
Herring Gull *Larus argentatus*	Red	10	Among flocks of black headed gull on Football Club field.
Linnet *Linaria cannabina*	Red	3	Around the boundaries of the arable field and in the LoWS.
Skylark *Alauda arvensis*	Red	2	In flight over the on-site arable field and surrounding arable.
Starling *Sturnus vulgaris*	Red	84	Flocks resting on power lines and houses to the west of site.
Song thrush *Turdus philomelos*	Red	3	Primarily to the south of the site.
Yellowhammer *Emberiza citrinella*	Red	1	Within the LoWS.
Black-headed Gull *Chroicocephalus ridibundus*	Amber	353	Regularly observed flying over site. Large flocks resting/feeding on Football Club field.
Common Gull *Larus canus*	Amber	2	Flying over site.
Dunnock *Prunella modularis*	Amber	5	In boundary treelines and in scrubby areas in LoWS.

Importance

3.64 Based on the adapted criteria of Fuller (see Appendix 3), the breeding assemblage present in 2020 (24 species) would qualify as being of **local** importance. However, using professional judgement and local experience, it was considered that the numbers of BoCC species recorded were higher than typical of Essex farmland, with the bird community being particularly diverse and including a number of more

notable species (e.g. nightingale) given its limited scale. This was considered to reflect the relatively unique habitat resource offered by the site at a local level over the 2020 breeding season (fallow arable land), as well as proximity to highly favourable dense scrub nesting habitats within the LoWS to the east and extending further south from the site. The value of the site itself to the breeding bird community was considered to be limited by its scale to **local** importance; however the wider local mosaic of habitats, including the site itself and extending to the south and east, was considered to be of importance at a district level for breeding birds.

3.65 The wintering community on site was less diverse however still included a high proportion of red and amber list bird species and a high density of farmland associated BoCC for a site of its scale. Although the value of the arable field habitat for foraging was reduced at the end of summer 2020 when the fallow vegetation was cleared, the site continued to provide suitable foraging habitat for these species along the boundaries and through the centre of the site as ground vegetation began to regrow, with the LoWS scrubby areas providing ample refuge opportunity. However, no waterfowl, wader or gull species were recorded utilising the site (though some were recorded flying over or utilising adjacent areas), clearly indicating that it does not represent functionally linked land to the nearby Colne Estuary SPA/Ramsar internationally designated site.

3.66 It was as such considered that the site has **local** importance for wintering birds.

Great Crested Newt

Desk Study

3.67 The EFC records search did not identify any records for great crested newt within 2km of the site. However, a further search carried out using NBN Atlas identified presence records associated with Natural England licence returns between 1-2km south east of the site within an area containing a large number of waterbodies associated with the quarrying history of the locality. These records originated from 2016.

3.68 The site falls within a 'green zone' under the Natural England (2020) Essex Risk Zones map (developed for the great crested newt district licensing scheme). Green zones are areas where great crested newt are considered less likely to be present. An 'amber zone' (higher risk of great crested newt presence) also exists further south the site; this covers the wider area of the Wivenhoe and Alresford Quarry sites, which include a network of connected waterbodies.

On-site Assessment

3.69 The west of the site (proposed for development) was considered largely unsuitable terrestrial habitat for great crested newt due to a history of periodic soil disturbance associated with arable cropping. At the time of survey, only very early successional processes had begun and the field still offered very little cover for this species. However, the tall ruderal, scrub and grassland boundary vegetation was considered to provide some opportunities for sheltering and commuting.

3.70 The LoWS field to the east, with long-sward grassland and scrub, was considered suitable terrestrial habitat, providing both shelter and foraging opportunities.

HSI Survey

3.71 Aquatic habitat required for breeding was not observed on site, however five waterbodies were identified within 500m of the boundary (Appendix 9), these again being associated with the quarrying history of the area. The closest (1) was located 180m to the south of the western arable field proposed as the development area (approximately 120m south of the wider site).

3.72 Those waterbodies that were accessible during the survey (1 and 2) were subject to HSI assessment. These were both found to be of 'poor' suitability for great crested newt, primarily due to high impacts of fish and waterfowl (Table 9; See Appendix 9 for detailed results).

Table 9. HSI calculation and score for accessible ponds.

Waterbody	1	2	3	4	5
HSI (X1/10)	**0.33**	**0.34**	**Not accessed**		
Pond suitability	Poor	Poor			
Distance to proposed development	180m	490m	280m	420m	250m

Importance

3.73 On balance habitats within the proposed development area were considered to be of **negligible** importance to any local great crested newt population. This assessment was driven by the poor suitability of the nearest assessed waterbody and the distance of all other waterbodies from the proposed development area. The nearest non-assessed (Waterbody 5) was approximately 250m distant; while studies suggest a routine migratory range for the species of up to 250m (Cresswell & Whitworth, 2004), Jehle (2000) determined a smaller terrestrial radius of 63m within which 95% of summer refuges are located. In addition, the waterbodies in the area are generally known to be used as fishing lakes and hence are highly unlikely to be suitable for newt breeding, even where un-assessed. Considering this together with the limited suitable boundary habitat available within the western portion of the site proposed for development, it was judged highly unlikely that great crested newt would be impacted by the development of the site, provided that the LoWS field to the east was retained as a wildlife corridor in line with Wivenhoe Neighbourhood Plan policies (see Appendix 2). No further consideration of great crested newt was therefore deemed necessary and as such this species is not discussed further in this report.

Hazel Dormice

Desk Study

3.74 Twelve records for dormice within 2km of the site were returned from the EFC records search; the closest 1.5km from the site and the most recent from 2015. The extended 10km NBN Atlas search returned 159 records. These included a contemporary record from 2009 approximately 2km south east of the site.

On-site Assessment

3.75 The western portion of the site (proposed for development) was considered to provide some limited opportunities for dormice along the boundaries in the form of treelines and patches of scrub. However

preferred core habitats for this species (broadleaf woodland with developed understorey and species-rich complex-structured hedgerow) were not present. The scrub habitats within this area were patchily distributed and typically poorly arboreally connected, limiting the ability of dormice to move safely through the site. The value of the treelines was also limited by their relatively uniform and open structure and species-poor nature. These factors were considered to severely limit the amount of suitable nesting habitat and the availability of a variety of food sources, necessary to sustain dormice throughout the year.

3.76 The LoWS field to the east was considered more suitable, with scrub habitat through the southern section of the field providing cover, nesting opportunities and an autumn food resource. It was considered likely that dormice are present in the wider locality to the south of the site, which comprises extensive areas of scrub and patches of woodland.

Importance

3.77 Although evidently present in the local landscape, given the limited extent and sub-optimal nature of habitats within the western portion of the site proposed for development, it was judged highly unlikely that hazel dormice would be impacted by the development of the site, provided that the LoWS field to the east was retained as a wildlife corridor in line with Wivenhoe Neighbourhood Plan policies (see Appendix 2). No further consideration of hazel dormice was therefore deemed necessary and as such this species is not discussed further in this report.

Invertebrates

Desk Study

3.78 Contemporary records of notable invertebrate species within 2km of the site included three for slender-horned leather bug *Ceraleptus lividus* (Nationally rare, associated with gravel pits), twelve for stag beetle *Lucanus cervus* (Nationally rare) and three for white-letter hairstreak butterfly *Satyrium w-album* (Red list endangered and NERC Act priority species).

On-site Assessment

3.79 The western portion of the site (proposed for development) was considered largely unfavourable for invertebrates due to a history of periodic soil disturbance and spraying associated with arable cropping. The boundary habitats (ruderals, scrub and treelines) contained native flora and were considered to have greater potential. However, given their limited extent, structural diversity, and the restricted range of common flora observed, it was judged they were likely to support only a common invertebrate assemblage. White-letter hairstreak was considered unlikely to be present due to a lack of elm within the site. Slender-horned leather bug is frequently associated with gravel pits and it is likely records for this species originated from the quarries off-site to the south east. With regard to stag beetle, the amount of dead wood suitable for larvae development on site was very limited. The potential for individuals to be present on site could not be discounted, however it was considered highly unlikely that the site would be of core importance to the local population.

Importance

3.80 Therefore, the site was considered of **site** level importance for invertebrates, and likely to support a limited assemblage of predominantly common species; no further surveys were therefore recommended to adhere to legislation and planning policy.

Reptiles

Desk Study

3.81 The data search returned eight records for common lizard, five for grass snake and four for slow-worm within 2km of the site. Grass snake was the most recently recorded species (2018). The closest record was for common lizard, 1.4km from site.

Preliminary Assessment

3.82 The boundary vegetation on site was considered to provide opportunities for reptiles, with tree roots providing hibernation opportunities, scrub providing cover and grasses/ruderals offering foraging and basking habitat. The value of the majority of the area proposed for development (arable) was considered to be limited to some basking opportunity at the time of survey.

3.83 The LoWS field to the east, with long-sward grassland and scrub, was considered to provide a more extensive area of suitable habitat. The proximity of this habitat and ecological connections to further suitable habitat off-site to the east and south was considered to confer an increased likelihood of reptile presence along the boundaries of the proposed development area.

Presence/likely Absence Surveys

3.84 Surveys recorded a peak count of one juvenile grass snake; this is classed as a 'low' population, according to the Froglife (1999) standard. The grass snake was recorded on the western boundary of the proposed development area within marginal grass/ruderal vegetation. Detailed results and a plan showing reptile refugia locations are provided in Appendix 10.

Importance

3.85 The low reptile population of grass snake is not considered to be of substantive ecological importance and is valued at the **site** level. The extent of suitable habitat within the development area for this species was very limited, with presence considered to be driven by proximity to more favourable off-site habitats to the south, where extensive areas of scrub and established grassland with several waterbodies exist, providing more optimal grass snake habitat.

Other Notable Species

Desk Study

3.86 Records returned for NERC Act 2006 notable species included five for brown hare *Lepus europaeus*, 19 for hedgehog *Erinaceus europaeus*, nine for harvest mouse *Micromys minutus*, two for common toad

Bufo bufo and one for polecat *Mustela pistorius*. The closest record was for hedgehog, recorded 0.7km from site in 2014. The most recent record was for polecat, recorded 1.1km from site in 2015.

On-site Assessment

3.87 The boundary habitats within the proposed development area and scrubby/grassland habitats within the LoWS to the east were considered to provide suitable sheltering and foraging opportunities for hedgehog. The presence of hedgehog on site was confirmed during the May bat transect survey when an individual was observed in the west of the arable field close to the pedestrian access from Richard Avenue (see Appendix 11). These habitats were also considered to provide suitable sheltering and foraging opportunities for common toad, which was considered highly likely to be present locally given the number of larger, deeper waterbodies to the south and east of the site.

3.88 No other notable species were incidentally observed during the course of other surveys on site. The arable field was considered sub-optimal for brown hare due to the relatively enclosed and overlooked nature of the site, as this species tends to favour open farmland. Polecat was considered likely absent as although this species occurs in farmland landscapes, it favours an arable-woodland ecotone which was not present on site. The LoWS field to the east was considered suboptimal, though potentially suitable for harvest mouse, however; they were considered unlikely to be present within the development area itself, due to a lack of hedgerow, insufficient structural diversity in the field margins, and the poorly vegetated nature of the dry ditches.

Importance

3.89 The site was therefore considered to have **site** value for hedgehog and common toad.

Summary

Table 10. Summary evaluation of features.

Feature	Summary Description	Value
SPA/Ramsar/SAC	Essex Estuaries SAC, incorporating: • Colne Estuary SPA & Ramsar • Blackwater Estuary SPA & Ramsar • Dengie SPA & Ramsar Abberton Reservoir SPA & Ramsar Stour & Orwell Estuaries SPA & Ramsar	International
SSSI	Upper Colne Marshes SSSI Colne Estuary SSSI Roman River SSSI Bullock Wood SSSI	National
LNR/LoWS	Colne LNR 11 LoWS, including Wivenhoe Cross Pit LoWS, directly adjacent to site	Local
Habitats	Arable land forming majority of proposed development area of limited inherent value, however increased value to fauna left fallow. Boundary habitats of greater interest, particularly Oak treeline to east. LoWS grassland and scrub habitats to east of local value.	Up to local
Flora	No red list or protected species within development area, though one Schedule 8 species (bluebell) growing within LoWS. One Schedule 9 invasive species present on western boundary (false acacia).	Site

Feature	Summary Description	Value
Badger	Foraging, commuting and sett-building opportunities. Known to be present locally but no evidence observed on site.	Site
Bats	Opportunities for roosting limited, but moderate suitability foraging habitat on-site. Highly suitable foraging habitat to south well linked to site by boundary treelines, driving commuting value at district level.	Up to district
Birds	Breeding and wintering assemblages including a high proportion and density of red and amber list BoCC species associated with farmland habitats for a site of this scale.	Local
Great crested newt	Nearest waterbody of 'poor' suitability and limited suitable terrestrial habitat within proposed development area. Considered likely absent.	Negligible
Hazel dormouse	Although present locally, only limited sub-optimal habitat within/adjacent proposed development area. Considered likely absent.	Negligible
Invertebrates	Limited natural habitats with limited structural diversity. Unlikely to support a notable assemblage.	Site
Reptiles	Low population of grass snake on site. Arable boundary features provide suitable habitat adjacent development area, with more extensive suitable habitat within LoWS to the east and off-site to south where a number of waterbodies exist.	Site
Other notable species	Suitable for hedgehog and common toad. Presence of hedgehog confirmed during bat surveys.	Site

4.0 Impacts, Mitigation & Enhancement Measures

Designated Sites

Impacts

4.1 As Wivenhoe Cross Pit LoWS is directly adjacent to the proposed development area, direct impacts on this site such as pollution events, noise disturbance and lighting impacts are possible during construction. No direct impacts to any other statutory or non-statutory sites are expected due to distance from the proposed development. Without mitigation, impacts are expected to be adverse at a local level.

4.2 The site is within the ZoI of four Essex coastal European designated sites under the Essex RAMS, the closest being the Colne Estuary SPA/Ramsar, and also falls within a Natural England SSSI Impact Risk Zone relating to residential development (of 100+ units) for two nationally designated SSSIs; Upper Colne Marshes SSSI and Colne Estuary SSSI. As such, during the occupational phase, increases in recreational pressure on these designated sites can be expected to result from the proposed development. Increased recreational pressures can also be expected to impact locally designated LNRs and LoWS that are publicly accessible within the ZoI of the site. These impacts are expected to be adverse at up to international level in the absence of mitigation.

4.3 Direct impacts to Wivenhoe Cross Pit LoWS could additionally occur during the occupational phase without suitable mitigation; in particular noise and light disturbance. Without mitigation, these impacts are expected to be adverse at local to district level.

Mitigation

4.4 Potential direct impacts to Wivenhoe Cross Pit LoWS during construction will require mitigation through the development of a Construction Environmental Management Plan (CEMP): Biodiversity, recommended to be secured via planning condition. This should include risk assessments of any potentially damaging activities and identify practical measures to avoid and minimise risk of impacts, e.g. sensitive timings, construction lighting, and precautionary working methods.

4.5 Potential in-combination recreational effects on internationally designated sites will be mitigated via a contribution of £125.58 per dwelling to the Essex RAMs (Place Services, 2019). In addition, due to the scale of the development (over 100 dwellings), on-site semi-natural open space designed in accordance with Natural England Suitable Alternative Natural Greenspace (SANGs) guidance will be delivered to mitigate for effects of the development in isolation. While new residents are still likely to visit the Colne Estuary SPA/Ramsar for recreation due to its close proximity, through the provision of alternative and immediate recreational walking opportunities on-site should reduce the frequency of new resident visits to more distant internationally and nationally designated off-site areas.

4.6 On-site semi-natural open space will include:

- High-quality, informal, semi-natural areas
- Circular dog walking routes of 2.7 km within the site and/or with links to surrounding public rights of way (PRoW) (avoiding the estuary footpaths)

- An area where dogs can be exercised safely 'off-lead'
- Signage/information leaflets to householders to promote these areas for recreation
- Dog waste bins
- A commitment to the long-term maintenance and management of these provisions

4.7 The development will deliver two semi-natural Public Open Spaces (POS); one to the north of the new development area which will be landscaped to achieve a semi-natural feel, and a second to the east within the LoWS field. The latter will be retained as a wildlife corridor in accordance with Wivenhoe Neighbourhood Plan policies and formally opened to public access.

4.8 No formal Public Rights of Way (PRoW) currently exist through either of these areas. However, they have historically been regularly informally accessed for walking by existing Wivenhoe residents, as evidenced by a number of well-worn paths through the site. Recreational carrying capacity will therefore be enhanced through landscaping and creation of a wider network of informal mown paths, linking to existing local PRoW and off-site walking routes. This will deliver circular walks of 2.7km via on-site paths together with links to nearby off-site greenspace. Facilities will additionally be enhanced through provision of dog bins and a visual information board highlighting the alternative non-estuarine walking routes available.

4.9 Further details on the mitigation proposed to address recreational impacts is provided within the Information to Support Habitat Regulations Assessment Report for the site (SES, 2021).

4.10 To avoid and minimise potential noise and light disturbance and recreational impacts to Wivenhoe Cross Pit LoWS post-occupation, the development design has retained the existing treeline dividing the proposed development area and LoWS in full and buffered the LoWS from the development area (minimum 10m buffer). A sensitive lighting scheme for the development that avoids any direct lighting of retained boundary habitats is recommended to be secured via planning condition.

4.11 It is further recommended that a Biodiversity Mitigation & Enhancement Strategy (BMES), including provisions for the adjacent area of Wivenhoe Cross Pit LoWS, is prepared during the design and construction phases of the scheme. This may also be secured via an appropriately worded planning condition. The BMES should detail practical measures to minimise disturbance to sensitive features and enhance the site for wildlife long term. Building on measures detailed in the site HRA (SES, 2021), this should include the management of recreational access through maintenance of mown pathways, provision of an interpretation board detailing the wildlife value of the site and other semi-natural connected local habitats, and ongoing management prescriptions to maintain habitats in a favourable condition for associated fauna including bats, birds and reptiles.

Residual Effects

4.12 Through the above mitigation it is considered that residual effects on international and national designated sites during the occupational phase will be reduced to **neutral.** For Wivenhoe Cross Pit LoWS, a **neutral** residual effect is expected to be achieved during construction through implementation of a CEMP: Biodiversity, with a **positive** residual effect expected to be achieved long-term through implementation of the recommended BMES.

Habitats

Impacts

4.13 In the absence of mitigation, potential construction phase impacts of the development include loss of habitats of site to local value through site clearance and damage to retained habitats e.g. due to pollution events, or for trees/hedgerows, through direct damage or compaction of roots. In addition, retained habitats could be subject to indirect effects through increased light disturbance.

4.14 During the occupational phase, retained habitats are also at risk of losing their ecological functionality through edge effects due to lighting and recreational disturbance, therefore adversely affecting their biodiversity value.

Mitigation

4.15 Significant impacts of habitat loss will be avoided through sensitive design; the proposed layout retains all habitats of greater than site value (boundary treelines and the LoWS scrub/grassland), with the proposed development sited within arable land of low intrinsic ecological value. Where minor loss of existing boundary vegetation is unavoidable due to the need to create road or pedestrian access, this will be mitigated through new planting of native species in excess of losses to deliver biodiversity net gain for the development. Loss of existing arable habitat will not be fully compensated as this habitat is of relatively low value and is abundant in the local landscape; however, landscaping for the POS will include an area sown with wild bird seed mix to ensure a continued feeding resource for arable bird species associated with the site.

4.16 Retained boundary vegetation will be protected from potential damage during works through the provision of suitable fencing such as Heras fencing, installed in line with Root Protection Areas (RPAs). The production of a CEMP: Biodiversity including risk assessments of any potentially damaging activities and practical measures to avoid and minimise risk of impacts to sensitive retained habitats will further protect retained habitats through the construction period.

4.17 Edge effects will be minimised through buffering of sensitive retained habitat features from the development area, specifically via the implementation of a minimum 10m buffer between the development edge and the boundary treeline dividing this and Wivenhoe Cross LoWS. Recreational impacts on habitats will be managed through implementation of the measures detailed in the HRA (SES, 2021) and the BMES recommended to be secured via planning condition, which will include management of recreational access through maintenance of mown pathways, provision of dog waste and litter bins, an interpretation board, and ongoing management prescriptions to maintain retained and created habitats in a favourable condition.

4.18 To address potential lighting impacts to retained habitats during occupation, a sensitive lighting scheme should be prepared for the residential development at detailed design stage in accordance with the latest guidance from the Institution of Lighting Professionals and Bat Conservation Trust's Guidance Note 08/18 Bats and artificial lighting in the UK (2018) and other referenced sources. The sensitive lighting scheme should be secured via an appropriately worded planning condition. Plans should seek to avoid any significant increase in lux levels along retained vegetation features, aiming typically to maintain levels in the region of 0.1-0.25 lux (equivalent to a typical cloudy or moonlit

natural nocturnal light levels). Lighting levels along the most sensitive eastern boundary treeline should be maintained fully within this range. Elsewhere through the site, lighting along retained boundary vegetation features should not exceed a maximum of 1 lux (equivalent to a fully moonlit night) at 2m above ground level. Specific lighting strategies adopted to reduce light spill onto sensitive features and into the surrounding environment will include the following, as appropriate:

- Use of LED luminaires. Metal halide and fluorescent sources not to be used.
- Use of luminaires with a warm white spectrum (wherever possible) to reduce blue light component.
- All luminaires to be mounted on the horizontal, *i.e.* no upward tilt.
- Only luminaires with flat, cut-off lanterns, an upward light ratio of 0% and good optical control to be used.
- The height of lighting columns will be limited to 6m and the spacing of lighting columns will be maximised to reduce spill of light into unwanted areas such as hedgerows and trees (Fure, 2006).
- Light sources will not emit ultra-violet light to avoid attracting insects and thus potentially reducing numbers in adjacent areas, which bats may use for foraging.
- Luminaires will feature high peak wavelengths (ideally higher than 550nm) to avoid the component of light most disturbing to bats (Stone, 2012)
- Directional shields will be utilized where necessary to direct light spill away from sensitive habitats
- Low-level directional downlighters will be utilized if lighting along pedestrian routes in proximity to hedgerows and treelines is required.
- Lighting that is required for security or access will use a lamp of no greater than 2000 lumens (150 Watts) and be PIR sensor activated on a short timer (1 minute), to ensure that the lights are only on when required and turned off when not in use (Jones, 2000; Hundt, 2012).
- Using reflective surfaces under lights will be avoided. Lights will be positioned so that they do not reflect off windows (e.g. onto bat flight lines).

Enhancement - Biodiversity Net Gain

4.19 The proposed development area sits within arable land that has a limited existing ecological value, with the more sensitive boundary and LoWS scrub/grassland habitats set to be retained. The proposal therefore offers a significant opportunity to deliver benefits to biodiversity and achieve measurable biodiversity net gain (BNG) in line with the NPPF. Net gains will be achieved through sensitive landscaping of the northern POS to create a semi-natural habitat mosaic incorporating diverse native species planting. Additional enhancement is proposed to be delivered through sensitive ongoing management of the LoWS area to maintain and enhance these habitats for wildlife and nectar-rich/berry-producing wildlife friendly ornamental planting throughout the development area.

4.20 Considering the assemblage of protected and priority species known to utilise the site, the following habitat provisions have been incorporated within the landscape proposals:

- Northern POS will be landscaped and managed as an open area of wild-life friendly grassland.
- The majority of new grassland sown within the northern POS will be of a tussock type (e.g. Emorsgate EM10), which will provide suitable habitat for reptiles.

- Finer meadow grass/wildflower mixtures will be utilised in proximity to the built development (e.g. Emorsgate EM3).
- An area of Basic Wild Bird Seed Mix KBS1 will also be sown and maintained in an area of the northern POS to provide continued foraging habitat for farmland bird species
- Use of formal paved paths will be avoided wherever feasible (in favour of informal mown paths) to maintain a semi-natural feel to the open spaces.
- New tree planting will incorporate a range of native species.
- Planting at the edges of the development area will incorporate native species-rich hedgerows (at least five woody species).
- Within and adjacent the developed area, lower plants providing a nectar resource for invertebrates will be included.
- Planting of invasive species (as per the London Invasive Species Initiative (2014) - Species of Concern list) will be avoided throughout, given the sites proximity to sensitive off-site habitats.

4.21 Biodiversity net gain calculations are provided in Appendix 12. The net gain assessment evidences a prospective future biodiversity net gain of 2.66 habitat units across the wider site, a net positive change of 35.88%. This is in excess of the 10% future mandatory requirement set to be brought into legislation under the forthcoming Environment Bill, evidencing the high biodiversity value offered by the proposed development scheme as a whole.

Residual Effects

4.22 Through sensitive design and the implementation of a CEMP: Biodiversity, the residual effect on habitats is predicted to be **neutral** during the construction phase. Long-term, **beneficial** effects are predicted as proposed enhancements mature, as evidenced by the biodiversity net gain metric.

4.23 New sports fields are proposed to the north of the development area; it is understood that Taylor Wimpey will provide the land for the sports pitches however will not be responsible for their delivery. The delivering body will therefore need to give consideration to whether lighting of the pitches is required. As no design proposals for the sports pitches are available, it is not possible to assess the residual effects of this aspect of the proposal. However if lighting is included, significant impacts of disturbance to retained habitats could potentially result. Given the sensitivity of the LoWS area and the value of the site boundary habitats to fauna, the likely ecological impacts of any lighting proposed will require further assessment by the delivering body. The required assessment is considered to include modelling of lux levels by a lighting specialist to determine levels of light spill, followed by an assessment of this data by an ecologist.

Protected and Notable Species

Flora

Impacts

4.24 The proposed development area does not currently support any protected or notable plant species and therefore no significant negative impacts to rare or notable flora are expected to result from the development; while bluebell was recorded on the eastern boundary of the LoWS, this area is distant from the proposed development and as such will not be impacted by works.

4.25 In regard to invasive species, false acacia (a Schedule 9 species) was recorded on the western boundary of the site. It is an offence to plant or otherwise cause to grow Schedule 9 species in the wild. Section 14 of the WCA 1981 does not impose an explicit obligation to manage Schedule 9 species not introduced onto land by a landowners own actions. However, it may be possible to argue that a landowner who knowingly allows a Schedule 9 species that he did not introduce to accumulate on his land and create a problem as it spreads to other areas of the wild is 'causing it to grow'. Negligent or reckless behaviour, such as inappropriate disposal of waste, where this results in a Schedule 9 species becoming established in the wild also constitutes an offence. Given the sensitivity of the adjacent LoWS site, impacts of spread of this species could potentially be significant at local level.

Mitigation

4.26 A program of targeted herbicidal treatment of false acacia stems has already commenced in February 2021. Vegetation will be cleared and stems cut and treated for a period of at least three years. Monitoring will be undertaken in year four to identify if any regrowth has occurred, with further treatment then undertaken in years four and five if necessary. This will serve to eradicate false acacia from the site.

Enhancement

4.27 Botanical diversity on site will be enhanced through wildlife friendly landscaping including the use of wildflower mixes in the main POS space and new native tree and hedgerow planting, as detailed in 4.20 and shown on the Landscape Masterplan.

Residual Effects

4.28 As no rare or notable species were found within the proposed construction zone, residual effects during construction are predicted to be **neutral**. Long-term, it is considered likely that a **positive** residual effect on flora will be achieved through implementation of the wildlife friendly landscaping scheme and eradication of false acacia from the site.

Badger

Impacts

4.29 With no active setts on site, potential impacts of the development are likely to be limited to badger death/injury during construction due to e.g. foraging/dispersing badgers encountering improper storage of chemicals or falling into excavations and being unable to escape.

4.30 However, a badger population is known to exist locally and suitable sett-building habitat exists on site (boundary ditches). As badger are prolific sett builders, new setts could potentially establish on site during the period between ecological survey and construction commencement. If this occurred, potential impacts could include disturbance and/or injury to badgers occupying a sett, and damage to/destruction of a sett. These impacts would represent offences under the Protection of Badgers Act 1992.

4.31 Impacts during the occupational phase are considered likely non-significant in the absence of mitigation as surveys did not detect any evidence of regular use of the site by badger (e.g. latrines, setts) and the risk of road traffic accidents (RTAs) is considered to be very low as no major roads are incorporated within the development and speed limits will be low on site.

Mitigation

4.32 To mitigate potential impacts of death/injury to foraging and dispersing badgers during construction, the following precautionary techniques that are sympathetic to badgers will be followed throughout the construction phase:

- Covering trenches at night or leaving a plank of wood leant against the side to ensure badgers can escape if they were to accidentally fall in;
- Covering open pipework with a diameter of greater than 120mm at the end of the workday to prevent animals from entering and becoming trapped;
- Appropriately storing any chemicals overnight; and
- Regular removal of litter.

4.33 As badgers are prolific sett-builders and suitable sett-building habitat is present on site (within dry ditches on the eastern boundary), a pre-construction badger walkover survey will be undertaken within six weeks before works begin on site, to ensure no new setts have established on-site in the intervening period.

Residual Effects

4.34 Through the above precautionary working methods, it is predicted that the development will result in a **neutral** residual effect on badgers during construction. Operational phase residual effects are also predicted to be **neutral** in the absence of any specific mitigation.

Bats

Impacts

4.35 Fifteen trees within or bounding the red line area had low to moderate suitability to support roosting bats. If these trees were to be felled or pruned to facilitate the development, potential impacts could include injury, death and destruction of a roost, which are offences under the Conservation of Habitats and Species Regulations (2019). Given the limited number of suitable trees on site and limited suitability of identified features, impacts are considered potentially major (death of individual bats), though adverse at the site level only, as the wider landscape will support a number of alternative roosting opportunities.

4.36 The foraging bat assemblage utilising the site could additionally be impacted by habitat loss during construction if the existing boundary vegetation on site was required to be cleared. Disruption of linked commuting routes could also occur due to the removal of existing boundary vegetation; this could potentially lead to loss of a roost due to abandonment, which would again constitute an offence under the Conservation of Species and Habitats Regulations 2019.

4.37 During the occupational phase, foraging and commuting bats, as well as roosting bats (if present) could potentially be impacted by lighting disturbance. This could again result in loss of foraging habitat, disruption of commuting routes, and loss of roost(s) through abandonment, if present.

4.38 Potential impacts to the foraging/commuting bat assemblage on site are predicted to be adverse at up to district level.

Mitigation

4.39 To avoid and minimise impacts to roosting bats (if present), trees with suitability for roosting bats will largely be retained, along with their connecting habitat, and buffered from lighting disturbance through the development of a sensitive lighting scheme as outlined in 4.18.

4.40 One 'low suitability' tree (T20) is proposed to be felled. This tree will be 'soft-felled' in accordance with current guidance (Collins, 2016). This will involve felling the tree in sections, lowering cut sections gently to the ground with ropes, then leaving these in situ on the ground overnight before they are chipped or moved off site. In the unlikely event that a roosting bat was discovered during these operations, a Natural England EPSM licence would be sought and appropriate mitigation provided, likely in the form of the provision of bat boxes on retained trees.

4.41 Mitigation for impacts to foraging and commuting bats will comprise the retention of existing treelines along the boundaries of the site with only minor gaps created where strictly necessary to create road or pedestrian access. A sensitive lighting scheme for the residential development (see 4.18) will ensure a 'dark corridor' is maintained alongside the treelines. The eastern boundary treeline is considered particularly sensitive given the adjacent Wivenhoe Cross Pit LoWS and connection to other favourable off-site foraging habitats, and is considered to be important at district level; therefore a minimum 10m buffer will be maintained between this boundary and the development.

Enhancement

4.42 Given the levels of bat activity observed on site, it is considered appropriate that the development should deliver further enhancements for bats.

4.43 It is proposed this will include provision of new roosting opportunities through bat boxes (15 total) integrated in new buildings and installed on retained boundary trees. A variety of bat boxes that can integrate seamlessly into the design of new buildings are available, such as the Habibat Bat Box, which can be supplied plain for a rendered finish, or faced with brick (see Figure 1). Alternatively there are a wide range of woodcrete bat boxes with a long lifespan that are suitable for installation on trees, such as the Schwegler 1FD (see Figure 2).

Figure 1: Habibat Bat Box faced with red brick, incorporated within wall at gable end.

Figure 2: Schwegler 1FD bat box erected on a tree.

4.44 To maximise likelihood of occupation, boxes should be sited within the retained eastern boundary treeline (a core area of bat activity through the site) and within properties along the eastern edge of the development. Boxes should be sited at a minimum height of 3m away from artificial light sources, with orientations ranging from south to north facing to provide a range of micro-climactic conditions suitable for individual torpid bats as well as active maternity groups. Where installed on buildings, boxes should be installed high up within gable ends. Where installed on trees, care should be taken to ensure surrounding branches do not block the flight path to the box or provide opportunity for predators to access the box (e.g. cats). Full details relating to the type and locations of bat boxes to be provided are proposed to be included in the BMES, which may be secured via an appropriately worded planning condition.

4.45 Further enhancements for foraging bats will be delivered through the site landscaping. New planting will incorporate a diversity of native hedgerow and tree species as this is more favourable for invertebrates (bats prey). New semi-natural grassland areas will be subject to low-intensity management to maintain a tall sward height providing refuge and feeding opportunities for a variety of invertebrate species. Ongoing management will additionally seek to maximise the density and diversity of boundary treeline/scrub/grassland edge 'micro-habitats' along the margins of the site, through the northern POS and within the LoWS field, with detailed management actions recommended to be specified within the site BMES. Further enhancement will be delivered within the ornamental planting areas within the development itself through planting of nectar-rich night scented flora known to be attractive to moths.

Residual Effects

4.46 Retention of the site boundary habitats and protection through construction via the CEMP: Biodiversity will enable a **neutral** residual effect on bats to be achieved through the construction phase.

4.47 Sensitive lighting and buffering of the eastern boundary foraging/commuting corridor will ensure a neutral residual effect of the residential development is achieved during occupation. Through the delivery of on-site landscaping enhancements and provision of bat boxes, a **positive** residual effect for bats should be achieved long-term.

4.48 However, it should again be noted that as no design proposals for the sports pitches are available (and it is as such unclear whether these will be lit), it is not possible to fully assess the residual effects of this aspect of the proposal. Further assessment would need to be undertaken by the delivering body to determine this, as outlined in 4.23.

Birds

Impacts

4.49 Potential impacts on nesting birds include death, damage to and disturbance of nests during vegetation clearance.

4.50 The boundary treeline habitats on site supported a high density of breeding territories; therefore if these were removed, a significant impact of nesting habitat loss on the breeding bird community, which includes a number of red and amber list BoCC, would be anticipated. Loss of open arable nesting habitat is considered unlikely to have a significant adverse impact on the local skylark population, given the relatively small scale of the site, the low number of territories supported and the ample availability of alternative arable nesting habitat off-site within the broader landscape to the north and east.

4.51 Increased disturbance during the construction phase is considered likely to have an adverse effect on the BoCC species community nesting along the boundaries of the site and within the adjacent LoWS without suitable mitigation.

4.52 In addition, the BoCC farmland bird community utilising the site could be negatively impacted by loss of the fallow-arable feeding resource offered by the site during the 2020 survey season; although this habitat was a transient resource and had only recently established, while present it provided a relatively unique habitat resource at a local level.

4.53 Furthermore, although not part of the development footprint, Wivenhoe Cross Pit LoWS supported a high density of BoCC nesting territories and will potentially be affected by increased recreational disturbance from the development during occupation.

4.54 Given the value of the breeding bird community on and adjacent site, impacts are considered potentially adverse at up to local level in the absence of suitable mitigation.

Mitigation

4.55 Where any clearance of nesting bird habitat is required (scrub, trees, and also arable/grassland given the presence of skylark on site), then this will be undertaken outside the nesting bird season (March to August inclusive), or only once a habitat inspection has been carried out by a suitably qualified ecologist within 48 hours prior to clearance to confirm the absence of active nests. Any active nests located during inspections will be protected with a suitable buffer of retained vegetation around the nest (of appropriate size to the species) and monitored until the nest is no longer active/all chicks have fledged, when the ecologist will provide sign off for clearance to be undertaken.

4.56 Significant impacts of nesting habitat loss will be avoided through sensitive design, with the site layout retaining the existing boundary treeline features. Where some minor losses of existing boundary vegetation are necessary to create access into the site, this will be fully compensated through new planting. An area of Basic Wild Bird Seed Mix KBS1 will also be sown and maintained in an area of the northern POS to provide continued foraging habitat for farmland bird species.

4.57 Potential impacts of disturbance to retained nesting habitats during construction will be mitigated through the CEMP: Biodiversity, which will specify measures to control light and noise disturbance in accordance with industry best practice.

4.58 Potential recreational disturbance impacts to Wivenhoe Cross Pit LoWS during occupation will be managed through implementation of the measures detailed in the HRA (SES, 2021) and the BMES recommended to be prepared pre-occupation, which will include management of recreational access through maintenance of mown pathways, an interpretation board, and ongoing management prescriptions to maintain retained and created habitats in a favourable condition.

Enhancement

4.59 New habitats for foraging birds will be delivered through the site landscaping. New planting will incorporate berry producing native hedgerow species as well as semi-natural grassland areas providing refuge and feeding opportunities for a variety of invertebrate species. Resources for seed-feeding farmland species will be maintained through the provision of an area of wild bird seed mix planting maintained within the northern POS.

4.60 Additional natural nesting habitat will be delivered through new tree and hedgerow planting. Furthermore, the scheme will provide integral bird boxes within the fabric of new buildings and installed on retained trees. It is proposed this will comprise 8 boxes installed on retained trees around the boundaries of the site and 12 integrated swift bricks to be installed on the gable ends of new properties. Studies have shown swift bricks are frequently used by a range of other small bird species such as house sparrow (Barlow et al., 2020), which are known to utilise the site. Swift bricks should be installed with a northerly to easterly orientation to prevent overheating and be clustered within the scheme due to the colonial nesting habitats of both swifts and house sparrows to foster likelihood of successful uptake. Where installed on trees, boxes should be made of a long-lasting material e.g. woodcrete and will be installed at a minimum height of 2m. Care must be taken to ensure surrounding branches do not provide opportunity for predators to access the box (e.g. cats). Numerous suitable designs are available, two examples are provided below:

Figure 3: Bird Brick Houses swift box for integration into walls.

Figure 4: Schwegler 1B bird box for erection on trees.

4.61 Full details relating to the type and locations of bird boxes to be provided are proposed to be included in the BMES, which may be secured via an appropriately worded planning condition. The BMES will also include habitat management provisions for the LoWS area to maintain the quality of existing scrub nesting habitats within this area and enhance them for nesting birds long term. The aim will be to maintain dense thickets of scrub alongside areas of longer-sward grassland within an early-successional habitat mosaic. Management will follow recommended prescriptions for nightingale (a severely declining red list species recorded on and adjacent site) but will also benefit a variety of other passerine species.

Residual Effects

4.62 It is predicted that retention of the site boundary habitats and protection through construction via the CEMP: Biodiversity will enable a **neutral** residual effect to be achieved through the construction phase.

4.63 Through the delivery of on-site landscaping enhancements, provision of bird boxes and enhancement of the adjacent LoWS through implementation of the proposed BMES, a **neutral to positive** residual effect for birds could potentially be achieved in the long-term.

Invertebrates

Impacts

4.64 Significant construction impacts are not considered likely as loss of habitat within the construction zone is likely to result in killing and/or injury to a common invertebrate assemblage only; no long-term impact to local populations is expected to result from this.

4.65 However, although the site was considered unlikely to support significant numbers of stag beetle larvae due to limited presence of deadwood, the possibility of this species presence on site could not be ruled out. As this species is 'Nationally Scarce', if existing potential larvae habitat (dead tree stumps along the boundaries of the site) were required to be removed, a potential adverse effect would be expected. The scale of this impact would likely be low (site level) due to the limited amount of suitable habitat on site.

4.66 During the occupation phase, there is potential for indirect effects through increased light levels which could result in the abandonment of habitat. This could again have an adverse effect at the site level, given the limited diversity and density of invertebrate micro-habitats on site.

Mitigation

4.67 Any existing dead tree stumps along the boundaries of the site will be left in situ wherever feasible. If removal is necessary, this will be undertaken under the supervision of an ecologist and the stump will be re-buried at a nearby location where it can remain undisturbed within the northern POS or adjacent LoWS.

4.68 Implementation of a sensitive lighting scheme for the residential development that avoids light-spill into the adjacent LoWS and retained boundary vegetation (see 4.18) will mitigate potential light disturbance impacts on invertebrates on and adjacent site.

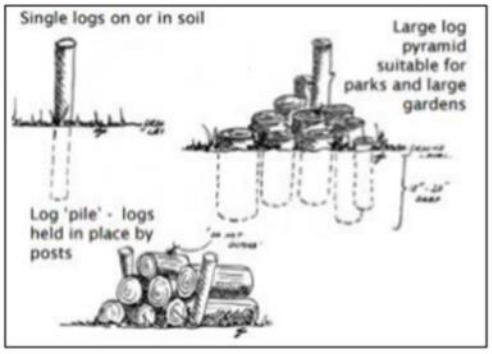
Enhancement

4.69 Enhancements for invertebrates will be delivered through the site landscaping. New planting will incorporate native hedgerow and tree species, and new semi-natural grassland areas will utilise wildflower mixes.

4.70 Semi-natural grassland will be subject to low-intensity management to maintain a tall sward height providing refuge and feeding opportunities for a variety of species. Ongoing management will additionally seek to maximise the density and diversity of boundary treeline/scrub to grassland edge 'micro-habitats' along the margins of the site, through the northern POS and within the adjacent LoWS field, with detailed management actions proposed to be specified within the site BMES. Further enhancement will be delivered within the ornamental planting areas within the development itself through planting of nectar-rich flora known to be attractive to pollinator species.

4.71 As an additional enhancement for stag beetle, log-piles suitable for this species (including part-buried timbers) will be incorporated within the landscaping of the northern POS (see Figure 5).

Figure 5: Log-pile enhancements for stag beetle.



Residual Effects

4.72 Through these measures a **neutral** residual effect on invertebrates is expected to be achieved during construction, with a **positive** residual effect delivered long-term through landscaping measures.

Reptiles

Impacts

4.73 Potential impacts on grass snake are death/injury during construction.

4.74 Habitat loss is not considered a significant impact due to the limited extent of suitable habitat within and directly adjacent the proposed construction zone, the low population associated with the site and the abundance of more highly favourable grass snake habitat to the south and east, including within the LoWS area.

4.75 Given the low population supported by the site, potential impacts are considered significant within the context of the site only.

Mitigation

4.76 Given the low number of grass snake recorded and highly mobile nature of this species, trapping and translocation out of the site is considered disproportionate to the risk of killing/injury. It is therefore proposed that clearance of suitable reptile habitat proceeds under the supervision of an Ecological Clerk of Works (ECoW) using sensitive working methods and timings following an ecological method statement (proposed to be incorporated in the CEMP: Biodiversity). Clearance of suitable habitat will be undertaken only during the reptile active season (core season April-September but frequently extending into March-October in the south of England, dependent on weather conditions).

4.77 Where suitable boundary habitats require clearance, the following mitigation will apply:

- Areas comprising grassy/herbaceous vegetation will be carefully strimmed to a height of no less than 150mm above ground level under the supervision of an ECoW, who will then perform a hand-search of the area to capture any remaining reptiles. Any boundary scrub, tree or hedgerow vegetation requiring removal will be cut down to no less than 150mm above ground level during the first phase of clearance.
- Following the hand-search, the vegetation can then be further strimmed to ground level after a period of 24 hours has elapsed, allowing time for any remaining reptiles to disperse from the area.
- As a final step, tree stumps and remaining low-level scrub will be uprooted and roots will be hand searched and then removed from site under the supervision of the onsite ecologist. Any reptiles disturbed will be re-located to retained boundary habitats.

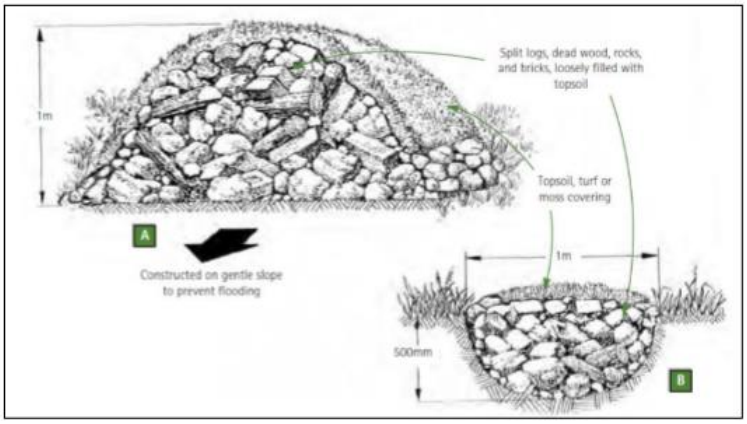
4.78 Once clearance is completed the site will be maintained as unsuitable habitat for reptiles throughout construction. In particular care will be taken not to create potential refuge/hibernation opportunities through storage of materials on the ground. Materials will be stored on pallets, in locations away from any retained boundary habitats.

Enhancement

4.79 It is considered that the development of the site offers the opportunity to significantly enhance it for reptiles. The following measures will deliver this:

- Northern POS to be created and maintained as an open area of wild-life friendly grassland (predominantly tussock type), providing foraging and basking opportunities.
- Once established, tussock grassland will be subject to low-intensity rotational management to maintain continuity of areas with a tall sward height.
- Ongoing habitat management provisions (proposed to be specified in detail in the site BMES), will maximise the density and diversity of graded interface habitats around the boundaries of the site, through the northern POS and within the adjacent LoWS.
- One reptile hibernacula will additionally be created within the northern POS, see Figure 6.

Figure 6: Reptile hibernacula design.



Residual Effects

4.80 Through precautionary clearance methods as specified, a neutral residual effect is anticipated during construction, with a **positive** residual effect delivered long-term through landscaping and ongoing management measures.

Other Notable Species

Impacts

4.81 Potential impacts to hedgehogs and common toad include risk of death/injury during construction/vegetation clearance.

4.82 In addition if access is impeded to new residential gardens, habitat loss/fragmentation could significantly impact hedgehog during the occupational phase.

Mitigation

4.83 Where clearance of suitable habitat (arable margins with mixed scrub/grassland) is necessary, precautionary measures will be followed to reduce risk of direct harm. These measures will include:

- Sensitive timings for works e.g. outside of hedgehog hibernation season (November-March)
- A search by an ecologist for hedgehog nests prior to clearance
- A two-stage cut of tall grasses and ruderals, where the first cut is made to a height of no less than 15cm and 24 hours then left to elapse before remaining vegetation is cleared to ground level, allowing time for any disturbed animals to move away from the area

4.84 Precautionary measures recommended for badger (e.g. covering trenches overnight or provision of a mammal ladder), will further serve to protect hedgehogs during construction.

4.85 To facilitate the movement of hedgehogs through the site post-construction, 'hedgehog highways' will be provided within all new lengths of garden (and where feasible boundary). A 13cm x 13cm hole is recommended which is too small for most pets and can be delivered by raising a fence panel per garden, installing hedgehog friendly fencing, removing a brick at the bottom of a wall or cutting a hole in fencing/walls.

Figure 7: Hedgehog friendly fencing

Enhancement

4.86 New semi-natural grassland habitats to be created in the northern POS will benefit hedgehogs and common toad by providing enhanced foraging opportunities on site.

Residual Effects

4.87 Sensitive working and clearance methods will deliver a **neutral** residual effect for notable species during construction. A **positive** residual effect for common toad and hedgehog should potentially be achieved through landscaping enhancements and the provision of hedgehog friendly fencing.

5.0 Conclusions

5.1 A summary of likely impacts, mitigation and enhancements proposed is provided in Table 11.

Table 11. Summary of likely impacts, mitigation and enhancement measures and residual impacts.

Feature	Impacts – Construction Phase	Impacts – Operational Phase	Mitigation	Enhancement	Residual Effect – Construction Phase	Residual Effect – Operational Phase
SPA / Ramsar / SAC	No significant impacts predicted	Increased recreational pressure	Financial contribution to Essex RAMs Provision of on-site open space & links to local PRoW / 2.7km walking route	N/A	Neutral	Neutral
SSSI	No significant impacts predicted	Increased recreational pressure	Provision of on-site open space & links to local PRoW / 2.7km walking route	N/A	Neutral	Neutral
LNR/ LoWs	Direct impacts on Wivenhoe Cross LoWS e.g. pollution events, noise and light disturbance	Increased recreational pressure Light disturbance	Provision of on-site open space & links to local PRoW / 2.7km walking route Preparation & implementation of CEMP: Biodiversity	BMES including management measures to protect and enhance on-site area of Wivenhoe Cross Pits LoWS	Neutral	Positive (for Wivenhoe Cross Pit LoWS)
Habitats	Loss of habitats of up to local value during site clearance Damage to retained habitats Lighting disturbance of retained habitats	Loss of ecological functionality of retained habitats due to edge effects/lighting disturbance	Retention/protection of habitats of local value (boundary treelines, hedgerow, LoWS scrub and grassland) Preparation & implementation of CEMP: Biodiversity 10m buffer to be implemented between development edge and LoWS boundary treeline Sensitive lighting strategy for residential	Wildlife friendly landscaping scheme including: - Native tree and hedgerow planting - A large northern POS to be created and managed as an open area of semi-natural grassland - Nectar rich ornamental planting within the built development	Neutral	Positive
Rare and Notable Flora	Spread of false acacia within/beyond site	Spread of false acacia within/beyond site	Targeted herbicidal treatment program to eradicate false acacia from site.	Wildlife friendly landscaping scheme incorporating diverse native planting and wildflower mixes	Neutral	Positive

Feature	Impacts – Construction Phase	Impacts – Operational Phase	Mitigation	Enhancement	Residual Effect – Construction Phase	Residual Effect – Operational Phase
Badger	Injury/death during construction	No significant impacts predicted	Standard **precautionary** measures; covering trenches overnight or installing a plank/mammal ladder, sensible storage of chemicals/equipment, avoidance of littering Pre-construction walkover to check for any new setts established on site	N/A	Neutral	Neutral
Bats	Killing/injury Loss/disturbance of a roost Loss of foraging/ commuting habitat Lighting impacts during/post construction	Lighting disturbance of retained foraging/commuting habitats	Soft felling of low suitability T20 Retention and buffering of boundary vegetation features and LoWS Sensitive lighting scheme for residential development	Provision of bat boxes on retained trees/within new buildings (15 total) Wildlife friendly landscaping scheme favourable for bats invertebrate prey	Neutral	Positive
Birds	Injury/death of birds and eggs Destruction of nests Disturbance of nests Loss of fallow arable feeding resource	Recreational disturbance of retained habitats	Sensitive timings for vegetation clearance or nesting bird check by an ecologist within 48 hours prior with suitable buffer to be applied around any nests found Retention, reinforcement and buffering of boundary features and LoWS New native hedgerow and tree planting Sowing of wild bird seed mix in northern POS	Wildlife friendly landscaping scheme incorporating berry producing native hedgerow species as well as semi-natural grassland areas providing refuge and feeding opportunities for a variety of invertebrate species. New natural nesting habitats (trees and hedgerows) to be provided along with artificial nesting opportunities (8 boxes on retained trees, 12 installed in new properties). Recreational impacts to LoWS managed through BMES provisions.	Neutral	Neutral to Positive

Feature	Impacts – Construction Phase	Impacts – Operational Phase	Mitigation	Enhancement	Residual Effect – Construction Phase	Residual Effect – Operational Phase
Invertebrates	Killing/injury of stag beetle larvae	Lighting disturbance	Deadwood / tree stumps to be left in situ or removal supervised by ecologist and re-buried elsewhere Sensitive lighting scheme	Wildlife friendly landscaping scheme incorporating a diverse mix of native species and nectar-rich species. Sensitive management to maximise density and diversity of micro-habitats, specified in BMES Log piles suitable for stag beetle	Neutral	Positive
Common reptiles	Death/injury during site clearance/ construction	N/A	CEMP: Biodiversity to specify sensitive two-stage clearance of suitable habitats, supervised by ecologist, during reptile active season	Wildlife friendly landscaping scheme including a large northern POS to be created and managed as an open area of semi-natural tussock grassland Provision of one hibernacula Sensitive ongoing management of semi-natural POS to maximise edge habitat resource.	Neutral	Positive
Other notable species (hedgehog, common toad)	Death/injury during site clearance/ construction	Fragmentation of habitat for hedgehog	Sensitive timings (outside hedgehog hibernation season) and methods for clearance of suitable habitats to be specified in CEMP: Biodiversity. Precautionary methods during construction (as for badgers).	Provision of hedgehog highways in fencing. New semi-natural grassland in the northern POS will benefit hedgehogs and common toad by providing enhanced foraging opportunities on site.	Neutral	Positive

5.2 Through the above mitigation including sensitive layout design (retaining boundary habitats where possible), a wildlife friendly landscaping scheme, and sensitive practices/management during construction and occupation (proposed to be detailed via a CEMP and BMES, and recommended to be secured via appropriately worded planning conditions), it is considered that all significant impacts upon biodiversity, including any potential adverse impacts upon specific protected species and habitats will be able to be wholly mitigated in line with relevant wildlife legislation, chapter 15 of the NPPF (MHCLG, 2019); and adopted and local plan policies with regard to biodiversity.

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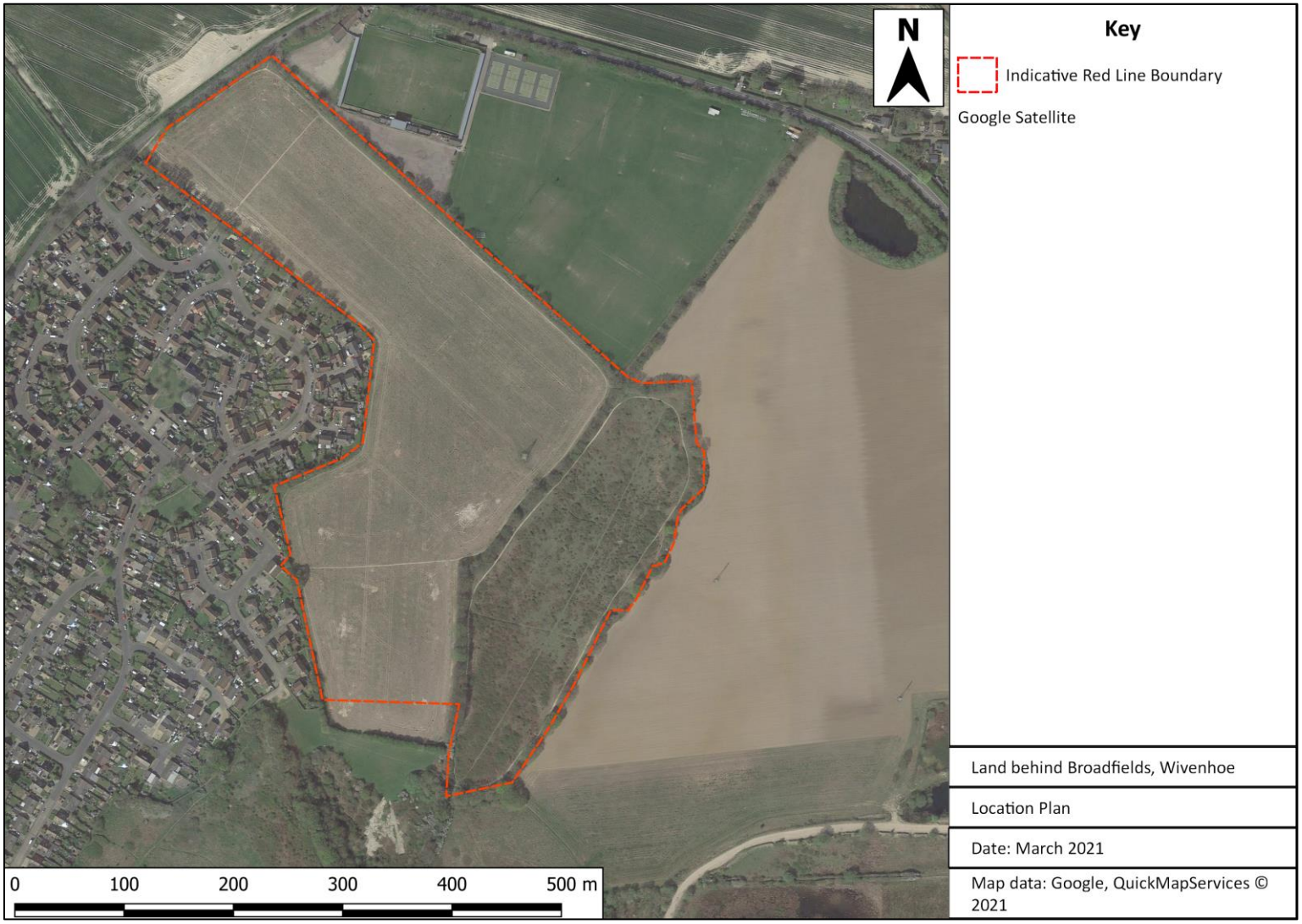
Appendix 1. Site Location Plan



Appendix 2. Legislative and Policy Framework

This document has not been prepared by a legal or planning professional and should be read as an interpretation of relevant statutes and planning policy guidance only. The information presented within this document has been reported in good faith and are the genuine opinion of SES on such matters. SES does not accept any liability resulting from outcomes relating to the use of this information or its interpretation within this document.

National Planning Policy

The NPPF (MHCLG, 2019) states that:

Paragraph 170

Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);
b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;
c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;
d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;

Paragraph 175

When determining planning applications, local planning authorities should apply the following principles:

a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;
b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;
c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and
d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.

Local Planning Policy

Colchester Borough Local Plan (2004-2020)

The Colchester Borough Council policy relevant to nature conservation within the adopted Local Plan (2004-2020) is policy ENV1 Environment., this policy states that:

- The Borough Council will conserve and enhance Colchester's natural and historic environment, countryside and coastline. The Council will safeguard the Borough's biodiversity, geology, history and archaeology through the protection and enhancement of sites of international, national, regional and local importance. In particular, developments that have an adverse impact on Natura 2000 sites or the Dedham Vale Area of Outstanding Natural Beauty will not be supported.

- Within the Coastal Protection Belt development will not be permitted that would adversely affect the open and rural character of the undeveloped coastline, and its historic features, sites of nature conservation importance and wildlife habitats.

- The network of strategic green links between the rural hinterland, river corridors, and key green spaces and areas of accessible open space that contribute to the green infrastructure across the Borough will be protected and enhanced.

- Development will be supported at appropriate locations to improve public access, visual amenity and rehabilitate the natural environment. Development will need to minimise and mitigate adverse impacts on river, coastal and ground water quality.

- The Council will seek to direct development away from land at risk of fluvial or coastal flooding in accordance with PPS25, including areas where the risk of flooding is likely to increase as a result of climate change.

- Unallocated greenfield land outside of settlement boundaries (to be defined/reviewed in the Site Allocations DPD) will be protected and where possible enhanced, in accordance with the Landscape Character Assessment. Within such areas development will be strictly controlled to conserve the environmental assets and open character of the Borough.

- Where new development needs, or is compatible with, a rural location, it should demonstrably:
    i. be in accord with national, regional and local policies for development within rural areas, including those for European and nationally designated areas;
    ii. be appropriate in terms of its scale, siting, and design;
    iii. protect, conserve or enhance landscape and townscape character, including maintaining settlement separation;
    iv. protect, conserve or enhance the interests of natural and historic assets;
    v. apply a sequential approach to land at risk of fluvial or coastal flooding in line with the guidance of PPS25;
    vi. protect habitats and species and conserve and enhance the biodiversity of the Borough; and
    vii. provide for any necessary mitigating or compensatory measures.

Colchester Borough/North Essex Authorities Emerging Local Plan (2013-2033)

In February 2021 Colchester Council formally adopted the Colchester Borough Local Plan 2013-2033: North Essex Authorities' Shared Strategic Section 1 Plan. Colchester, Braintree and Tendring Councils will accordingly now be able to proceed with the adoption process and examination of the authority specific policies and allocations in Section 2 of the plan.

The Adopted Section 1 North Essex Strategic Plan contains the following policies relevant to nature conservation:

Policy SP 2 Recreational disturbance Avoidance and Mitigation Strategy (RAMS)

Contributions will be secured from development towards mitigation measures in accordance with the Essex Coast Recreational disturbance Avoidance and Mitigation Strategy 2018-2038 (RAMS).

Policy SP 7 Place Shaping Principles

All new development must meet high standards of urban and architectural design. Development frameworks, masterplans, design codes, and other design guidance documents will be prepared in consultation with stakeholders where they are needed to support this objective. All new development should reflect the following place shaping principles, where applicable:

- Protect and enhance assets of historical or natural value;
- Incorporate biodiversity creation and enhancement measures;
- Provide an integrated and connected network of biodiverse public open space and green and blue infrastructure, thereby helping to alleviate recreational pressure on designated sites;
- Include measures to promote environmental sustainability including addressing energy and water efficiency, and provision of appropriate water and wastewater and flood mitigation measures including the use of open space to provide flora and fauna rich sustainable drainage solutions;

Section 2 of the Plan, currently at examination stage, specifies revised draft environmental policy as follows:

Policy ENV1: Environment

The Local Planning Authority will conserve and enhance Colchester's natural and historic environment, countryside and coastline. The Local Planning Authority will safeguard the Borough's biodiversity, geology, history and archaeology, which help define the landscape character of the Borough, through the protection and enhancement of sites of international, national, regional and local importance. In particular, developments that have an adverse impact on the integrity of European sites, Sites of Special Scientific Interest or the Dedham Vale Area of Outstanding Natural Beauty (including its setting) will not be supported.

Development proposals within designated areas or within the Coastal Protection Belt will need to comply with policies ENV2 and ENV4. Development proposals where the principal objective is to

conserve or enhance biodiversity and geodiversity interests will be supported in principle. For all proposals, development will only be supported where it:

i. Is supported with appropriate ecological surveys where necessary;
ii. Where there is reason to suspect the presence of a protected species (and impact to), or Species/Habitats of Principal Importance, applications should be accompanied by an ecological survey assessing their presence and, if present, the proposal must be sensitive to, and make provision for their needs;
iii. Will conserve or enhance the biodiversity value of greenfield and brownfield sites and minimise fragmentation of habitats;
iv. Maximises opportunities for the preservation, restoration, enhancement and connection of natural habitats in accordance with the UK and Essex Biodiversity Action Plans or future replacements; and
v. Incorporates beneficial biodiversity conservation features and habitat creation where appropriate.

Plans or projects, which may have a likely significant effect on a European site which have not been screened or considered in the Borough's Habitat Regulations Assessment or Appropriate Assessment, will be required to prepare a separate HRA screening and if necessary to complete a separate appropriate assessment to ensure compliance with the Habitat Regulations 2010.

Proposals for development that would cause direct or indirect adverse harm to nationally designated sites or other designated areas, protected species, Habitats and Species of Principle Importance or result in the loss of irreplaceable habitats, such as ancient woodland, Important Hedgerows and veteran trees, will not be permitted unless:

i. They cannot be located on alternative sites that would cause less harm;
ii. The benefits of the development clearly outweigh the impacts on the features of the site and the wider network of natural habitats; and
iii. Satisfactory mitigation and compensation measures are provided.

The Local Planning Authority will take a precautionary approach where insufficient information is provided about avoidance, mitigation and compensation measures and secure mitigation and compensation through planning conditions/obligations where necessary.

Policy ENV3: Green Infrastructure

The Local Planning Authority will aim to protect, enhance and deliver a comprehensive green infrastructure network comprising strategic green links between the rural hinterland, urban Colchester, river corridors and open spaces across the Borough. It will seek to protect and enhance the existing network of green and blue infrastructure features and to secure the delivery of new green infrastructure where deficiencies and gaps are identified that will benefit communities, wildlife and the environment. The Council will work with access stakeholder/groups to support the delivery of a 'new' multi user route, the Colchester Orbital, around urban Colchester.

Development proposals that contribute to the delivery of projects identified in the Colchester Green Infrastructure Strategy, the Orbital Project Audit Paper and the Public Rights of Way Improvement Plan for Essex will be positively supported.

Proposals that cause loss or harm to the green infrastructure network will not be permitted unless the need for and benefits of the development outweigh any adverse impacts. Where adverse impacts on green infrastructure are unavoidable, development will only be permitted if suitable mitigation measures for the network are provided. Key linkages will be constructed to a suitable standard to allow year round secure usage by all.

The Local Planning Authority will seek contributions or require work to be undertaken as part of new development where appropriate, to create new paths where gaps are evident in the existing green infrastructure network/Orbital routes or to enhance the quality of the existing route. The use of land and buildings as new allotments, orchards, community gardens and for local food growing spaces and production will be supported, including the temporary use of vacant or derelict land or buildings and the use of incidental open space on housing estates and other open space areas, where this does not conflict with other policy objectives.

The Wivenhoe Neighbourhood Plan

The Wivenhoe Neighbourhood Plan was written by a group of volunteers to guide planning decisions in the locality to 2032, based on the views, vision and wishes of the people living there. It has been adopted by CBC and integrated into the new emerging Colchester Borough Local Plan (Policy SS16). Relevant policies are detailed below:

POLICY WIV 2: Wivenhoe Town Settlement Boundary

Except where supported by other policies in the development plan, development outside the Settlement Boundary, as identified on the Wivenhoe Proposals Map, should:

(i) demonstrate that it needs, or is compatible with, a countryside location; and
(ii) be appropriate in terms of its scale, siting, and design; and
(iii) protect, conserve or enhance landscape and townscape character, including maintaining settlement separation; and
(iv) protect, conserve or enhance the interests of natural and historic assets; and
(v) apply a sequential approach to land at risk of fluvial or coastal flooding in line with national planning policy and guidance (or any successor document); and
(vi) protect habitats and species and conserve or enhance biodiversity; and
(vii) provide for any necessary mitigating or compensatory measures;

POLICY WIV 29: Land behind Broadfields

The land behind Broadfields shown in Figure 35 totalling 4.06 hectares is allocated for a minimum of 120 dwellings subject to the following conditions:

(i) a minimum of 45 dwellings shall be provided with one or two bedrooms which should be designed as homes suitable for older people, single people, or for young couples. They could be bungalows, terraced properties or apartments; and

(ii) the number of dwellings with four bedrooms or more shall not exceed 25 (these could include an office for home-working and / or an annexe to accommodate a relative); and

(iii) dwellings, of whatever size, designed for older residents or active retirees should preferably be built to the Lifetime Homes standard; and

(iv) 20% of all properties should be affordable housing or that percentage relevant under national or Borough policies at the time the planning application is submitted subject to viability considerations; and

(v) it can be demonstrated that the development will not have a detrimental impact on wildlife, as evidenced through an appropriate wildlife survey;

(vi) vehicle access into the residential part of the site shall be provided from Richard Avenue; and

(vii) 2 hectares of land to the northern part of the site adjacent to Broad Lane Sports Ground as indicated on Figure 35 shall be provided for additional sports pitches; and (viii) a dedicated footpath / cycleway along Elmstead Road to link up Broad Lane Sports Ground with the built-up part of Wivenhoe shall be provided; and

(viii) a shared-use footpath and cycle track shall be provided directly linking the development to the facilities at Broad Lane Sports Ground and linking with the public footpath to the south of the site; and

(ix) a contribution shall be paid towards the creation of a combined footpath/cycle track linking the new development to the public footpath (FP No. 14) from The Cross; and

(x) contributions towards open spaces, sports, recreational facilities and community facilities shall be required in line with Borough Policies current at the time any application for planning permission is made. Proposals to include some self-build plots within this site allocation will also be supported.

Wildlife Legislation

The two principal wildlife statutes are the Conservation of Habitats and Species Regulations 2017 (as amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019) that deals with internationally important sites and species, and the Wildlife and Countryside Act (WCA) 1981 that deals with nationally important sites and species.

Certain habitats and species within discrete sites are protected as SSSI under the WCA 1981. A proportion of these are more strictly protected as proposed or designated SPA, SAC and Ramsar sites under the Conservation of Habitats and Species Regulations (2017, as amended). These designations protect features and resources listed as being of international importance from both direct and indirect effects arising from a range of issues including proposed development. In addition, non-statutory designated sites (e.g. Local Wildlife Sites) are protected under the National Parks and Access to the Countryside Act, (1949) Section 21.

Certain species listed on Schedule 5 of the WCA 1981, including all bat species, great crested newt *Triturus cristatus,* hazel dormouse *Muscardinus avellanarius* and otter *Lutra lutra* are also protected under the Conservation of Habitats and Species Regulations (2017, as amended). Taken together it is illegal to:

- Deliberately kill, injure or capture wild animals listed under the regulations;
- Deliberately disturb wild animals listed under the regulations in such a way to be likely to significantly affect:
- The ability of any significant groups of animals of that species to survive, breed, rear or nurture their young; or
- The local distribution of that species.
- Recklessly disturb wild animals listed under the regulations or obstruct access to their place of rest;
- Damage or destroy breeding sites or resting places of such animals;
- Deliberately take or destroy the eggs of such an animal;
- Possess or transport any part of an animal listed under the regulations, unless acquired legally; and/or
- Sell, barter or exchange any part of any such animal.

A range of species other than birds, including water vole *Arvicola amphibius*, are protected from disturbance and destruction under the WCA 1981 through inclusion on Schedule 5.

All breeding birds are protected from deliberate destruction under the WCA 1981. Certain species are further protected from disturbance at their nest sites being listed on Schedule 1 of the WCA 1981.

Common reptiles including common lizard *Zootoca vivipara,* slow-worm *Anguis fragilis*, grass snake *Natrix helvetica* and adder *Vipera berus* are protected under the WCA 1981, they are listed as schedule 5 species, therefore part of Section 9(1) and section 9(5) apply; the Countryside and Rights of Way Act 2000 (CRoW) also strengthens their protection.

Badger *Meles meles* is protected from sett disturbance and destruction under the Protection of Badgers Act 1992.

Section 40 of The Natural Environment and Rural Communities Act (NERC) 2006 places a legal duty on Local Authorities to conserve biodiversity. Section 41 (S41) sets out a list of 943 species and habitats of principal importance. These species are known as England Biodiversity Priority (EBP) species and are those identified as requiring action under the former UK Biodiversity Action Plan (BAP) and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework.

Native, species-rich hedgerows that fit certain criteria are protected as being 'important' under the Hedgerow Regulations (1997).

Japanese Knotweed *Fallopia japonica*, along with other introduced and invasive species are listed under Schedule 9 of the WCA 1981. Japanese knotweed is highly invasive and its rhizomes cause damage to built structures. Hence it is also classed as controlled waste under the Environment Protection Act 1990 and has therefore either to be removed or disposed of in a licensed landfill or the rhizomes buried to a depth of at least 5m.

Appendix 3. Detailed Methods

Extended Phase 1 Habitat Survey

Phase 1 Habitat Survey is a standard technique for obtaining baseline ecological information for areas of land, including proposed development sites. Phase 1 Habitat Survey methods are set out in the Handbook for Phase 1 Habitat Survey (Joint Nature Conservation Committee, 2010). Habitat mapping was undertaken using the standard classification to indicate habitat types. Features of ecological interest and value were highlighted using target notes.

Detailed Botanical Survey

As the Phase 1 Habitat Survey was conducted during sub-optimal timings for botanical survey, a further site visit was undertaken in May 2019 to assess the floristic value of the site and compile a peak-season detailed botanical species list.

Plant species identified in each of the various habitat parcels were recorded and their abundances assessed on the DAFOR scale:

- D - Dominant
- A - Abundant
- F - Frequent
- O - Occasional
- R - Rare

These scores represent the abundance within the defined area only and do not reflect national or regional abundances. Plant species nomenclature follows Stace (2010).

Bats

Preliminary Assessment

Habitats on and adjacent site were assessed for their suitability to support roosting, foraging and commuting bats using guidelines issued by the Bat Conservation Trust (Collins, 2016). All potential roosting habitats (existing trees) were assigned a level of suitability according to the descriptions outlined in Table A3.1. Trees were initially assessed from ground level, using binoculars where necessary to identify potential roost features, bat access points and evidence of bat occupation such as droppings, urine staining and mammalian fur oil staining.

The site was also assigned a level of suitability for foraging and commuting bats according to the descriptions outlined in Table A3.1.

Table A3.1. Assessment of the potential suitability of a proposed development site for roosting, foraging and commuting bats (Collins, 2016)

Suitability	Roosting habitats	Commuting and foraging habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats	Negligible habitat features on site likely to be used by commuting and foraging bats
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically but not enough space, shelter, protection and appropriate conditions to be used on a regular basis or by larger numbers of bats A tree of sufficient size and age to contain potential roosting features but with none seen from the ground or features seen with only very limited roosting potential	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by another habitat Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or patch of scrub
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge High-quality habitat that is well-connected to the wider landscape that is likely used regularly by foraging bats such as broad-leaved woodland, tree-lined watercourses and grazed parkland Site is close to and connected to known roosts

Activity surveys

The site was assessed as having moderate potential for foraging and commuting bats therefore a suite of further activity surveys was required. The following surveys have been conducted over the 2020 active season in line with published guidelines (Collins, 2016), see Table A3.2.

Table A3.2. Guidelines on the number of bat activity surveys recommended to achieve a reasonable survey effort in relation to a site with moderate habitat suitability, adapted from Collins 2016.

Survey type	Moderate suitability habitat for bats
Transect surveys	One survey visit per month between April and October in appropriate weather conditions for bats.

Survey type	Moderate suitability habitat for bats
Automated surveys	Two locations per transect, data to be collected on five consecutive nights per month between April and October in appropriate weather conditions for bats.

One transect route was designed to cover all the best habitats for bats within and adjacent to the proposed development area. The route was walked at a continuous pace (so the sampling area is the same per unit time), with surveyors recording observations of bats such as numbers, flight direction, flight height, behaviour (e.g. foraging or commuting), appearance and relative speed. Surveyors used BatLogger M detectors to record echolocation calls.

Surveys were undertaken after dusk, commencing at sunset and continuing for approximately two hours. One of the survey visits comprised a dusk and additional pre-dawn survey commencing two hours before dawn and lasting until sunrise.

Automated surveys

Automated static detectors provide quantitative data over longer periods of time useful for assessing the species assemblage in an area and the temporal changes in bat activity.

Two static detectors per transect were set up at different monitoring points and used to record bat activity for at least five consecutive nights per month between April to October. Survey dates were selected (as far as feasible) when the predicted weather forecast indicated suitable weather conditions for foraging and commuting bats (*i.e.* air temperature at sunset above 10°C, no strong winds and no rain). The units were set up to continuously record from 30 minutes before sunset until 30 minutes after sunrise.

All recordings were stored on memory cards and analysed using computer software programs including Analook, Kaleidoscope, and Batsound. For full-spectrum data, an initial automated analysis was performed using SonoChiro software. All non-pipistrelle species assignments were then manually verified, as were calls assigned to pipistrelle species with less than 80% confidence, and a random 10% of noise calls.

For each month of sampling, the total number of registrations (defined as an individual recording) for each species were then summed and divided by the number of sampling nights, in order to generate the mean number of registrations per night for each species per month of recording.

Birds

Breeding Bird Surveys

Four breeding bird survey visits were undertaken over the 2020 bird breeding season from April to June. The survey area included the whole of the study area (including the adjacent LoWS) and adjacent areas that could be surveyed from within the site, generally covering a buffer perimeter of 10-20m. Thus, adjacent field boundaries and other potential bird nesting habitats where birds using the site during the breeding season may nest, and vice versa were included. The survey was conducted via a transect route covering all areas of the study area, walked slowly while pausing to record birds heard

and observed, and varying route directions between survey visits. Birds flying over and not using the site or surrounding area were recorded separately. All bird locations and behaviour were mapped onto photocopied OS maps (1:5000 scale) using the standard CBC notation.

Survey visits were undertaken during the morning after the dawn period when bird singing intensity tends to be high but stable (Bibby et al. 2000). Singing nightingale were additionally recorded during bat transect surveys; these incidental recordings have also been incorporated within the assessment.

Field maps were reviewed to determine probable breeding bird registrations relating to different territories and to judge which birds were using the area for breeding or for other activities such as foraging. A probable or definite territory is defined as a cluster of registrations of singing or displaying individuals from more than one visit, or one or more registrations of the following breeding behaviour: disturbance displaying, interspecific aggressive interaction, repetitively alarming, carrying food, nest material or faecal sacs, or if active nests or young were found.

If a singing bird was recorded on just one visit or sight/call observations of birds were recorded in the same area on more than one visit and were not considered likely to be associated with any other recorded territories, these was assigned as a possible territory. For birds that do not sing, such as many waterfowl, birds present at a location in suitable breeding territory on at least two visits were assigned to probable territories. Presence of such species in suitable breeding habitat on a single visit was assigned to possible territories unless the possibility of nesting is considered negligible by the observer.

This process is open to subjectivity in interpretation except where active nests are located. Therefore, these territories are classed as putative and their mapped locations indicate the 'centre' of a territory and not necessarily the nesting location. The maps were analysed to determine the number of probable and possible territories or pairs of each species present.

The criteria of Fuller (1980; Table A3.3) have been adapted to CIEEM geographical importance categories to assess the importance of the breeding bird assemblage on site:

Table A3.3. Site value based on breeding bird community size (adapted from Fuller 1980).

Number of breeding bird species	Site Value
<25	Local
25-49	District
50-69	County
70-84	Regional
>85	National

Wintering Bird Surveys

The wintering bird survey method is a derivation of standard breeding bird survey methodology (Gilbert *et al.* 1998) visiting the site four times through the wintering period in 2020/2021 between November-February. During the surveys a transect was walked slowly pausing to record birds heard and observed, covering all areas of the site (including the adjacent LoWS area), and route directions were varied between survey visits. Birds flying over and not using the site or surrounding area were recorded separately. All bird locations and behaviour were mapped onto photocopied OS maps (1:5000 scale).

Great Crested Newt

Habitat Suitability Index

The HSI for the great crested newt was developed by Oldham et al (2000). An HSI is a numerical index, between 0 and 1. 0 indicates unsuitable habitat, 1 represents optimal habitat. The HSI for the great crested newt incorporates 10 suitability indices, all of which are factors thought to influence the likelihood of great crested newt presence (*e.g.* surrounding habitat, geographical location, shading, presence of waterfowl and fish).

The HSI is calculated as a geometric mean of the 10 suitability indices (SI) as indicated below:

- Geographic locality
- Pond area
- Permanence
- Water quality
- Shade
- Waterfowl presence
- Fish presence
- Pond count within 1km2 of survey pond
- Terrestrial habitat quality
- Macrophyte cover

HSI = (SI1 x SI2 x SI3 x SI4 x SI5 x SI6 x SI7 x SI8 x SI9 x SI10) 1/10

The data regarding each factor is collected in the field at each pond and also by using maps, this is then converted into SI scores on a scale of 0.1 - 1.0. The results can then be used to calculate the HSI. In general ponds with high HSI scores are more likely to support great crested newts than those with low scores.

Table A3.4 HSI score categories (Oldham *et al*., 2000)

HSI score	Pond suitability
< 0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
> 0.8	Excellent

The HSI for great crested newt is a measure of habitat suitability. It is not a substitute for newt surveys. In general, ponds with high HSI scores are more likely to support great crested newt than those with low scores. However, the system is not sufficiently precise to allow the conclusion that any particular pond with a high score will support newts, or that any pond with a low score will not do so. There is also a positive correlation between HSI scores and the numbers of great crested newt observed in ponds. So, in general, high HSI scores are likely to be associated with greater numbers of great crested newt. The relationship however is not sufficiently strong to allow predictions to be made about the numbers of newts in any particular pond. HSI scoring of ponds can be useful when:

- Evaluating the general suitability of a pond or group of ponds to support great crested newt;
- Comparing ponds across different areas of a site or within the landscape;
- Evaluating the suitability of ponds to be used as receptor sites for great crested newt;
- Planning restorative or enhancement works to ponds.

Lee Brady developed a system of using HSI scores to define ponds suitability for great crested newts on a categorical scale during a study undertaken in south-east England in which 248 ponds were surveyed for great crested newt using standard methods and also subjected to an HSI. The results of this study show that as the HSI score increases, the proportion of ponds occupied also increases, as summarised below:

Table A3.5 HSI range, associated suitability and predicted probability of presence.

HSI Range	Pond Suitability	Predicted presence of great crested newt (% of ponds occupied n=248)
<0.5	Poor	0.03
0.5 - 0.59	Below average	0.2
0.6-0.69	Average	0.55
0.7-0.79	Good	0.79

Reptiles

Presence/likely Absence Surveys

Artificial refuges (0.5m x 0.5m felt squares) were laid in suitable habitat, using the surveyor's professional judgement at an approximate density of 10p/ha of suitable habitat (Froglife, 1999).

Artificial refuges were used to observe reptiles basking or taking refuge, these laid in transects and left for seven days to settle before the survey commenced.

Visits for the presence/likely absence survey were undertaken during 'suitable' days for reptile activity; a 'suitable' survey day is determined by the weather, with temperature being the pre-eminent factor. Reptile surveys conducted between 10 and 17°C have the most chance of success. The key months for reptile surveys are April, May and September with April and May being advantageous because it is reptile mating season, which means they will be more obvious and less wary of observers. Also, the temperatures are generally lower during these months and as such it will take longer for the reptiles to warm up so they must spend more time basking. During the warmer summer months animals will have to spend less time basking due to the increase in ambient temperature, thus reptile survey visits will be conducted earlier in the day during the hotter summer months. However, the temperature on the day of the visit will ultimately determine what time the survey takes place.

As presence was detected a categorical population assessment was carried out with the largest count within the first seven visits indicating the category of the recorded reptile species. The table below details the assessment categories:

Table A3.6. Froglife reptile population assessment.

Species	Low Population	Good Population	Exceptional Population
Common Lizard	<5	5-20	>20
Slow-Worms	<5	5-20	>20
Grass Snake	<5	5-10	>10
Adder	<5	5-10	>10

CIEEM EcIA Methods

Ecological features are evaluated and assessed with due consideration for the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment (EcIA) (CIEEM, 2016; updated 2018). For clarity, the evaluation and assessment process adopted within this report is set out below.

Establishing potentially important ecological features

Potentially important ecological features of relevance to the development are determined in accordance with current CIEEM guidelines. Table A3.7 below sets out a non-exhaustive list of ecological features that are typically considered, along with key examples:

Table A3.7. Examples of potentially important ecological features.

Potentially important ecological feature	Typical examples
Statutory designated sites	SSSIs, SACs, SPAs, Ramsar sites, LNRs, NNRs
Non-statutory designated sites	LWSs, CWSs
Protected species	European protected species (*e.g.* GCN, bats)
International, National or local priority habitats	S41 priority habitats and species; Annex I Habitats
Notable species or sub-species	Individual red-listed species
Notable or large population or assemblage of species	Diverse bird assemblage; exceptional numbers of common amphibians
Novel or locally distinct assemblage of species	Diverse non-native floral community on a brownfield site; populations of individual species showing distinct physical variation
Habitats which form diverse mosaics, create important connection and/or have synergistic attributes;	Brownfield habitat mosaics; riparian habitat corridors; hedgerow network utilised by an important bat population
Habitats of potential importance (with regard to restoring or creating habitats to S41 priority or SSSI quality)	Previous Ancient Woodland (PAWs) sites
Habitats of secondary or supportive importance (which safeguard important habitats, or which support important populations of species)	Scrub habitats buffering calcareous grassland from agricultural improvement; pasture regularly utilised by bird populations for which an SPA is designated

Establishing likely Zone of Influence (ZoI)

For the purposes of this assessment, the site is considered to be inside the 'zone of influence' of:

- Internationally important designations within 22km of the site boundary.
- Nationally important designations within 5km of the site boundary.

- Locally important designations within 2km of the site boundary.
- Non-statutory designations within 2km of the site boundary.

The arbitrary distances identified set out above considered sufficient for identifying the majority of designations which may be affected by the proposals. However, it is acknowledged that in certain circumstances effects beyond these distances are possible and should be considered as far as is reasonably practicable to do so.

It should also be noted that certain ecological features have smaller 'zones of influence' than those mentioned above. For such features the appropriate zone of influence is described and justified as appropriate within the report, depending on their respective sensitivity to an environmental change.

The results of professionally accredited or published scientific studies have been used and referenced, where available, to establish the spatial and temporal limits of the biophysical changes likely to be caused by specific activities and to justify decisions about the zone of influence.

Determining importance of ecological features

In determining the importance of ecological features, a range of guidelines and reference materials have been utilised, including:

- Criteria against which statutory and non-statutory nature conservation designations are selected (*e.g.* SSSI designation criteria; LWS selection criteria).
- Definitions for national and priority habitats.
- Publications and guidelines against which to establish the importance of particular populations or assemblages of species groups (*e.g.* Wray *et al* for evaluating bat populations and roosts; ISIS for assessing conservation interest of invertebrate assemblages).
- Publications describing the conservation status of individual species (*e.g.* Red-data books).
- The Hedgerows Regulations to assess the importance of hedgerows.
- National, regional and local species Atlases.
- Species/group population trends.

It should be noted that the legal protection which some species and their habitats receive are considered separately from 'importance' within this assessment as not all legally protected species are necessarily rare (*e.g.* common pipistrelle bat). Legal issues and the appropriate mechanism for dealing with any such constraint are addressed in the report.

It should also be noted that the social, community, economic or multifunctional importance attributed to ecological features are not assessed as they fall outside the scope of this assessment.

Geographic frame of reference

In assigning importance to an ecological resource the following geographic frames of reference are used:

- International;

- National (*i.e.* England);
- Regional (South East);
- County (Essex);
- District (Colchester);
- Local or Parish (Wivenhoe); and
- Within Site or zone of influence only

The size, conservation status and the quality of features or species are all relevant in determining value. Furthermore, the value of a species and / or habitat may vary depending on its geographical location.

Characterising effects and any significant effects of the proposed project or occupation are characterised using the following terminology:

- Direct or indirect
- Beneficial or adverse
- Magnitude and/or extent
- Duration
- Reversibility
- Timing and frequency

Impacts have been assessed using the Mitigation Hierarchy, which forms the key principles of Ecological Impact Assessment (EcIA):

- Avoidance – seeking options to avoid harm to ecological features;
- Mitigation – seeking options to avoid or minimise adverse effects;
- Compensation – offsetting adverse effects through appropriate compensatory measures;
- Enhancements – seeking to provide net benefits for biodiversity.

Determining ecologically significant effects

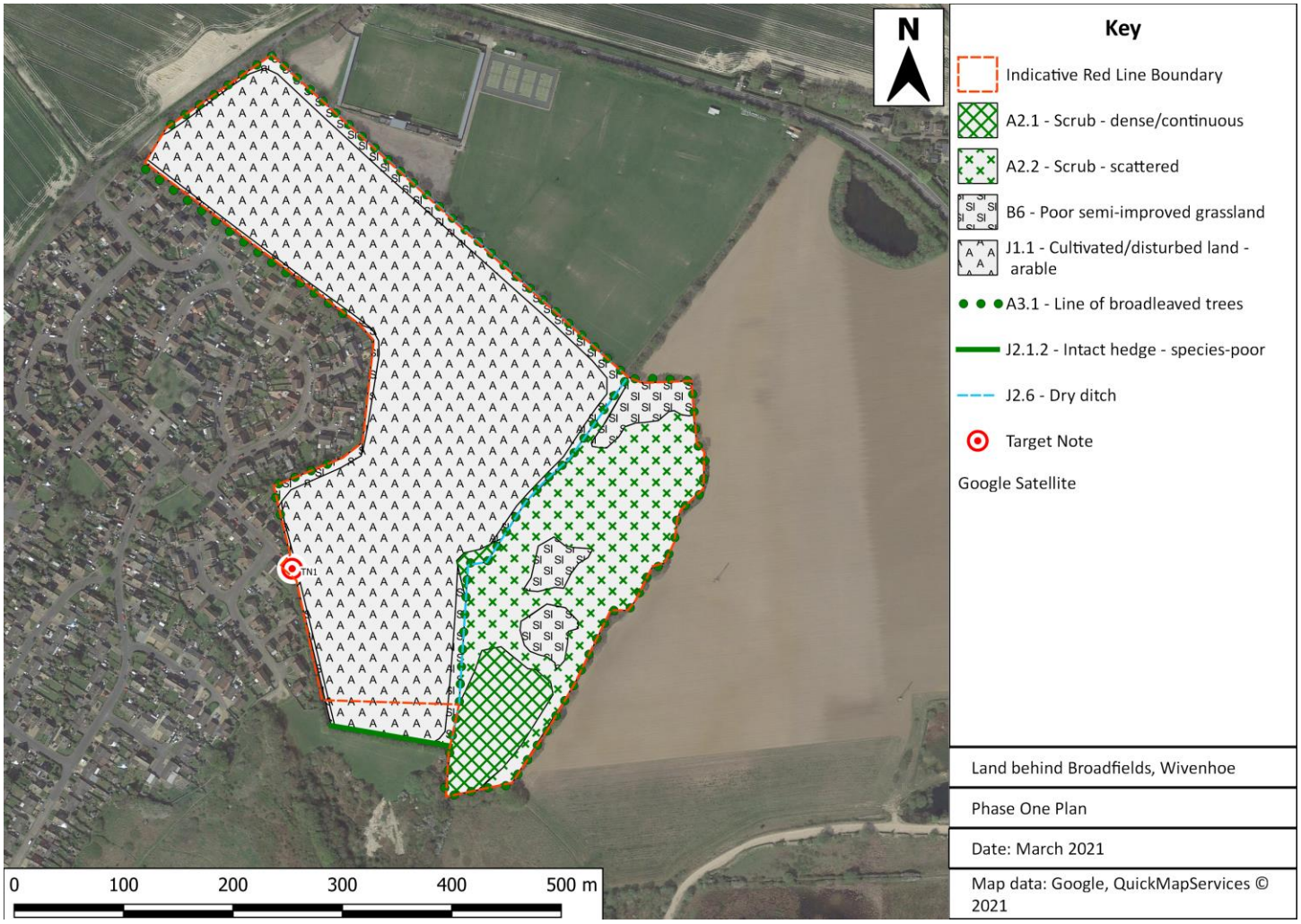
An ecologically significant effect is defined as an effect (adverse or beneficial) on the integrity of a defined designated site or ecosystem and/or the conservation status of habitats or species within a given geographical area.

The importance of any feature that will be significantly affected is then used to identify the geographical scale at which the impact is significant. This value relates directly to the consequences, in terms of legislation, policy and/or development control at the appropriate level. So, a significant adverse effect on a feature's importance at one level would be likely to trigger related planning policies and, if permissible at all, generate the need for development control mechanisms, such as planning conditions or legal obligations, as described in those policies.

If an effect is found not to be significant at the level at which the resource or feature has been valued, it may be significant at a more local level. Significant effects on features of ecological importance will be mitigated (or compensated for) in accordance with guidance derived from policies applied at the scale

relevant to the value of the feature or resource. The scale is derived from the interaction of the feature sensitivity and magnitude of impact.

Appendix 4. Phase 1 Survey Plan & Target Notes



TN#	Description
1	*False acacia, Schedule 9 invasive species.*

Appendix 5. Site Photographs

Photo 1: View across the development site highlighting dominant arable habitat and fallow state of field with crop stubble still in place.

Photo 2: Scrub, ruderal and grassland habitats along the western boundary of the development site.

Photo 3: Location of proposed access from Richard Avenue.

Photo 4: T1 Oak with low suitability for roosting bats, adjacent to proposed access.

Photo 5: Younger treeline beyond the southern boundary of the development site.

Photo 6: Established oak treeline dividing the western arable field and LoWS.

Photo 7: Scrub and grassland habitats within Wivenhoe Cross Pit LoWS.

Photo 8: Waterbody 1, an ex-gravel pit now utilised as a fishing lake to the south of the site.

Appendix 6. Botanical Species Lists

Table A6.1: Plant assemblages recorded during Phase 1 survey

Common name	Latin name	Arable	Improved grassland	Scattered broadleaf trees	Tall ruderal	Scattered scrub
Annual meadow grass	*Poa annua*		A			
Ash	*Fraxinus excelsior*			O		
Barley	*Hordeum vulgare*	D				
Blackthorn	*Prunus spinosa*					F
Bramble	*Rubus fructicosus agg.*					A
Bristly ox tongue	*Helminthotheca echioides*	O				
Cleavers	*Galium aparine*		A			
Cocks foot	*Dacytlis glomerata*		A			
Common nettle	*Urtica dioica*		F		D	
Cow parsley	*Anthriscus sylvestris*		O			
Creeping thistle	*Cirsium arvense*	F				
Daisy	*Bellis perennis*		O			
Dandelion	*Taraxacum offincinale*	O	O			
Dog rose	*Rosa canina*					F
Doves foot cranesbill	*Geranium molle*		O			
Elder	*Sambucus nigra*					R
False acacia	*Robinia pseudoacacia*					R
False oat grass	*Arrhenatherum elatius*		A			
Field maple	*Acer campestre*			O		
Field speedwell	*Veronica persica*	O	O			
Guernsey fleabane	*Conzya sumatrensis*	O				
Hawthorn	*Crataegus monogyna*			A		F
Hazel	*Corylus avellana*					R
Hedge mustard	*Sisymbrium officinale*	O				
Ivy	*Hedera helix*					A
Lesser burdock	*Arctium minus*		O			
Oilseed rape	*Brassica napus subsp. napus*	O				
Perennial rye grass	*Lolium perenne*	A	A			

Common name	Latin name	Arable	Improved grassland	Scattered broadleaf trees	Tall ruderal	Scattered scrub
Prickly sow-thistle	*Sonchus asper*	A				
Purple leaf plum	*Prunus cerasifera*			O		
Red dead nettle	*Lamium purpureum*	R				
Scentless mayweed	*Tripleurospermum inodorum*	O				
Sessile oak	*Quercus petrea*			D		
Smooth sow thistle	*Soncus oleraceus*	A				
Snowberry	*Symphoricarpos albus*					R
Soft brome	*Bromus hordeaceus*		F			
Spear thistle	*Cirsium vulgare*	O				
Stinking iris	*Iris foetidissima*		R			

Table A6.2: Plant assemblages recorded during detailed botanical survey

Vernacular	*Taxon*	Development Area: Housing	Development Area: Sports Pitch & POS Land	Wivenhoe Cross Pit LoWS	Status	Comment
Annual Meadow-grass	*Poa annua*	F	F		Native	
Apple	*Malus pumila*			O	Established	
Ash	*Fraxinus excelsior*	O	O		Native	
Barren Brome	*Anisantha sterilis*	F		F	Native	
Barren Strawberry	*Potentilla sterilis*			A	Native	
Black-grass	*Alopecurus myosuroides*	F	F		Established	
Blackthorn	*Prunus spinosa*	O	O	F	Native	
Blue Fleabane	*Erigeron acris*	F	F	O	Native	Abundant in fallow field and frequent in LoWS
Bluebell	*Hyacinthoides non-scripta*			O	Native	Present along eastern boundary of LoWS
Borage	*Borago officinalis*	R	R		Casual	
Bracken	*Pteridium aquilinum*			O	Native	

Vernacular	*Taxon*	Development Area: Housing	Development Area: Sports Pitch & POS Land	Wivenhoe Cross Pit LoWS	Status	Comment
Bramble	*Rubus fruticosus agg.*	O	O	F	Native	
Bristly Oxtongue	*Helminthotheca echioides*	F	F		Native	
Broad-leaved Dock	*Rumex obtusifolius*	F	F	O	Native	
Broom	*Cytisus scoparius*			O	Native	
Buck's-horn Plantain	*Plantago coronopus*			O	Native	
Bulbous Buttercup	*Ranunculus bulbosus*	F	F	O	Native	
Butterfly-bush	*Buddleja davidii*		R		Established	
C. monogyna x laevigata	*Crataegus x media*	R			Native	
Cat's-ear	*Hypochaeris radicata*	A	F	F	Native	
Charlock	*Sinapis arvensis*	O	F		Native	
Cleavers	*Galium aparine*	O	O	O	Native	
Cock's-foot	*Dactylis glomerata*	F	F	F	Native	
Common Chickweed	*Stellaria media*	O	O		Native	
Common Field-speedwell	*Veronica persica*	F	F	F	Native	
Common Ivy	*Hedera helix*	O	O	O	Native	
Common Mallow	*Malva sylvestris*	O	O		Native	
Common Mouse-ear	*Cerastium fontanum subsp. vulgare*	F	F	F	Native	
Common Nettle	*Urtica dioica*	O	O	F	Native	
Common Ragwort	*Senecio jacobaea*	O	O	O	Native	
Common Stork's-bill	*Erodium cicutarium*	R			Native	
Common Toadflax	*Linaria vulgaris*		O		Native	
Common Vetch	*Vicia sativa subsp. segetalis*			F	Established	
Cow Parsley	*Anthriscus sylvestris*	O	O		Native	
Creeping Buttercup	*Ranunculus repens*	O		O	Native	
Creeping Cinquefoil	*Potentilla reptans*			O	Native	
Creeping Thistle	*Cirsium arvense*	F	F	F	Native	
Curled Dock	*Rumex crispus*	O	O		Native	

Vernacular	*Taxon*	Development Area: Housing	Development Area: Sports Pitch & POS Land	Wivenhoe Cross Pit LoWS	Status	Comment
Cut-leaved Crane's-bill	*Geranium dissectum*	F	F	O	Native	
Daisy	*Bellis perennis*	O	O	O	Native	
Dandelion	*Taraxacum agg.*	F	F	F	Native	
Dog-rose	*Rosa canina agg.*	O	O	O	Native	
Dogwood	*Cornus sanguinea*	O	O	F	Native	
Dove's-foot Crane's-bill	*Geranium molle*			O	Native	
Early Forget-me-not	*Myosotis ramosissima*			A	Native	
Elder	*Sambucus nigra*	O	O	O	Native	
Field Forget-me-not	*Myosotis arvensis*	F	F	F	Native	
Field Madder	*Sherardia arvensis*	A	A	F	Native	
Field Maple	*Acer campestre*	O			Established	
Field Pansy	*Viola arvensis*	F	F		Native	
Field-rose	*Rosa arvensis*			R	Native	
Foxglove	*Digitalis purpurea*			R	Native	
Garden Pansy	*Viola x wittrockiana*		R		Casual	
Garlic Mustard	*Alliaria petiolata*	O	O		Native	
Germander Speedwell	*Veronica chamaedrys*	R	R		Native	
Goat Willow	*Salix caprea*			R	Native	
Great Lettuce	*Lactuca virosa*	F	F		Native	
Greater Periwinkle	*Vinca major*	R			Native	
Greater Plantain	*Plantago major subsp. major*	F	F		Native	
Greater Stitchwort	*Stellaria holostea*	O	O	F	Native	
Green Alkanet	*Pentaglottis sempervirens*	O	O		Established	
Grey Willow	*Salix cinerea subsp. cinerea*		R		Native	
Groundsel	*Senecio vulgaris*	A	A		Native	
Guernsey Fleabane	*Conyza sumatrensis*	F	O		Established	
Hairy Bitter-cress	*Cardamine hirsuta*	O	O	O	Native	
Hard Rush	*Juncus inflexus*			R	Native	

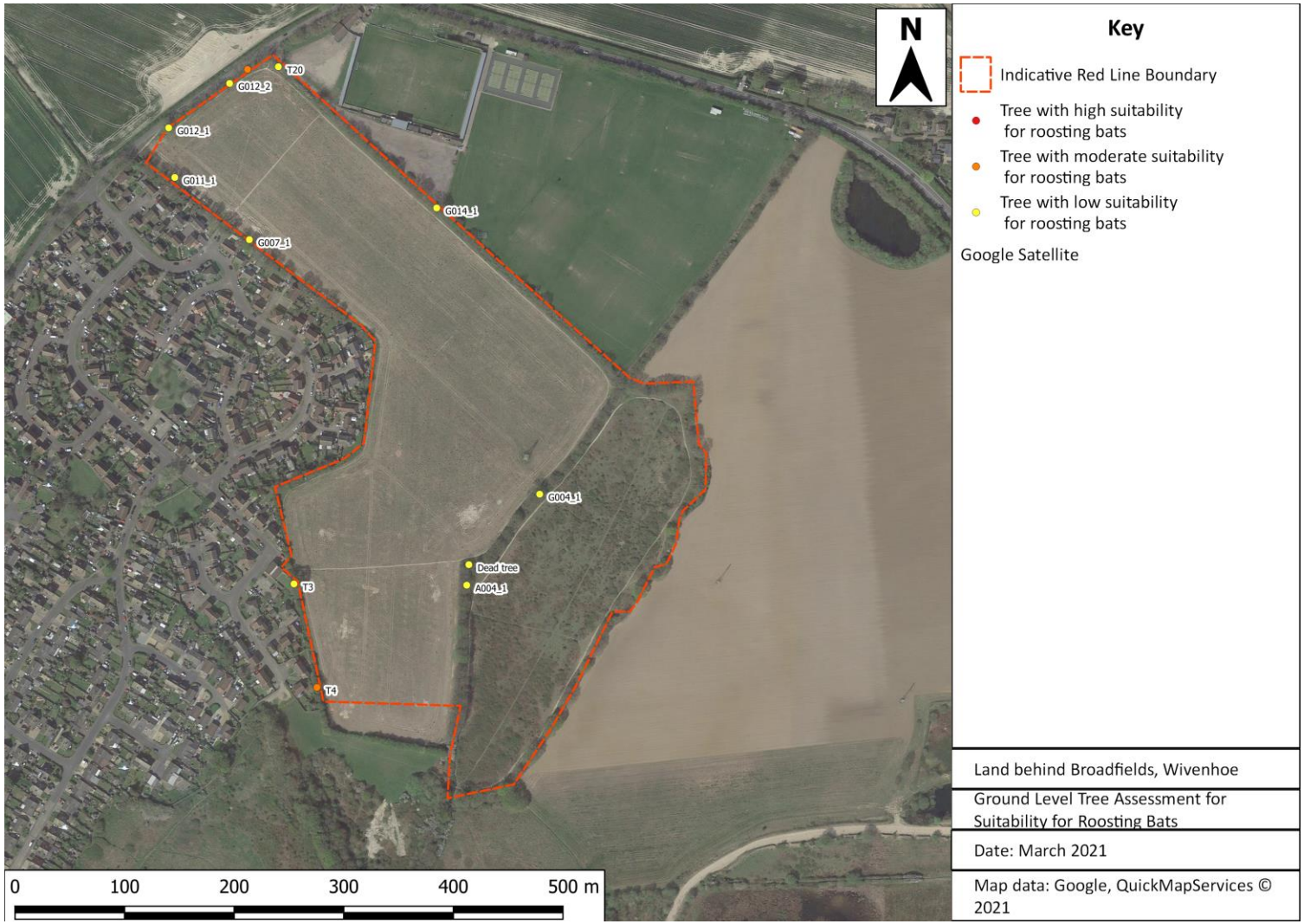
Vernacular	*Taxon*	Development Area: Housing	Development Area: Sports Pitch & POS Land	Wivenhoe Cross Pit LoWS	Status	Comment
Hawthorn	*Crataegus monogyna*	O	O	O	Native	
Hazel	*Corylus avellana*		O	O	Native	
Hedge Bedstraw	*Galium album*			F	Native	
Hedge Mustard	*Sisymbrium officinale*	F	F		Native	
Herb-Robert	*Geranium robertianum*	F	F		Native	
Hoary Willowherb	*Epilobium parviflorum*	F	F		Native	
Hogweed	*Heracleum sphondylium*	O	O	O	Native	
Holly	*Ilex aquifolium*	O	O	O	Native	
Honesty	*Lunaria annua*	R			Established	
Honeysuckle	*Lonicera periclymenum*		R		Native	
Lesser Burdock	*Arctium minus sens. lat.*	O	O	O	Native	
Lesser Trefoil	*Trifolium dubium*			F	Native	
Marsh Cudweed	*Gnaphalium uliginosum*	F	F	F	Native	
Marsh Thistle	*Cirsium palustre*		R		Native	
Mugwort	*Artemisia vulgaris*	R	O		Native	
Narrow-leaved Ragwort	*Senecio inaequidens*		R		Established	A recent arrival, associated with suburban and industrial sites.
Nipplewort	*Lapsana communis subsp. communis*	F	F		Native	
Oil-seed Rape	*Brassica napus subsp. oleifera*		O		Casual	
Opium Poppy	*Papaver somniferum*		O		Established	
Parsley-piert	*Aphanes arvensis*			O	Native	
Pedunculate Oak	*Quercus robur*	O	O	O	Native	
Perforate St John's-wort	*Hypericum perforatum*	O		O	Native	
Pineappleweed	*Matricaria discoidea*	O	O		Native	
Pink Campion (S. dioica x latifolia)	*Silene x hampeana*	R			Native	
Prickly Lettuce	*Lactuca serriola f. integrifolia*	O	O		Native	
Prickly Sow-thistle	*Sonchus asper*	F	F		Native	

Vernacular	*Taxon*	Development Area: Housing	Development Area: Sports Pitch & POS Land	Wivenhoe Cross Pit LoWS	Status	Comment
Red Campion	*Silene dioica*	R	R		Native	
Red Dead-nettle	*Lamium purpureum*	F	F	O	Native	
Red Fescue	*Festuca rubra agg.*	O	F	F	Native	
Ribwort Plantain	*Plantago lanceolata*	F	F	F	Native	
Rosebay Willowherb	*Chamerion angustifolium*			F	Established	
Scarlet Pimpernel	*Anagallis arvensis subsp. arvensis*	F	F		Native	
Scented Mayweed	*Matricaria chamomilla*	O	O		Native	
Scentless Mayweed	*Tripleurospermum inodorum*	O	O		Native	
Sessile Oak	*Quercus petraea*	F	O	O	Native	The line of trees along the eastern boundary of the development land is entirely Sessile Oak
Sharp-leaved Fluellen	*Kickxia elatine*	F	F		Native	Classic arable weed. Localised distribution
Shepherd's-purse	*Capsella bursa-pastoris*	O	O		Native	
Silver Birch	*Betula pendula*	O	O	O	Native	
Small-leaved Elm (sensu Stace)	*Ulmus minor*	O	O		Native	
Smooth Hawk's-beard	*Crepis capillaris*	F	F	O	Native	
Smooth Sow-thistle	*Sonchus oleraceus*	F	F		Native	
Soft-brome	*Bromus hordeaceus*	O	O		Native	
Spear Thistle	*Cirsium vulgare*	O	O	O	Native	
Spotted Medick	*Medicago arabica*	O	O	F	Native	
Square-stalked Willowherb	*Epilobium tetragonum*	F	F		Native	
Sticky Mouse-ear	*Cerastium glomeratum*	F	F	F	Native	
Stinking Iris	*Iris foetidissima*			R	Native	
Sun Spurge	*Euphorbia helioscopia*	R	O		Native	
Sycamore	*Acer pseudoplatanus*	O			Established	
Thale Cress	*Arabidopsis thaliana*	R	R		Native	

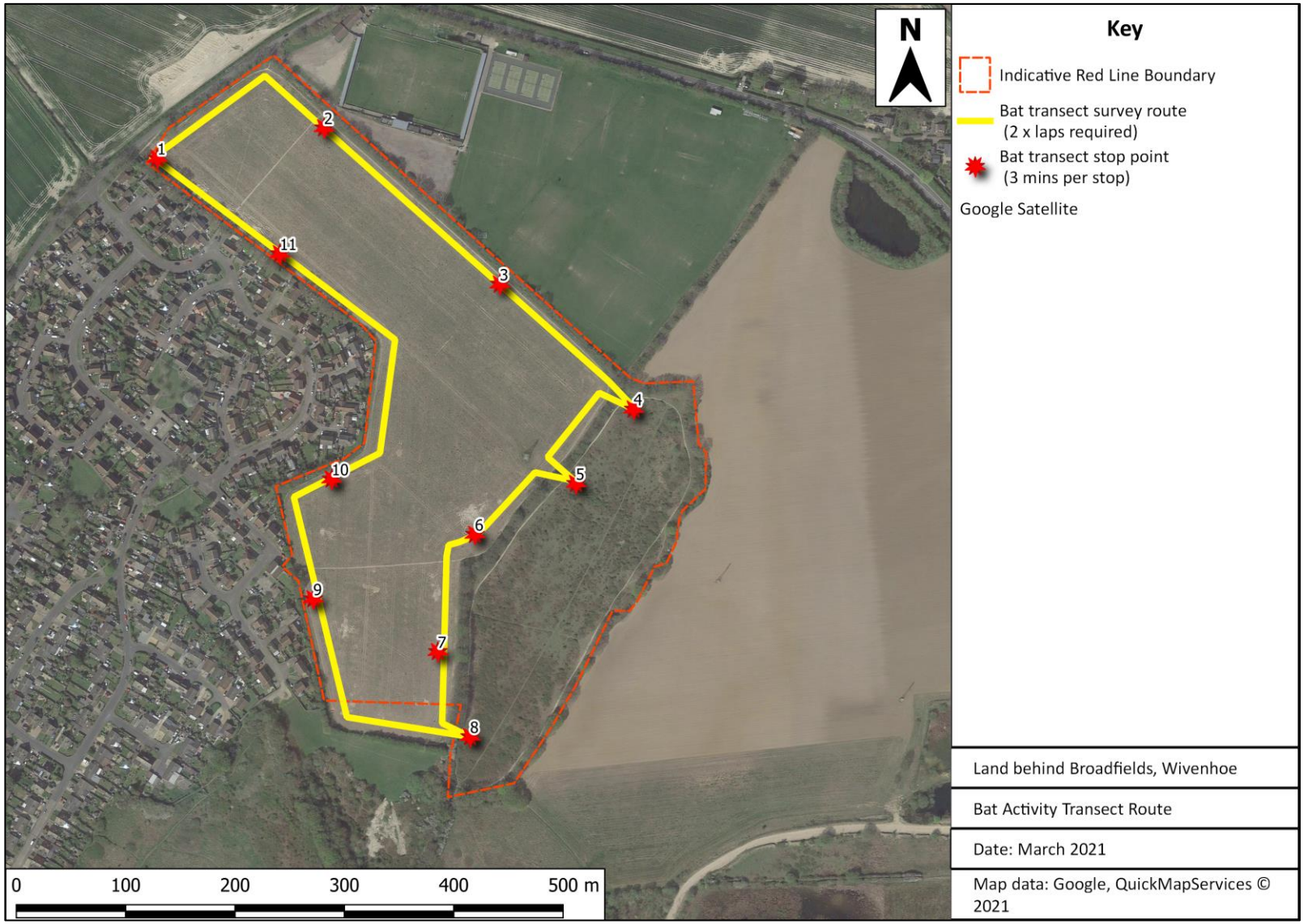
Vernacular	*Taxon*	Development Area: Housing	Development Area: Sports Pitch & POS Land	Wivenhoe Cross Pit LoWS	Status	Comment
Thyme-leaved Speedwell	*Veronica serpyllifolia subsp. serpyllifolia*	O	O	F	Native	
Toad Rush	*Juncus bufonius*	F	F		Native	Present as an arable weed
Two-rowed Barley	*Hordeum distichon*	F	O		Casual	Crop remnant
V. arvensis x tricolor	*Viola x contempta*	R			Native	
Weld	*Reseda luteola*	R	R		Native	
Welted Thistle	*Carduus crispus*	R	R	R	Native	
White Campion	*Silene latifolia*	F	F	F	Native	
White Dead-nettle	*Lamium album*	R	R		Native	
Wild Cherry	*Prunus avium*			R	Native	
Wild Radish	*Raphanus raphanistrum subsp. raphanistrum*	O	O		Native	
Wild Strawberry	*Fragaria vesca*	F			Native	
Wild Teasel	*Dipsacus fullonum*			R	Native	
Winter-cress	*Barbarea vulgaris*	O	F		Native	
Wood Avens	*Geum urbanum*	F	F	F	Native	
Wood Dock	*Rumex sanguineus*	O	O		Native	
Wood Sage	*Teucrium scorodonia*	O	O	O	Native	
Yorkshire-fog	*Holcus lanatus*			O	Native	

Appendix 7. Bat Survey Results

Appendix 7a – Ground Level Tree Assessment Results



Appendix 7b – Bat Activity Transect Route



Appendix 7c – Bat Activity Transect Summary Tables

Date		Survey type	Survey timings	Weather	Route Start
07/04/2020		April dusk transect	Start/Sunset: 19:40 Finish: 21:40	13C 30% Cloud BF 1-2	Stop 1 -> Stop 2
Time	**Location**	**Comments**			
19:40 – 19:45					
19:45 – 19:50					
19:50 – 19:55					
19:55 – 20:00					
20:00 – 20:05	Stop 5	1x pass, common pipistrelle flying south along treeline on LoWS side 1x pass, soprano pipistrelle flying north along treeline on LoWS side			
20:05 – 20:10	Walk 5	1x pass, common pipistrelle flying north along treeline on development side			
20:10 – 20:15	Walk 6 Stop 7	4x passes, common pipistrelle foraging up and down treeline on development side 1x pass, soprano pipistrelle flying north along treeline			
20:15 – 20:20	Walk 7	2x passes, common pipistrelle flying north along treeline 7x passes, common pipistrelle foraging up and down treeline and over fallow field			
20:20 – 20:25	Walk 7	2x pass, common pipistrelle (same bat as above) foraging			
20:25 – 20:30	Stop 8 Walk 8	3x passes, common pipistrelle (unseen) 3x passes, common pipistrelle foraging on southern boundary			
20:30 – 20:35	Walk 8 Walk 9	1x pass, brown long-eared (unseen) 1x pass, common pipistrelle (unseen)			
20:35 – 20:40					
20:40 – 20:45					
20:45 – 20:50					
20:50 – 20:55	Stop 2	2x passes, common pipistrelle (unseen) 1x pass, brown long-eared (unseen)			
20:55 – 21:00	Walk 2 Stop 3	1x pass, common pipistrelle flying north along boundary 1x pass, common pipistrelle (unseen)			
21:00 – 21:05					
21:05 – 21:10	Stop 5	1x pass, common pipistrelle (unseen) 1x pass, brown long-eared (unseen)			
21:10 – 21:15	Stop 6	2x passes, barbastelle (unseen)			
21:15 – 21:20	Stop 7 Walk 7	1x pass, barbastelle (unseen) 1x pass, common pipistrelle foraging in SE corner of development side			
21:20 – 21:25	Walk 7	4x passes, common pipistrelle (same bat as above) foraging in SE corner of development side			
21:25 – 21:30					
21:30 – 21:35					
21:35 – 21:40					

Date	Survey type	Survey timings	Weather	Route Start
12/05/2020	May dusk transect	Start/Sunset: 20:39 Finish: 22:47	12C 90% Cloud BF 1	Stop 8 -> Stop 7

Time	Location	Comments
20:39 – 20:44		
20:44 – 20:49		
20:49 – 20:54	Stop 5	1x pass, soprano pipistrelle (unseen)
20:54 – 20:59	Stop 4	2x passes, soprano pipistrelle flying east along northern LoWS boundary
20:59 – 21:04	Stop 4	soprano pipistrelle, 2 bats, one heading north and one west
21:04 – 21:09		
21:09 – 21:14	Stop 3	1x pass, common pipistrelle (unseen)
21:14 – 21:19	Stop 2	1x pass, soprano pipistrelle (unseen)
21:19 – 21:24	Walk 1	2x passes, soprano pipistrelle (unseen)
21:24 – 21:29		
21:29 – 21:34	Stop 11	1x pass, Daubenton's commuting south along west boundary
21:34 – 21:39		
21:39 – 21:44		
21:44 – 21:49	Stop 8 Stop 9	1x pass, Daubenton's (unseen) 1x pass, Noctule
21:49 – 21:54		
21:54 – 21:59	Stop 6	1x pass, common pipistrelle
21:59 – 22:04	Stop 5 Walk 4	1x pass, soprano pipistrelle 1x pass, barbastelle (unseen); 1x pass, soprano pipistrelle (unseen)
22:04 – 22:09	Stop 4	Nr. constant activity, soprano pipistrelle, 2 bats social-calling 1x pass, barbastelle 2x passes, common pipistrelle
22:09 – 22:14		
22:14 – 22:19	Stop 3 Stop 2	1x pass, soprano pipistrelle 1x pass, noctule
22:19 – 22:24		
22:24 – 22:29	Stop 1 Stop 11	Soprano pipistrelle, 2 bats 2x passes, soprano pipistrelle
22:29 – 22:34	Walk 10 Stop 10	1x pass, common pipistrelle 1x pass, common pipistrelle (same bat as above)
22:34 – 22:39	Walk 9	2x passes, common pipistrelle
22:39 – 22:44	Walk 8	2x passes, common pipistrelle 1x pass, barbastelle
22:44 – 22:49	Stop 8	3x passes, barbastelle 2x passes, soprano pipistrelle 1x pass, Daubenton's

Date		Survey type	Survey timings	Weather	Route Start
09/06/2020		June dusk transect	Start/Sunset: 21:13 Finish: 23:12	12C 10% Cloud BF 1	Stop 11 -> Stop 1
Time	**Location**	**Comments**			
21:13 – 21:18					
21:18 – 21:23					
21:23 – 21:28					
21:28 – 21:33					
21:33 – 21:38	Stop 4	6x passes, common pipistrelles 17x passes, near-constant soprano pipistrelle activity			
21:38 – 21:43	Walk 4 Stop 5	3x passes, soprano pipistrelle 3x passes, common pipistrelle; 7x passes, soprano pipistrelle			
21:43 – 21:48	Walk 5 Stop 6	Common & soprano pipistrelle, constant foraging 1x pass, common pipistrelle; 1x pass, noctule; soprano pip constant foraging, 2 bats.			
21:48 – 21:53	Stop 6 Walk 6 Stop 7	Common & soprano pipistrelle, and noctule all continuously foraging along tree line 5x passes, noctule foraging with common pipistrelle 1x common and 2x soprano pipistrelle passes; 3x passes, noctule still foraging			
21:53 – 21:58	Stop 7 Walk 7 Stop 8	1x pass, common pipistrelle; 2x passes, noctule 2x passes, common pipistrelle; 6x passes, soprano pipistrelle 1x passes, soprano pipistrelle			
21:58 – 22:03	Stop 8 Stop 9	3x passes, soprano pipistrelle 5x passes, common pipistrelle			
22:08 – 22:13	Stop 10	1x passes, common pipistrelle			
22:13 – 22:18	Stop 11	1x pass, common pipistrelle			
22:18 – 22:23	Walk 1	1x pass, common pipistrelle			
22:23 – 22:28	Walk 1 Stop 2	4x passes, soprano pipistrelle 3x passes, soprano pipistrelle with social calls			
22:28 – 22:33	Stop 3 Walk 3	4x passes, soprano pipistrelle 1x passes, soprano pipistrelle			
22:33 – 22:38	Stop 4	3x passes, common pipistrelle			
22:38 – 22:43	Walk 4 Stop 5 Walk 5	2x passes, soprano pipistrelle 1x passes, common pipistrelle; 3x passes, soprano pipistrelle 2x passes, soprano pipistrelle			
22:43 – 22:48	Walk 5 Stop 6	1x passes, common pipistrelle; 2x passes, soprano pipistrelle 2x passes, common pipistrelle; 3x passes, soprano pipistrelle; 2 passes, barbastelle			
22:48 – 22:53	Stop 7 Walk 7 Stop 8	3x passes, common pipistrelle; 3x passes, soprano pipistrelle 3x passes, soprano pipistrelle 1x passes, soprano pipistrelle			
22:53 – 22:58	Stop 8	1x passes, common pipistrelle; 4x passes, soprano pipistrelle			
22:58 – 23:03					
23:03 – 23:08					
23:08 – 23:13					

Date		Survey type	Survey timings	Weather	Route Start
14/07/2020		July dusk transect	Start/Sunset: 21:09 Finish: 23:09	17C 80% Cloud BF 2	Stop 5 -> Stop 4
Time	**Location**	**Comments**			
21:09 – 21:14					
21:14 – 21:19					
21:19 – 21:24					
21:24 – 21:29	Walk 1	1x pass, common pipistrelle commuting			
21:29 – 21:34	Stop 1	2x passes, common pipistrelle commuting from houses down northern boundary treeline 6x passes, noctule foraging over oak trees adj. properties			
21:34 – 21:39	Walk 11 Stop 11	3x passes, noctule (same bat as above); 1x pass, soprano pipistrelle (unseen) 11x passes, noctule (same bat); 9x passes, common pipistrelle (2 bats)			
21:39 – 21:44	Walk 10	Continuous noctule foraging; 1x pass each, common and soprano pipistrelle			
21:44 – 21:49	Walk 10 Stop 10 Walk 9	2x passes, noctule Repeated noctule passes; 3x passes, common pipistrelle; 1x pass, soprano pipistrelle 2x passes, common pipistrelle; 1x pass, soprano pipistrelle			
21:49 – 21:54	Walk 9 Stop 9	2x passes, common pipistrelle 3x passes, common pipistrelle (1 from residential area);			
21:54 – 21:59	Walk 8 Stop 7 Stop 8	12x passes, noctule foraging 1x pass, common pipistrelle; 2x passes, noctule Continuous noctule activity; 1x pass, soprano pipistrelle			
21:59 – 22:04	Stop 8 Walk 7	1x pass, common pipistrelle 2x passes, soprano pipistrelle; 2x passes, noctule			
22:04 – 22:09	Stop 6	2x pass, noctule foraging			
22:09 – 22:14	Stop 5	1x pass, Daubenton's commuting north along boundary treeline to LoWS			
22:14 – 22:19	Stop 5 Stop 4	1x pass, soprano pipistrelle 1x pass, Daubenton's			
22:19 – 22:24	Stop 3	1x pass, soprano pipistrelle			
22:24 – 22:29	Stop 2	1x pass, common pipistrelle; 1x pass, soprano pipistrelle			
22:29 – 22:34	Stop 2 Stop 1	1x pass, common pipistrelle (same bat); 1x pass, soprano pipistrelle 2x passes, common pipistrelle			
22:34 – 22:39	Stop 11	1x pass, soprano pipistrelle			
22:39 – 22:44	Walk 10	1x pass, soprano pipistrelle			
22:44 – 22:49	Stop 9	3x passes, noctule			
22:49 – 22:54					
22:54 – 22:59					
22:59 – 23:04	Walk 6	2x passes, brown long-eared			
23:04 – 23:09	Stop 5	1x pass, soprano pipistrelle; 1x pass, noctule			

Date		Survey type	Survey timings	Weather	Route Start
18/08/2020		August dusk transect	Start/Sunset: 20:12 Finish: 22:12	22C 10% Cloud BF 2	Stop 9 -> Stop 10
Time	**Location**	**Comments**			
20:12 – 20:17					
20:17 – 20:22					
20:22 – 20:27					
20:27 – 20:32					
20:32 – 20:37					
20:37 – 20:42	Walk 2	1x pass, soprano pipistrelle commuting south down treeline			
20:42 – 20:47	Stop 3 Walk 3 Stop 4	1x pass, soprano pipistrelle 1x pass, soprano pipistrelle 4x passes, soprano pipistrelle foraging			
20:47 – 20:52	Stop 4 Walk 4 Stop 5	5x passes, soprano pipistrelle foraging with social calls, 2 bats 2x passes, soprano pipistrelle 4x passes, soprano pipistrelle, 2 bats chasing			
20:52 – 20:57	Stop 5 Walk 5 Stop 6	1x pass, common pipistrelle; 2x passes, soprano pipistrelle 3x passes, soprano pipistrelle 5x passes, soprano pipistrelle			
20:57 – 21:02	Stop 6 Walk 6 Stop 7	Continuous soprano pipistrelle foraging, 2 bats with Type C social calls 2x passes, noctule 1x pass, common pipistrelle			
21:02 – 21:07	Stop 7 Stop 8	1x pass, soprano pipistrelle 1x pass, common pipistrelle commuting north; 1x pass, soprano pipistrelle foraging in LoWS			
21:07 – 21:12	Walk 8 Stop 9	1x pass, soprano pipistrelle on west boundary 1x pass, common pipistrelle; 5x passes soprano pipistrelle			
21:12 – 21:17	Stop 9 Stop 10	14x passes, soprano pipistrelle (2 bats foraging near Avenue access) 1x pass, common pipistrelle; 2x passes, noctule			
21:17 – 21:22	Stop 10 Walk 10	1x pass, common pipistrelle 1x pass, barbastelle (unbothered by bright FC floodlights)			
21:22 – 21:27	Walk 10 Stop 11	1x pass, soprano pipistrelle (FC lights spilling across to this boundary) 2x passes, noctule; constant pipistrelle activity with social calls			
21:27 – 21:32	Stop 11 Walk 11 Stop 1	2x passes, soprano pipistrelle (social calls) 4x passes, common pipistrelle (social calls) 3x passes, common pipistrelle			
21:32 – 21:37	Stop 1 Walk 1	1x pass, common pipistrelle 1x pass, common pipistrelle; 1x pass, soprano pipistrelle			
21:37 – 21:42	Walk 2 Stop 3	1x pass, Natterer's; 1x pass, common pipistrelle 2x passes, common pipistrelle; 1x pass, soprano pipistrelle			
21:42 – 21:47	Stop 3 Stop 4	1x pass, soprano pipistrelle 2x passes, common pipistrelle			
21:47 – 21:52	Stop 4 Walk 4 Stop 5	1x pass, common pipistrelle; 1x pass, soprano pipistrelle 1x pass, soprano pipistrelle (FC lights now turned off) 1x pass, soprano pipistrelle flying south along treeline			
21:52 – 21:57	Stop 5 Walk 5 Stop 6	1x pass, soprano pipistrelle 1x pass, soprano pipistrelle 1x pass, common pipistrelle; 1x pass, Daubenton's			
21:57 – 22:02	Walk 6	1x pass, soprano pipistrelle			
22:02 – 22:07	Stop 8	2x passes, soprano pipistrelle			
22:07 – 22:12					

n.b. Adjacent football club floodlights on throughout majority of survey.

Date		Survey type	Survey timings	Weather	Route Start
10/09/2020		September dusk transect	Start/Sunset: 19:21 Finish: 21:21	16C 15% Cloud BF 1	Stop 11 -> Stop 10
Time	**Location**	**Comments**			
19:21 – 19:26					
19:26 – 19:31					
19:31 – 19:36					
19:36 – 19:41					
19:41 – 19:46	Stop 8	1x pass, soprano pipistrelle commuting north			
19:46 – 19:51	Stop 6	1x pass, common pipistrelle (not seen)			
19:51 – 19:56	Walk 5	Constant soprano pipistrelle foraging with social calls, joined by 2nd bat after 2 mins			
19:56 – 20:01	Walk 4 Stop 4	6x passes, soprano pipistrelle foraging along treeline 1x pass, common pipistrelle; 5x passes, soprano pipistrelle (3 bats)			
20:01 – 20:06	Stop 4 Walk 3 Stop 3	1x pass, common pipistrelle; 2x passes, soprano pipistrelle 1x pass, common pipistrelle along treeline; 3x passes, soprano pipistrelle, later joined by 2nd bat 1x pass, common pipistrelle			
20:06 – 20:11	Stop 3	1x pass, common pipistrelle flying south along treeline			
20:11 – 20:16					
20:16 – 20:21	Stop 1	1x pass, Daubenton's			
20:21 – 20:26					
20:26 – 20:31					
20:31 – 20:36	Stop 10 Walk 9	1x pass, common pipistrelle 1x pass, common pipistrelle			
20:36 – 20:41	Walk 8	1x pass, barbastelle			
20:41 – 20:46					
20:46 – 20:51					
20:51 – 20:56	Stop 6 Walk 5	*Pipistrelle sp.* social calls 2x passes, common pipistrelle; 1x pass, barbastelle			
20:56 – 21:01					
21:01 – 21:06					
21:06 – 21:11	Stop 3 Walk 2	1x pass, soprano pipistrelle 1x pass, common pipistrelle; 1x pass, soprano pipistrelle			
21:11 – 21:16	Walk 2	1x pass, common pipistrelle			
21:16 – 21:21	Stop 1 Stop 11	1x pass, soprano pipistrelle; 2x passes, brown long-eared *Pipistrelle sp.* social calls x3			

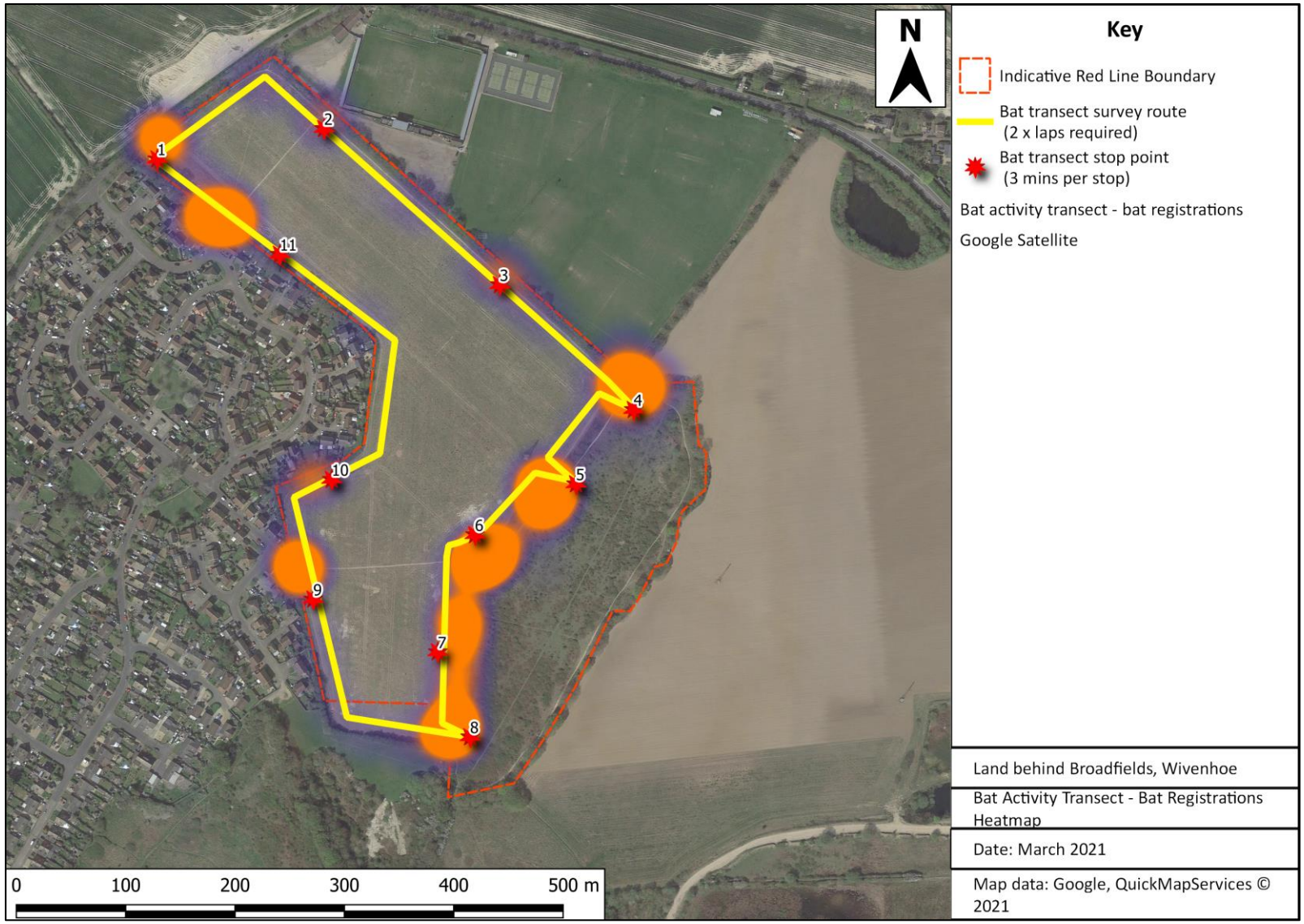
Date	Survey type	Survey timings	Weather	Route Start
11/09/2020	September dawn transect	Start: 04:18 Finish: 06:25	8C 50% Cloud BF 1	Stop 11 -> Stop 1

Time	Location	Comments
04:18 – 04:23		
04:23 – 04:28		
04:28 – 04:33		
04:33 – 04:38	Stop 3	1x pass, barbastelle; 1x pass, brown long-eared
04:38 – 04:43	Stop 4	1x pass, brown long-eared
04:43 – 04:48		
04:48 – 04:53		
04:53 – 04:58		
04:58 – 05:03		
05:03 – 05:08		
05:08 – 05:13		
05:13 – 05:18		
05:18 – 05:23		
05:23 – 05:28	Walk 10	2x passes, soprano pipistrelle
05:28 – 05:33	Walk 11	4x passes, soprano pipistrelle; 1x pass, brown long-eared
05:33 – 05:38	Walk 1	1x pass, brown long-eared in north corner near stop
05:38 – 05:43		
05:43 – 05:48		
05:48 – 05:53		
05:53 – 05:58		
05:58 – 06:03		
06:03 – 06:08		
06:08 – 06:13		
06:13 – 16:18		
06:18 – 06:23		

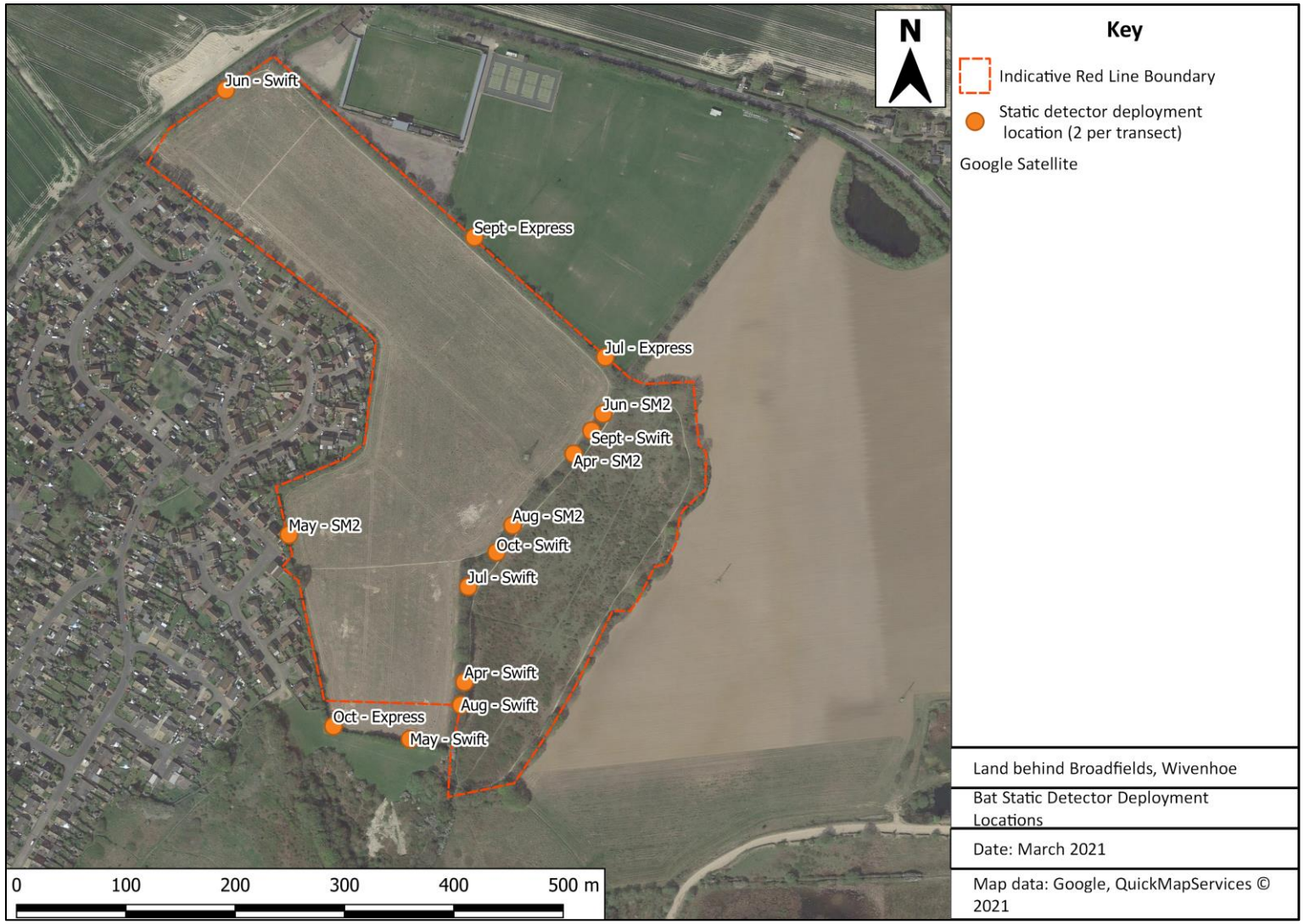
Date	Survey type	Survey timings	Weather	Route Start
15/10/2020	October dusk transect	Start/Sunset: 18:01 Finish: 20:01	10C 30% Cloud BF 1	Stop 8 -> Stop 7

Time	Location	Comments
18:01 - 18:06		
18:06 - 18:11		
18:11 - 18:16		
18:16 - 18:21		
18:21 - 18:26		
18:26 - 18:31		
18:31 - 18:36		
18:36 - 18:41	Stop 1	1x pass, common pipistrelle, commuting east
18:41 - 18:46		
18:46 - 18:51		
18:51 - 18:56		
18:56 - 19:01		
19:01 - 19:06	Stop 7	1x pass, soprano pipistrelle, flying south
19:06 - 19:11		
19:11 - 19:16		
19:16 - 19:21		
19:21 - 19:26		
19:26 - 19:31		
19:31 - 19:36		
19:36 - 19:41		
19:41 - 19:46		
19:46 - 19:51		
19:51 - 19:56		
19:56 - 20:01	Stop 9 Walk 8	1x pipistrelle sp. social call 1x pass, soprano pipistrelle (unseen)

Appendix 7d – Bat Activity Transect: Heatmap of Bat Registrations



Appendix 7e – Bat Static Detector Sampling Points



Appendix 7f – Bat Static Detector Data Summary

Static 1:												
Month	**P.pip**	**P.pyg**	**P.spp**	**N.nyc**	**N.spp**	**E.ser**	**M.dau**	**M.spp**	**P.aur**	**B.bar**	**Total**	**Detector**
April	15.1	8.6	0.4	0.3							**24.4**	**Swift**
May	8.5	1.7		0.7	0.3			0.2		0.7	**12.0**	**SM2**
June	387.3	211.3								0.3	**599.0**	**Swift**
July	58.0	45.7	7.4	2.7				0.6	0.4		**114.9**	**Express**
August	80.3	38.7		61.7	23.0		1.3		0.7	3.3	**209.0**	**SM2**
September	61.6	96.6		0.6	0.7	0.1		2.9	4.6		**167.0**	**Express**
October	6.4	7.3		0.3					0.6		**14.6**	**Express**

Static 2:												
Month	**P.pip**	**P.pyg**	**P.spp**	**N.nyc**	**N.spp**	**E.ser**	**M.dau**	**M.spp**	**P.aur**	**B.bar**	**Total**	**Detector**
April	9.4	11.4	1.0	0.4					0.2	0.8	**23.2**	**SM2**
May	43.7	31.0		0.2	0.2		0.3		0.8	0.2	**76.3**	**Swift**
June	149.2	136.2	11.8	5.2	1.4			0.2	0.4	2.4	**306.8**	**Express**
July	29.8	82.8		11.6	0.2		0.2		0.2	0.2	**125.0**	**Swift**
August	6.3	21.3		7.3	8.3				0.7	1.0	**45.0**	**Swift**
September	82.1	207.9		4.0	0.3		1.0		0.6	3.4	**299.3**	**Swift**
October	8.7	6.9		0.3			0.1		0.3	0.3	**16.6**	**Swift**

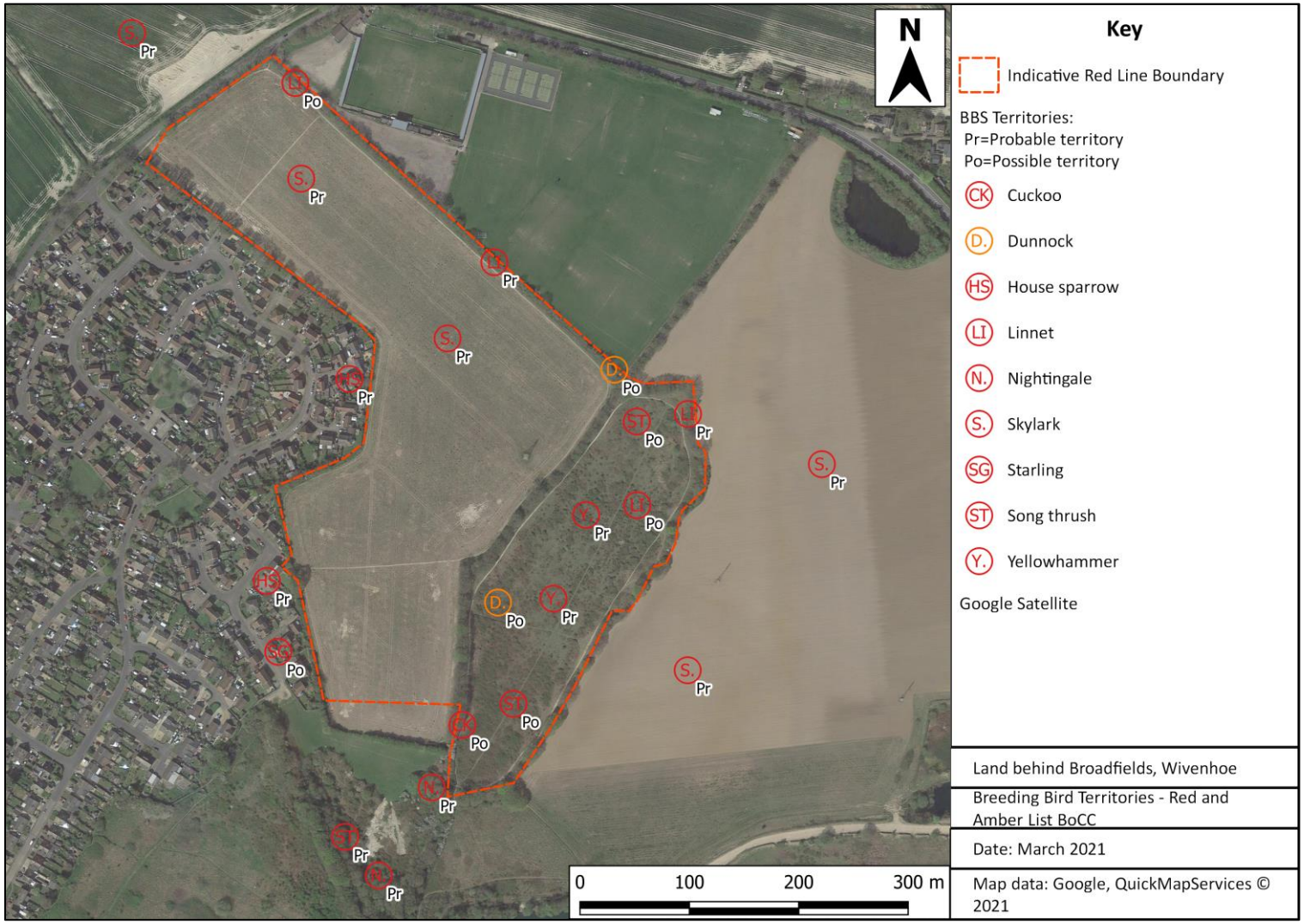
Combined Results:											
Month	**P.pip**	**P.pyg**	**P.spp**	**N.nyc**	**N.spp**	**E.ser**	**M.dau**	**M.spp**	**P.aur**	**B.bar**	**Total**
April	24.5	20.0	1.4	0.7	0.0	0.0	0.0	0.0	0.2	0.8	**47.6**
May	52.2	32.7	0.0	0.8	0.5	0.0	0.3	0.2	0.8	0.8	**88.3**
June	536.5	347.5	11.8	5.2	1.4	0.0	0.0	0.2	0.4	2.7	**905.8**
July	87.8	128.5	7.4	14.3	0.2	0.0	0.2	0.6	0.6	0.2	**239.9**
August	86.7	60.0	0.0	69.0	31.3	0.0	1.3	0.0	1.3	4.3	**254.0**
September	143.7	304.4	0.0	4.6	1.0	0.1	1.0	2.9	5.1	3.4	**466.3**
October	15.1	14.1	0.0	0.6	0.0	0.0	0.1	0.0	0.9	0.3	**31.1**

Reported figures are the mean number of bat registrations per night over each monthly sampling period.

P.pip = common pipistrelle, P.pyg = soprano pipistrelle,.spp = pipistrelle species, N.nyc = noctule, N.spp = Nyctalus species, E.ser = serotine, P.aur = brown long-eared, M.dau = Daubenton's bat, M.nat = Natterer's bat, B.bar = barbastelle, M.spp = Myotis species.

Appendix 8. Breeding and Wintering Bird Survey Results

Appendix 8a– Breeding Territory Map for Red & Amber List Species



Appendix 8b – Breeding Bird Survey Results

Species	Category	03/04/2020	05/05/2020	29/05/2020	23/06/2020	Max Count	Probable territories	Possible territories	Breeding Status	Areas recorded
Cuckoo *Cuculus canoris*	Red	0	0	0	2	2	0	1	Possible breeder	Heard from treeline dividing LoWS and development area, and from scrub south of site
Herring gull *Larus argentatus*	Red	0	0	0	1	1	0	0	Non-breeding	Flying over the centre of site.
House sparrow *Passer domesticus*	Red	5	2	26	10	26	2	0	Probable breeder	Breeding colonies likely located in houses bordering west of site. Observed in boundary vegetation through site.
Linnet *Linaria cannabina*	Red	4	6	18	6	18	1	3	Probable breeder	Territories in LoWS and along northern boundary to football pitches. Small flocks feeding in fallow arable.
Nightingale *Luscinia megarhynchos*	Red	0	1	0	2	2	2	0	Probable breeder	In scrub to south of site.
Skylark *Alauda arvensis*	Red	2	4	4	5	5	5	0	Probable breeder	Two territories within development arable, three further on neighbouring arable fields.
Song thrush *Turdus philomelos*	Red	0	1	2	3	3	1	2	Probable breeder	Territories in LoWS, one in scrub to south of site.
Starling *Sturnus vulgaris*	Red	13	6	53	78	78	0	1	Possible breeder	Possible territory in houses to west of site. Flocks feeding on fallow arable.
Yellowhammer *Emberiza citrinella*	Red	3	0	2	1	3	2	0	Probable breeder	LoWS only.
Black-headed gull *Chroicocephalus ridibundus*	Amber	3	0	0	1	3	0	0	Non-breeding	Flying over the centre of site.
Bullfinch *Pyrrhula pyrrhula*	Amber	1	0	0	0	1	0	0	Non-breeding	Calling from treeline to east of LoWS.
Common gull *Larus canus*	Amber	0	2	0	0	2	0	0	Non-breeding	Perched on houses to west and flying over LoWS.
Dunnock *Prunella modularis*	Amber	1	0	1	1	1	0	2	Possible breeder	Along eastern boundary of arable field and in LoWS.
Greylag goose *Anser anser*	Amber	0	2	0	0	2	0	0	Non-breeding	In off-site arable field to east of LoWS.
Meadow pipit *Anthus pratensis*	Amber	3	0	0	0	3	0	0	Non-breeding	Moving through LoWS.
Swift *Apus apus*	Amber	0	0	2	1	2	0	0	Non-breeding	Over development area and boundary with housing.
Blackbird *Turdus merula*	Green	5	13	7	7	13	1	3	Probable breeder	Within LoWs and along arable field boundaries.
Blackcap *Sylvia atricapilla*	Green	0	5	4	3	5	2 (1 confirmed)	4	Confirmed breeder	Within LoWs and along central treeline dividing LoWS and arable. Young observed in LoWS
Blue Tit *Cyanistes caeruleus*	Green	8	4	5	11	11	1	5	Probable breeder	Within LoWs and along arable boundaries.
Carrion crow *Corvus corone*	Green	1	1	2	1	2	0	0	Non-breeding	Calling from just off-site.
Chaffinch *Fringilla coelebs*	Green	10	15	7	6	15	4	4	Probable breeder	Within LoWs and along arable boundaries.
Chiffchaff *Phylloscopus collybita*	Green	5	4	4	5	5	4	2	Probable breeder	Territories along central treeline dividing LoWS and arable and in LoWS.
Collared dove *Streptopelia decaocto*	Green	0	1	1	0	1	0	1	Possible breeder	Off-site to south.
Goldfinch *Carduelis carduelis*	Green	1	2	4	7	7	0	2	Possible breeder	In hedgerow to south of development area & LoWS.
Great tit *Parus major*	Green	4	2	1	2	4	0	2	Possible breeder	Along central treeline dividing LoWS and arable.
Green woodpecker *Picus viridis*	Green	1	0	2	2	2	0	0	Non-breeding	To south of site.
Greenfinch *Chloris chloris*	Green	0	2	2	2	2	0	3	Possible breeder	Along central treeline dividing LoWS and arable and northern boundary to football club.
Jackdaw *Coloeus monedula*	Green	0	0	1	1	1	0	0	Non-breeding	Heard from houses to west of site.
Long-tailed tit *Aegithalos caudatus*	Green	0	0	3	1	3	0	0	Non-breeding	In hedgerow off-site to south.
Magpie *Pica pica*	Green	2	1	6	3	6	1	0	Probable breeder	Seen throughout site. Probable territory to north.

Species	Category	03/04/2020	05/05/2020	29/05/2020	23/06/2020	Max Count	Probable territories	Possible territories	Breeding Status	Areas recorded
Robin *Erithacus rubecula*	Green	4	1	4	1	4	1	1	Probable breeder	Northern area, LoWS and off-site.
Rook *Corvus frugilegus*	Green	1	0	0	2	2	0	0	Non-breeding	Calling from houses to west.
Swallow *Hirundo rustica*	Green	0	2	0	0	2	0	0	Non-breeding	Over development area and boundary with housing.
Whitethroat *Sylvia communis*	Green	0	2	2	1	2	0	1	Possible breeder	LoWS only.
Woodpigeon *Columba palumbus*	Green	17	6	6	10	17	0	1	Possible breeder	Across entire site, but generally more common in northern area and around hedgerows.
Wren *Troglodytes troglodytes*	Green	3	4	3	4	4	6	2	Probable breeder	Throughout site.
Canada Goose *Branta canadensis*	I	0	0	0	1	1	0	0	Non-breeding	Over field to east of site.
Pheasant *Phasianus colchicus*	I	2	0	1	1	2	0	0	Non-breeding	In open areas including development area and off-site arable field to east.
Red-legged Partridge *Alectoris rufa*	I	0	1	0	0	1	0	1	Non-breeding	By northern boundary of site.

Red rows are BOCC red-list, Amber rows are BoCC amber-list, Green rows are BoCC green-list, I rows are non-native species.
BoCC: Birds of Conservation Concern as defined and listed in Eaton et al., (2015)

Visit	Date	Surveyor	Survey Start	Survey Conditions
1	**03/04/2020**	Sarah Wiltshire	6:30am	6°C, 80% cloud cover, 1 Beaufort
2	**05/05/2020**	Sarah Wiltshire	6:00am	9°C, 60% cloud cover, 2 Beaufort
3	**29/05/2020**	Sarah Wiltshire	6:15am	11°C, 10% cloud cover, 2 Beaufort
4	**23/06/2020**	Sarah Wiltshire	6:00am	13°C, 0% cloud cover, 1 Beaufort

Appendix 8c – Wintering Bird Survey Results

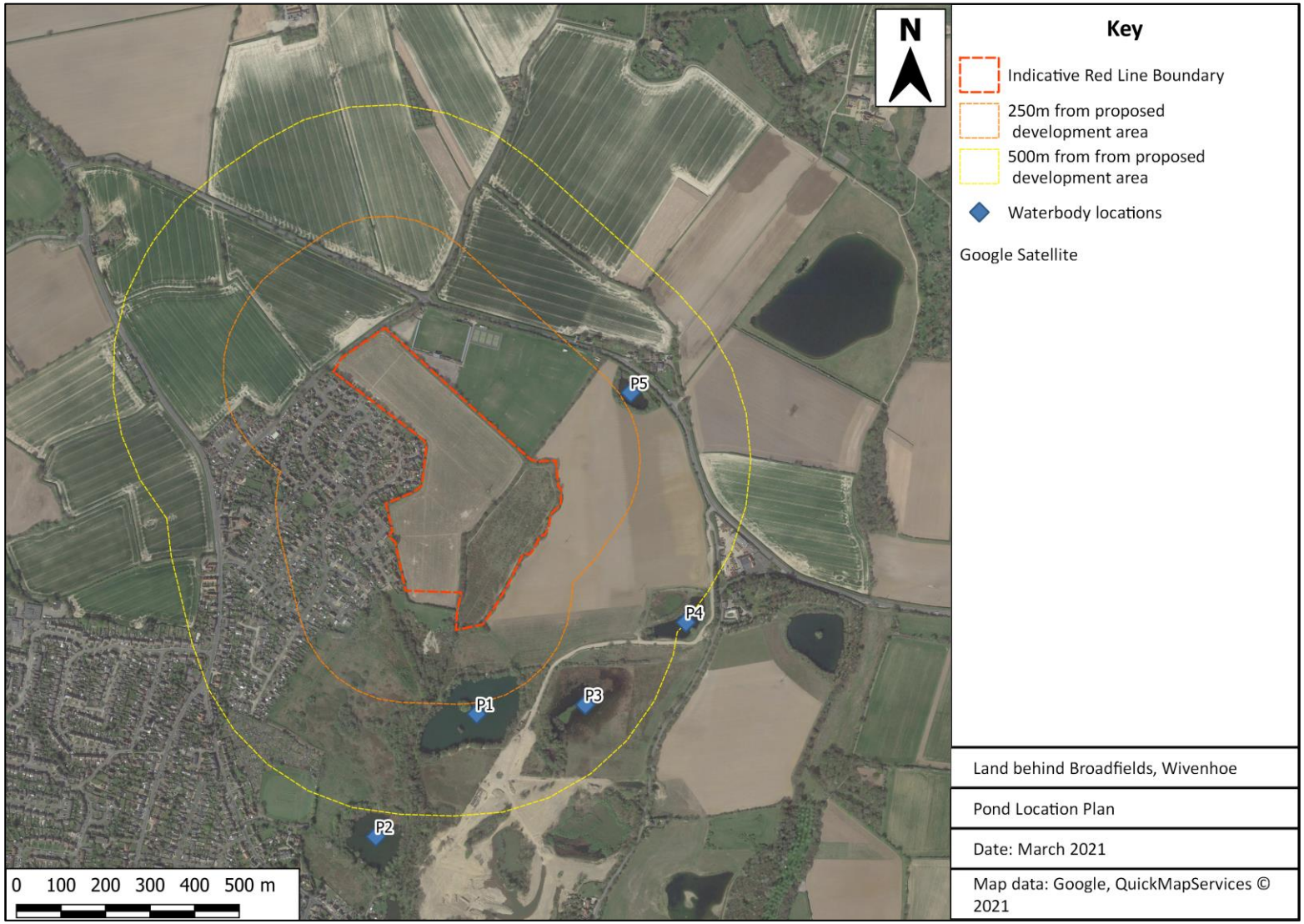
Species	Sch. 1	Category	27/11/2020	14/12/2020	29/01/2021	16/02/2021	Max Count	Comments
Fieldfare *Turdus pilaris*	Y	Red		6		2	6	Along the northern boundary of the arable field.
House sparrow *Passer domesticus*		Red	10	6		3	10	Along the boundaries of the arable field.
Herring Gull *Larus argentatus*		Red			10		10	Among flocks of BH gull on Football Club field.
Linnet *Linaria cannabina*		Red		1	3		3	Around the boundaries of the arable field and in the LoWS.
Skylark *Alauda arvensis*		Red				2	2	In flight over development site and surrounding arable.
Starling *Sturnus vulgaris*		Red	21	22	37	84	84	Flocks resting on power lines and houses to the west of site.
Song thrush *Turdus philomelos*		Red	1	2	1	3	3	Primarily to the south of the site.
Yellowhammer *Emberiza citrinella*		Red				1	1	Within the LoWS.
Black-headed Gull *Chroicocephalus ridibundus*		Amber	34	15	304	353	353	Regularly observed flying over site. Large flocks resting/feeding on Football Club field.
Common Gull *Larus canus*		Amber		2	1		2	Flying over site.
Dunnock *Prunella modularis*		Amber	1		2	5	5	In boundary treelines and in scrubby areas in LoWS.
Blackbird *Turdus merula*		Green	1	8	1	5	8	
Blue Tit *Cyanistes caeruleus*		Green	11	11	11	8	11	
Carrion Crow *Corvus corone*		Green	2	5	4	5	5	
Collared dove *Streptopelia decaocto*		Green		4	1	2	4	
Chaffinch *Fringilla coelebs*		Green	17	4	5	11	17	
Green Woodpecker *Picus viridis*		Green	1		1	1	1	
Goldfinch *Carduelis carduelis*		Green	4	3	7	1	7	
Great spotted woodpecker *Dendrocopos major*		Green			1	1	1	
Great tit *Parus major*		Green	12	7	4	5	12	
Jackdaw *Coloeus monedula*		Green	1	2	10	2	10	
Long-tailed tit *Aegithalos caudatus*		Green	10		3	2	10	
Magpie *Pica pica*		Green	2	10	4	5	10	
Robin *Erithacus rubecula*		Green	7	8	9	8	9	
Rook *Corvus frugilegus*		Green				15	15	
Woodpigeon *Columba palumbus*		Green	38	26	14	41	41	
Wren *Troglodytes troglodytes*		Green	2	2	2	2	2	

Red rows are BOCC red-list, Amber rows are BoCC amber-list, Green rows are BoCC green-list, I rows are non-native species.
BoCC: Birds of Conservation Concern as defined and listed in Eaton et al., (2015)

Visit	Date	Surveyor	Survey Start	Survey Conditions
1	**27/11/2021**	Sarah Wiltshire	7:30am	1°C, 10% cloud cover, 1 Beaufort
2	**14/12/2021**	Sarah Wiltshire	7:30am	8°C, 70% cloud cover, 2 Beaufort
3	**29/01/2021**	Sarah Wiltshire	8:30am	11°C, 10% cloud cover, 2 Beaufort
4	**16/02/2021**	Sarah Wiltshire	8:00am	7°C, 100% cloud cover, 1 Beaufort

Appendix 9. Great Crested Newt Survey Results

Waterbody Location Plan



HSI Results

Table A9.1: HSI values for ponds on or within the vicinity of site.

Index		Waterbody 1		Waterbody 2	
SI1	**Location**	Zone A	1	Zone A	1
SI2	**Pond Area**	>2000m2	0.8	>2000m2	0.8
SI3	**Pond Drying**	Never Dries	0.9	Never Dries	0.9
SI4	**Water Quality**	Moderate	0.67	Moderate	0.67
SI5	**Shade**	86-90%	0.4	76-80%	0.6
SI6	**Fowl**	Major	0.01	Major	0.01
SI7	**Fish**	Major	0.01	Major	0.01
SI8	**Ponds**	>12	1	>12	1
SI9	**Terrestrial Habitat**	Good	1	Good	1
SI10	**Macrophytes**	46-50%	0.8	46-50%	0.8
	HSI		**0.33**		**0.34**
	Suitability		**Poor**		**Poor**

Appendix 10: Reptile Survey Results

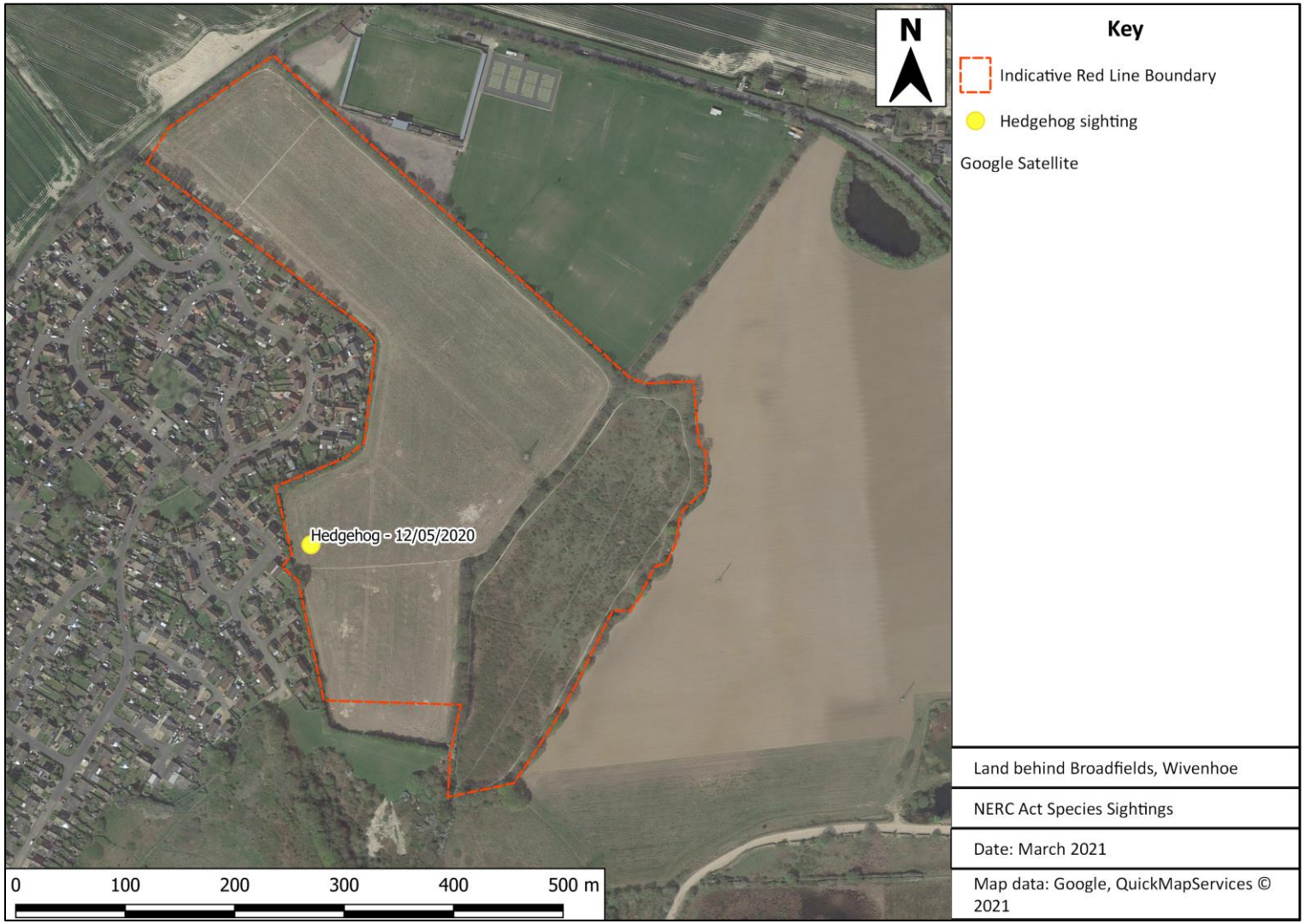
Reptile Mat Indicative Location Plan

Reptile Survey Results

Survey No.	Date	Temp	Cloud %	Wind (BS)	Last rain	Slow Worms				Common Lizards				Grass snake		Adder				Comments
						M	F	Total	J	M	F	Total	J	Ad	Juv	M	F	Total	J	
Setup	01/04/2020					0														
1	15/04/2020	14	20	1	>24 hrs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	24/04/2020	13	20	1	>24 hrs	0	0	0	0	0	0	0	0	0	1	0	0	0	0	On western boundary of development site
3	15/05/2020	16	40	1	>24 hrs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	29/05/2020	17	10	1	>24 hrs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	08/06/2020	17	10	2	>24 hrs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Field vole under 1 mat
6	23/06/2020	17	50	2	>24 hrs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	04/08/2020	15	60	1	>24 hrs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Appendix 11: Other Notable Species Survey Results

Hedgehog Sighting Plan



Appendix 12: Biodiversity Net Gain Metric

Appended separately.