

# Land north of School Road, Arborfield Cross

Ecological Assessment

September 2024



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Report Ref: DFA24071V3

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## **1 INTRODUCTION**

### **1.1 Background**

- 1.1.1 Derek Finnie Associates was commissioned by Croudace Homes, Vortal Homes Limited & Falcon Developments (SE) Limited to undertake an Ecological Assessment in relation to an area of land referred to as Land north of School Road, Arborfield Cross, herein referred to as the 'Site' (Figure 1). Croudace Homes, Vortal Homes Limited & Falcon Developments (SE) Limited are seeking outline permission for a proposed residential development of up to 95 dwellings together with open space and associated works. Therefore, there is a need to understand the ecological value of the Site and determine the presence ecologically valuable habitats and/or protected species or species of a raised conservation status, as these are a material consideration in planning system.
- 1.1.2 To this end, an Extended Phase 1 Habitat survey of the Site was undertaken in April 2024, with subsequent badger, bird, amphibian, reptile and bat assessments being conducted throughout the summer of 2024. The following report describes the methodology employed, describes the current ecological conditions within the Site, evaluates the ecological receptors identified and assesses the potential impact of the proposal based on information gathered to date.

## 2 LEGISLATIVE FRAMEWORK

### 2.1 National policy and Guidance

#### *Legal Framework*

2.1.1 The legislative framework applicable to this assessment is summarised below.

#### International Conventions and Directives

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (EC Habitats Directive);
- Council Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive);
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979;
- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) 1983; and
- Convention on Biological Diversity 1992.

#### National Legislation

- Environment Act 2021
- The Wildlife and Countryside Act 1981 (WCA);
- The Conservation of Habitats and Species Regulations 2017;
- The Countryside and Rights of Way Act 2000 (CRoW);
- Natural Environment and Rural Communities Act 2006 (NERC);
- The Protection of Badgers Act 1992; and
- The Hedgerow Regulations 1997.

#### Statutorily Protected Sites

2.1.2 Local Nature Reserves (LNRs); National Nature Reserves (NNRs); Sites of Special Scientific Interest (SSSIs); Special Areas of Conservation (SAC); and Special Protection Areas (SPAs) contain examples of some of the most important natural and semi-natural ecosystems in Europe and receive strict protection under United Kingdom (UK) legislation. Although not strictly protected under legislation, Ramsar sites are given the same level of protection through policy.

#### Non-Statutory Sites

2.1.3 Non-statutory sites of county conservation value are designated by Local Planning Authorities (LPAs). Such sites are afforded a measure of protection in local development plans.

#### Protected Species

2.1.4 Under UK legislation, a number of species, including bats *Chiroptera* sp. and great crested newts *Triturus cristatus* are strictly protected from death, injury or harm; whilst places used for their shelter or rest are protected from damage, disturbance and



destruction. Certain species such as some reptiles and birds only receive partial protection under UK legislation, e.g. protection from killing / injuring only or protection at certain times of the year only.

#### Invasive Weeds

- 2.1.5 The WCA 1981 makes it an offence to plant or otherwise cause to grow in the wild numerous species including Japanese knotweed *Fallopia japonica* and giant hogweed *Heracleum mantegazzianum*.

#### Non-Statutory Policies

- 2.1.6 The UK Biodiversity Action Plan (UK BAP) was established in response to the global Convention on Biological Diversity, 1992. Individual Action Plans define actions and measures to meet the conservation objectives defined in the strategy and specify measurable targets. They determine the broad habitats and species that are of value to the natural environment of the UK and identify actions and projects that could be undertaken to help protect or enhance the national biodiversity.
- 2.1.7 Local Biodiversity Action Plans (LBAPs) are implemented through planning policy, identifying habitats and species in need of conservation action at the local or regional level. BAPs in the UK have no statutory status but provide a framework for implementing conservation requirements.

#### ***Planning Policy***

##### National Planning Policy

##### National Planning Policy Framework 2023

- 2.1.8 The following objectives relating to biodiversity conservation are considered relevant to this assessment. The National Planning Policy Framework (NPPF) seeks to:
- Protect and enhance valued landscapes, geological conservation interests and soils;
  - Recognise the wider benefits of ecosystem services;
  - Minimise impacts on biodiversity and provide net gains in biodiversity, where possible, contribute to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;
  - Prevent both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;
  - Remediate and mitigate despoiled, degraded, derelict, contaminated and unstable land, where appropriate; and
  - Prevent the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss.

Regional Planning Policy

- 2.1.9 The South East Plan was partially revoked on 25 March 2013; However, Policy NRM6, which deals with the Thames Basin Heaths Special Protection Area, remains in place

***Policy NRM6: Thames Basin Heaths Special Protection Area***

*New residential development which is likely to have a significant effect on the ecological integrity of Thames Basin Heaths Special Protection Area (SPA) will be required to demonstrate that adequate measures are put in place to avoid or mitigate any potential adverse effects. Such measures must be agreed with Natural England.*

Local Planning Policy

- 2.1.10 Consideration was also given to the policies within Wokingham Borough Local Development Framework Adopted Core Strategy Development Plan Document (January 2010), specifically the policies CP7 and CP8:

***CP7 - Biodiversity***

*Sites designated as of importance for nature conservation at an international or national level will be conserved and enhanced and inappropriate development will be resisted. The degree of protection given will be appropriate to the status of the site in terms of its international or national importance.*

*Development:*

*A) Which may harm county designated sites (Local Wildlife Sites in Berkshire), whether directly or indirectly, or*

*B) Which may harm habitats or, species of principle importance in England for nature conservation, veteran trees or features of the landscape that are of major importance for wild flora and fauna (including wildlife and river corridors), whether directly or indirectly, or*

*C) That compromises the implementation of the national, regional, county and local biodiversity action plans will be only permitted if it has been clearly demonstrated that the need for the proposal outweighs the need to safeguard the nature conservation importance, that no alternative site that would result in less or no harm is available which will meet the need, and:*

*i) Mitigation measures can be put in place to prevent damaging impacts;*

*or*

*ii) Appropriate compensation measures to offset the scale and kind of losses are provided.*



*CP8 - Thames Basin Heaths Special Protection Area*

*Development which alone or in combination is likely to have a significant effects on the Thames Basin Heaths Special Protection Area will be required to demonstrate that adequate measures to avoid and mitigate any potential adverse effects are delivered*

### **3 METHODOLOGY**

#### **3.1 Data Search**

- 3.1.1 A review of the Government's MAGIC website was undertaken for the location and extent of statutory protected sites within 2km of the Site, extending to 5km in the case of Natura 2000 sites.
- 3.1.2 Thames Valley Environmental Record Centre (TVERC) was also contacted for information they may hold on non-statutory designated sites as well as species of a raised conservation status within a 2km radius of the Site.
- 3.1.3 Previous surveys undertaken in 2018 by Ecology Solutions which are publicly available were also reviewed; these survey data cover a slightly larger area but do include the majority of the current Site.
- 3.1.4 Derek Finnie Associates have also been involved in several projects in the vicinity; where relevant or useful, data from the schemes have been used to provide local context.

#### **3.2 Habitat Survey**

- 3.2.1 An 'extended' Phase 1 Habitat Survey was carried out on the 12<sup>th</sup> April 2024. The survey methodology followed that presented by the JNCC (2010). The Phase 1 technique aims to classify each habitat into categories based on the assemblage of plant species present, with the dominant plant species for each habitat being noted. In some cases, sub-divisions or modifications of the standard categories can be made where this is useful in providing further detail.
- 3.2.2 An 'extended' form of the basic methodology was employed to determine whether any notable or protected species of fauna utilise the study area, in particular badgers, bats, amphibians, reptiles and birds. In the absence of direct evidence of these species, an assessment was made of the potential for the site to support such species.
- 3.2.3 Additional data on certain vegetation parameters were also collected during the site survey to allow the Defra Biodiversity Net Gain metric to be completed.

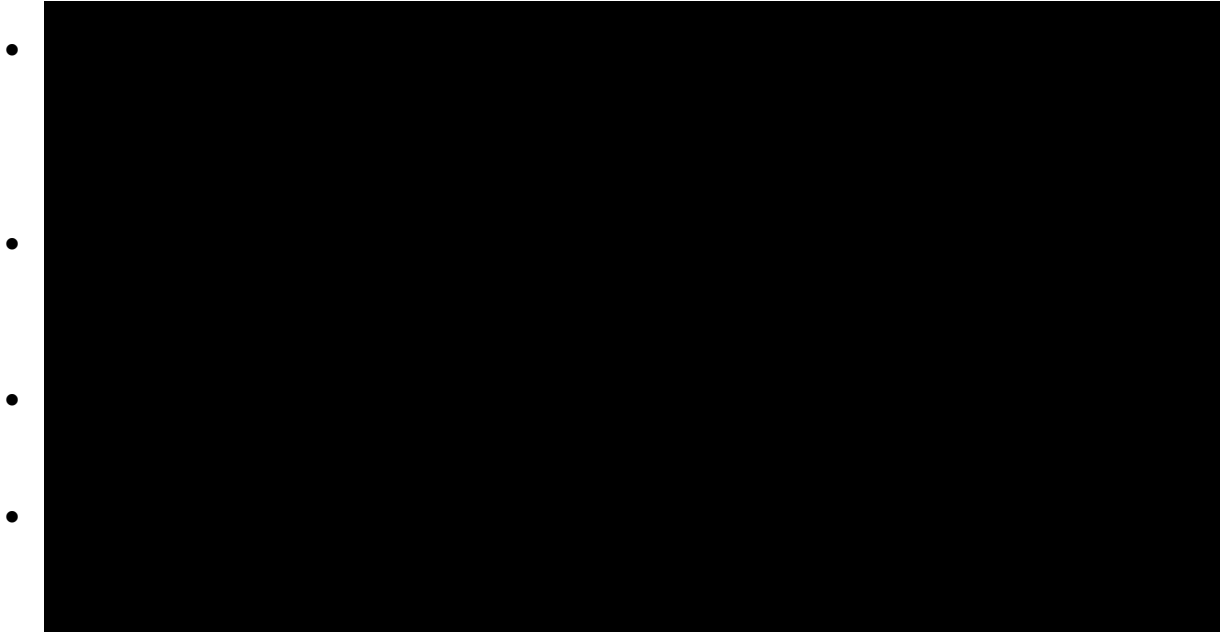
#### **3.3 Badger Survey**

3.3.1

3.3.2

3.3.3





3.4 Reptile survey

- 3.4.1 During the Phase 1 Habitat survey, potentially suitable reptile habitat was identified, hence it was deemed appropriate to undertake a species-specific survey of this taxon.
- 3.4.2 A total of 55 refugia, consisting of heavy-duty roofing felt approximately 0.5m<sup>2</sup>, were placed across the Site in line with best practice survey guidance. To maximise the efficiency of the survey the refugia were concentrated in areas which appeared to be more likely to support reptiles which was deemed to be the edges of the western field (Figure 2). Within the eastern field, the land has been farmed right up to the base of the hedges, leaving negligible semi-natural vegetation which could be exploited by reptiles. Although the Site covers 8.25ha, only approximately 5.0ha was deemed to be suitable reptile habitat, hence the placement of 55 refugia results in a density slightly above that recommended by Froglife (1999) of 10ha<sup>-1</sup>; this allows for some loss or damage to the refugia during the course of the survey without affecting the results significantly.
- 3.4.3 The refugia generally heat up quicker than the surrounding environment, which makes them attractive to reptiles which need to attain a certain body temperature to hunt effectively. Thus, careful inspection of the refugia results in a more effective way to locate these often-elusive animals.
- 3.4.4 The refugia were placed on Site on the 29<sup>th</sup> April 2024 and allowed to ‘bed in’ for at 10 days before the survey proper began. The refugia were checked on seven occasions throughout the survey period, on suitable days, which are classified as sunny, or partially sunny days, with little or no wind and an air temperature between 8°C and 19°C, as summarised in Table 1.

**Table 1.** Reptile Survey Dates and Conditions

| Visit No. | Date     | Weather               |
|-----------|----------|-----------------------|
| 1         | 11/05/24 | 13°C, sunny, no cloud |
| 2         | 18/05/24 | 15°C, 2/8 cloud       |



| Visit No. | Date     | Weather                     |
|-----------|----------|-----------------------------|
| 3         | 06/06/24 | 14°C, 1/8 cloud, light wind |
| 4         | 12/06/24 | 16°C, sunny, 4/8 cloud      |
| 5         | 21/07/24 | 13°C, sunny, 2/8cloud       |
| 6         | 01/08/24 | 14°C, sunny, no cloud       |
| 7         | 10/08/24 | 17°C, sunny, 1/8 cloud      |

- 3.4.5 In addition to checking the artificial refugia, other suitable natural basking areas around the Site were carefully inspected from a short distance using Leica 10x32 BGA binoculars, expanding the search area to cover parts of the Site where refugia could not be placed.

### 3.5 Great crested newt assessment

- 3.5.1 A review of aerial photography and mapping, along with local knowledge revealed the presence of three potential waterbodies within 500m of the Site. Pond P1 is located on the southern side of School Road, relatively close to the site boundary. A second, referred to as P2 is present close to the junction of School Road and Langley Common Road, approximately 450m for the Site boundary. The third, P3 is located on the opposite side of the Langley Common Road in the former Arborfield Studios site.

- 3.5.2 These ponds have previously been discounted as potential newt ponds. However, for completeness, they were re-assessed as part of the current work.

### 3.6 Bat Survey

#### *Night Time Walkover Surveys (NTWS)*

- 3.6.1 The methodology for the activity surveys was based on that outlined within the Bat Conservation Trust guidelines (BCT 2023), modified to meet the specific site requirements. The aim of the survey was to provide an indication of the level of bat activity within the study area, the species present and their distribution.
- 3.6.2 To date, four NTWS have been undertaken across the Site; a further two are planned. The surveys were conducted on the dates shown in Table 2. The surveys commenced approximately 15 minutes prior to sunset and concluded one and half hours after sunset. On each survey event, the surveyor was positioned in along the north eastern boundary of the Site, adjacent to the central hedgerow, where bat activity was likely to be greatest. Forty-five minutes after sunset, when commuting appeared to have ceased, the surveyor walked a continuous transect along a predetermined route (Figure 2), noting bat activity enroute. The surveyor was equipped with an 'Echo Meter Touch Pro 2' bat detector and a pair of 'Hikmicro Habrok 4K HE25L' infra-red and thermal imaging binoculars. The Echo Meter Touch Pro 2 allows bat calls to be recorded in both full spectrum and heterodyne; any bat calls can then be analysed using specific software where necessary.

**Table 2.** Bat Activity Survey Dates

| Date     | Sunset | Start time | Temperature | Weather                |
|----------|--------|------------|-------------|------------------------|
| 14/05/24 | 20:30  | 20:15      | 13°C        | Dry, light breeze      |
| 12/06/24 | 21:20  | 21:00      | 12°C        | Clear, moderate breeze |
| 17/07/24 | 21:09  | 20:55      | 14°C        | 1/8 cloud, light wind  |
| 03/08/24 | 20:44  | 20:30      | 17 °C       | 2/8 cloud, light wind  |

### ***Static Surveys***

- 3.6.3 In addition to the activity surveys, two Anabat Swift static detectors were placed within the branches of suitable tree on three occasions to date (See Figure 2). The static detectors were in place between 3<sup>rd</sup> - 8<sup>th</sup> May, 12<sup>th</sup> – 17<sup>th</sup> June and, 9<sup>th</sup> – 14<sup>th</sup> July 2024. A 2m microphone extension lead was used to ensure the microphone was located within the optimum presumed flight path of any foraging bats. A further two deployments are planned, in August and September.
- 3.6.4 The data from the detectors were analysed using Anabat Insight with *BatClassify UK AutoID*, with the ID Tag Certainty Threshold set at 80%. For the commoner species (common pipistrelle and soprano pipistrelle) one in every ten recordings was checked manually, with recordings being compared to those presented by Russ (2012); for the more uncommon species, every recording was checked manually.
- 3.6.5 Given the size of the Site and the habitats present, the level of bat survey was deemed sufficient.

## **3.7 Bird Survey**

- 3.7.1 Although no specific bird survey was undertaken, the Site was visited several times during the breeding bird season, with any territorial or breeding behaviour noted. This was then used to provide an assessment of the breeding bird assemblage within the Site.
- 3.7.2 Given the level of bird activity and the predicted level of impact, this was deemed a sufficient level of survey effort in line with Section 5.5 of BS: 42020 (2013).

## **3.8 Survey Constraints**

- 3.8.1 Phase 1 can be undertaken at any time of the year, with April being considered to be one of the more favourable months, although species that may flower later in the year could be under record or missed. However, given the habitats within the Site, and the subsequent visits made during the species -specific surveys, the confidence in the results is high.
- 3.8.2 The survey was undertaken in line with the latest sectoral guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM) and BS 42020: 2013 *Biodiversity – Code of Practice for Planning and Development*.
- 3.8.3 All survey work was undertaken by Derek Finnie MSc DipCon CEnv MCIEEM, Director of Derek Finnie Associates who has over 30 years as a practicing ecologist.



## 4 SITE DESCRIPTION

### 4.1 Desk Study

#### *Statutory Sites*

- 4.1.1 Thames Basin Heaths, which holds the multiple designations of SPA and SSSI lies approximately 4.1km to the south west of the Site. The SPA supports internationally important numbers of breeding nightjar, tree pipit and Dartford warbler.
- 4.1.2 Longmoor Bog SSSI is located some 1.8km to the south west of the Site. Longmoor Bog is one of a few examples in Berkshire of a base-poor valley mire, its main features being a well-developed carr of alder *Alnus glutinosa*, grey willow *Salix cinerea*, downy birch *Betula pubescens* and alder buckthorn *Frangula alnus* and an area of wet heathland dominated by purple moor-grass *Molinia caerulea* and cross-leaved heath *Erica tetralix*.

#### *Non-Statutory Sites*

- 4.1.3 TVERC provided information on seven Local Wildlife Sites within 2km of the Site, as summarised in Table 3.

**Table 3.** Local Wildlife Sites

| Site Name                         | Distance from Application Site | Comment                                                                                                                                                                                                                                                     |
|-----------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bearwood Estate – Woods and Lakes | 00.8km to the north east       | An extensive area of woodland with a large lake. Most of the woodland is long established broadleaved woodland. There are some areas of conifer plantation and mixed woodland.                                                                              |
| Gravel Pit Wood, The Holt         | 1.9km to the north             | A Lowland Mixed Deciduous Woodland (Section 41 Habitat of Principal Importance), which was probably planted up around a 100 years ago. The canopy varies but is predominately oak and ash with areas of birch over hazel coppice and a carpet of bluebells. |
| Hazelton's Copse                  | 0.2km to the north east        | Hazelton Copse, located towards the northeast of Arborfield Copse, is a Lowland Mixed Deciduous Woodland (Section 41 Habitat of principal importance), which is marked on the ancient woodland inventory as ancient semi-natural woodland.                  |
| Pound Copse                       | 1.5km to the west              | This ancient woodland lies at the junction of two geological types, namely Valley Gravel and Upper Chalk. It consequently has a varied flora. Most of it is semi-natural,                                                                                   |



| Site Name                                          | Distance from Application Site | Comment                                                                                                                                                                                                                                    |
|----------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                    |                                | though some areas have been replanted with conifers.                                                                                                                                                                                       |
| Long Copse and Robin Hood Copse                    | 1.4km to the south             | This site previously included Long Copse (North) and Spring Copse but these areas have been split into a separate site. Long Copse to the north of the Wokingham Lane byway has a canopy dominated by ash, alder and birch.                |
| Longmoor Woodland And Bog, California Country Park | 1.9km to the south east        | This is the part of California Country Park that lies outside the Longmoor Bog SSSI.                                                                                                                                                       |
| The Coombes                                        | 0.7km to the north             | The Coombes lies to the west of Barkham and consists primarily of an area of Lowland Mixed Deciduous Woodland that varies in its structure and species throughout. Much of the site is a Local Geological Site (LGS) in addition to a LWS. |

4.1.4 Hazelton's Copse and The Coombes are also said to be ancient woodlands.

***Species of a Raised Conservation Status***

4.1.5 TVERC do not hold any records of specially protected species or species of a raised conservation status for the site itself.

4.1.6

4.1.7 Numerous bat records exist in the wider area; these mainly comprise the commoner species such as common pipistrelle, soprano pipistrelle and Noctule. However, there appears to be a single record of greater horseshoe bat from 2011, as well as records of Barbastelle's, serotine and Leiser's bat for the vicinity.

4.1.8 A single great crested newt record was returned from within the pond in Hazelbrouck Meadows Country Park (SANG) from 2020, whilst slow worm have been recorded to the south of the School Road.

**4.2 Extended Phase 1 Survey**

4.2.1 The Site, which covers approximately 8.25ha, comprises two fields delineated by outgrown hedgerows. In the past the fields have been reported as supporting horse grazed pasture, but a review of historic aerial photograph would appear to indicate that they have been ploughed and re-seeded, or used for arable crops, several times since 2018. In 2024 the eastern field was given over to arable crops (maize) whilst the western field supported an improved grassland.

4.2.2 The following Phase 1 habitats were encountered within the Site:

- Broad-leaved woodland (linear);
- Scattered trees;
- Hedgerows;
- Improved grassland; and
- Arable.

4.2.3 Each habitat is described in turn below and depicted on Figure 1.

***Broad-leaved woodland (linear)***

4.2.4 Running in a more or less south west to north east direction through the centre of the Site is a line of semi-mature oaks which may once have been part of a hedgerow, but due to the dominance of trees within this feature, it is best described as a linear belt of trees; they are also more than 5m in width. Whilst this appears to be a relatively mature feature, with semi-mature oaks and what appears to be a bank in places, it does not appear on the OS maps until at least 1900, when it is shown as field boundary only. The first evidence of trees in this location does appear on the 1944 aerial photographs.

4.2.5 Oak *Quercus* sp. is the dominant species, although the occasional ash *Fraxinus excelsior* is also present. The understorey is dominated by hawthorn *Crataegus monogyna* and field maple *Acer campestre*, with lesser amounts of blackthorn *Prunus spinosa* and hazel *Corylus avellana*.

4.2.6 The ground flora comprises bramble *Rubus fruticosus* agg. ivy *Hedra helix*, false oat grass *Arrhenatherum elatius*, cow parsley *Anthriscus sylvestris*, cleavers *Galium aparine* and hedge bindweed *Calystegia sepium*.

4.2.7 A second linear belt of broad-leaved woodland is present along the western boundary, between the Site and Cole Lane. This is likely to have once been a hedgerow, but due to a lack of management it has encroached onto the surrounding land, where it now achieves a width of up to 20m in places. Here, oak and field maple are the most frequently occurring species, with lesser amounts of ash, hawthorn, holly with the occasional yew *Taxus baccata*.

***Scattered trees***

4.2.8 Numerous individual trees are located within the hedgerows that form the boundary to the Site. They comprise a mix of oak, ash, silver birch *Betula pendula*, willow *Salix* sp. and field maple. The trees are more frequent towards the west of the Site.

***Hedgerows***

4.2.9 Hedgerows form the boundary to the Site. They are generally outgrown, displaying limited management. Woody species within the hedgerows include hawthorn, blackthorn, elder *Sambucus nigra*, hazel, field maple, holly *Ilex aquilinum* and bramble *Rubus fruticosus* agg as summarised in Table 4.

Table 4. Summary of Hedgerows

| Hedgerow Number | Description                                                                                                                                                                                                                                                                   | 'Important' on ecological grounds* | HPI** |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------|
| H1              | Species rich, native, tall, outgrown hedge with several oak and ash standards. Species present include hawthorn, goat willow, hazel and blackthorn. Field layer limited to bramble, cow parsley, hogweed and common nettle. Arable crops cultivate right up to hedgerow base. | No                                 | Yes   |
| H2              | Native, tall, outgrown hedge with several oak and ash standards. Species present include hawthorn, blackthorn and goat willow. Improved grassland cultivated up to hedgerow base.                                                                                             | No                                 | Yes   |
| H3              | A line of suppressed ash with some oak. Woody species also include hawthorn, field maple and willow, with the occasional patch cherry and holly. Improved grassland cultivated up to hedgerow base.                                                                           | No                                 | Yes   |
| H4              | Hedge line with trees growing along the roadside comprising ash, field maple, hawthorn, blackthorn and a limited amount of holly.                                                                                                                                             | No                                 | Yes   |
| H5              | Tall outgrown hedge along the edge of Wood Lane, consisting of hawthorn and goat willow in the main and lesser amounts of blackthorn and field maple. Dense field layer of bramble and ivy.                                                                                   | No                                 | Yes   |

\* - In line with the Hedgerow Regulations 1997;

\*\* -Habitat of Principle Importance under the NERC Act 2006.

### *Improved grassland*

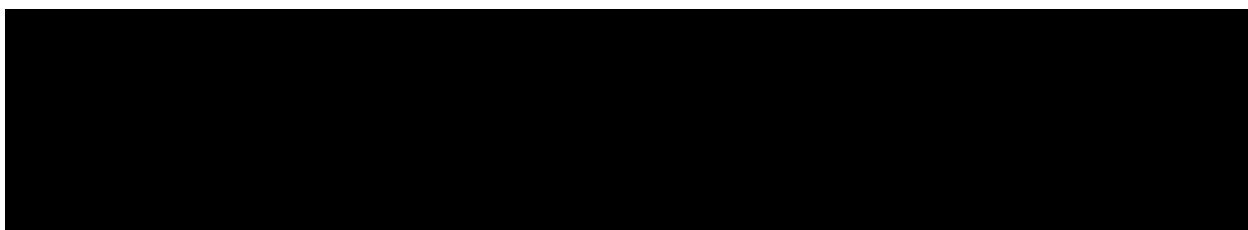
- 4.2.10 The western most field within the Site is given over to a grass ley comprising more or less entirely of perennial rye grass *Lolium perenne*. The sward seems to be relatively new, with some 'sowing lines' still visible, suggesting the sward has been re-sown this year. This would tie in with the land management pattern that is evident from reviewing recent aerial photography.

### *Arable*

- 4.2.11 The eastern field, during 2024, was given over arable land with a maize crop being grown. The field was cultivated more or less right up to the base of the adjoining hedgerows.

## 4.3 Fauna

### 4.3.1



### ***Bats***

- 4.3.2 Several of the semi-mature trees within the hedgerows do offer some potential roost features, although no evidence of roost has been noted. However, the trees that have been identified for removal were assessed to have negligible potential for roosting bats.
- 4.3.3 The NTWS realised a moderate bat assemblage with only four species of bat being encountered, namely common pipistrelle, soprano pipistrelle, noctule and brown-long-eared bat.
- 4.3.4 Up to four common pipistrelle were noted foraging up and down the central linear belt of woodland from 15 -20 minutes after sunset, suggesting the roost is nearby, but unlikely to be within the Site given the timings of the bats first registrations after sunset. A single soprano pipistrelle was all noted in this area on all four occasions to date. A further two common pipistrelle were noted on two occasions foraging along hedgerows H1 and H2 (Figure 1) on 12<sup>th</sup> June and 7<sup>th</sup> July.
- 4.3.5 On three out of the four-visits conducted to date, two noctule have been noted foraging high over the field at, or around, sunset, which is typical of this species.
- 4.3.6 A summary of bat registration encountered during the part of the surveys is present in Table 5.

**Table 5.** Summary of Bat registrations during transect.

| Species              | 14/05/24 | 12/06/24 | 17/07/24 | 03/08/24 |
|----------------------|----------|----------|----------|----------|
| Common pipistrelle   | 45       | 61       | 37       | 51       |
| Soprano pipistrelle  | 17       | 24       | 13       | 20       |
| Noctule              | 5        | 8        | 3        | 7        |
| Brown Long eared bat | 1        | -        | 2        | -        |

- 4.3.7 The result of the static surveys mirror those of the NTWS, although several *Myotis* sp. were also recorded on both static detectors, as summarised in Table 6

**Table 6.** Summary of Bat Registrations per Night

| Species              | 3 <sup>rd</sup> – 8 <sup>th</sup> May |        | 12 <sup>th</sup> – 17 <sup>th</sup> June |        | 9 <sup>th</sup> – 14 <sup>th</sup> July |        |
|----------------------|---------------------------------------|--------|------------------------------------------|--------|-----------------------------------------|--------|
|                      | Det. 1                                | Det. 2 | Det. 1                                   | Det. 2 | Det. 1                                  | Det. 2 |
| Common pipistrelle   | 128                                   | 68     | 213                                      | 65     | 178                                     | 57     |
| Soprano pipistrelle  | 21                                    | 14     | 31                                       | 16     | 21                                      | 12     |
| Noctule              | 4                                     | 6      | 12                                       | 6      | 2                                       | 6      |
| Brown Long eared bat | -                                     | 1      | 1                                        | 1      | -                                       | 2      |
| <i>Myotis</i> sp.    | 2                                     | -      | 2                                        | 3      | 5                                       | 3      |

- 4.3.8 A fuller analysis of the results will be provided on completion of the remaining surveys.



### *Dormouse*

- 4.3.9 No dormouse were recorded during a survey undertaken in 2017 which included the majority of the current Site and TVERC hold no record of dormouse within 2km of the Site. Hence, it is considered this species is absent from the Site.

### *Reptiles*

- 4.3.10 The reptile survey recorded an adult female grass snake on the 18<sup>th</sup> May and a sub-adult on the 12<sup>th</sup> June and again on the 1<sup>st</sup> August; see Figure 2 for the locations. No other reptiles were recorded from within the Site.
- 4.3.11 The 2024 survey returned a lower reptile assemblage compared to the previous 2017 survey undertaken by Ecology Solutions. This may be in part due to the change in Site conditions, with a more intense agricultural management now in place. Grass snake tends to have a rather large home range, so may only be present in the Site on occasion whilst hunting.

### *Amphibians*

- 4.3.12 There are no waterbodies within the Site. Pond P1, to the south of School Road was noted to hold water in early March, after what had been the wettest 18 months on recorded. However, it was completely dry by mid-April when a great crested newts eDNA analysis had been programmed. Hence, it would appear the pond may contain a small amount of water over winter, or after heavy rainfall, but otherwise appears to be dry. Therefore, it is unsuitable as an amphibian breeding pond.
- 4.3.13 Pond P2, which located 450m to the east of the Site boundary, is an ornamental pond located in the garden on a property toward the end of School Lane. Given the distance to the Site, the intense management within the Site and the lack of intervening ecological connectors, if newts were to be present within this waterbody, it is highly unlikely they would be using the Site as terrestrial habitat.
- 4.3.14 TVERC did not return any records of newts within 2km of the Site beyond the single record from Hazelbrouck Meadows Country Park some 1.6km to the south east.

### *Birds*

- 4.3.15 The Site did not appear to support any agricultural specialist such as skylark or yellowhammer. Given the current farming practices within the Site, combined with the relatively small, enclosed field sizes, the Site does not lend itself to supporting these species.
- 4.3.16 The hedgerows and linear belts of around the edge of the Site and though the centre supported a range of common, widespread breeding species as summarised in Table 6.

**Table 7.** Summary of Breeding bird Species

| Species     |                            | Breeding Status | Conservation status |
|-------------|----------------------------|-----------------|---------------------|
| Common name | Scientific name            |                 |                     |
| Blackbird   | <i>Turdus merula</i>       | Confirmed       |                     |
| Blackcap    | <i>Sylvia atricapilla</i>  | Probable        |                     |
| Blue tit    | <i>Cyanistes caeruleus</i> | Confirmed       |                     |
| Chaffinch   | <i>Fringilla coelebs</i>   | Probable        |                     |

| Species         |                                | Breeding Status | Conservation status |
|-----------------|--------------------------------|-----------------|---------------------|
| Common name     | Scientific name                |                 |                     |
| Chiffchaff      | <i>Phylloscopus collybita</i>  | Possible        |                     |
| Dunnock         | <i>Prunella modularis</i>      | Confirmed       | BoCC Amber List     |
| Great tit       | <i>Parus major</i>             | Confirmed       |                     |
| Greenfinch      | <i>Carduelis chloris</i>       | Probable        | BoCC Red List       |
| Long-tailed tit | <i>Aegithalos caudatus</i>     | Confirmed       |                     |
| Magpie          | <i>Pica pica</i>               | Probable        |                     |
| Robin           | <i>Erithacus rubecula</i>      | Confirmed       |                     |
| Song thrush     | <i>Turdus philomelos</i>       | Probable        | BoCC Amber; SPI     |
| Starling        | <i>Sturnus vulgaris</i>        | Probable        | BoCC Red List; SPI  |
| Treecreeper     | <i>Certhia familiaris</i>      | Probable        |                     |
| Whitethroat     | <i>Sylvia communis</i>         | Confirmed       |                     |
| Woodpigeon      | <i>Columba palumbus</i>        | Confirmed       | BoCC Amber          |
| Wren            | <i>Troglodytes troglodytes</i> | Confirmed       | BoCC Amber          |

#### *Other Fauna*

- 4.3.17 No other uncommon species, or species of a raised conservation concern were noted within the Site and the Site was assessed as having negligible potential to support such species.

## 5 EVALUATION

### 5.1 Definition of ecological value

- 5.1.1 A geographical scale of reference is used when evaluating ecological receptors within a Site, in line with the latest sectoral guidance presented by CIEEM (2018), as summarised in Table 8. The evaluation categories for each receptor have generally been reached by applying accepted criteria, such as naturalness, rarity, fragility and diversity, first proposed by Ratcliffe (1977) and commonly used in the assessment of both statutory and non-statutory sites.
- 5.1.2 Where sites have already been designated on ecological grounds, the assessment reflects the geographical context of the designations. For example, sites designated under international legislation or treaties are assessed to be of International value, whilst sites designated under UK legislation are of National value.
- 5.1.3 Consideration is also given to legal protection afforded to any ecological receptor within the Site, as are species or habitats identified as 'priorities' for biodiversity conservation in the UK. Local Planning Authorities will often have a duty to consider such species or habitats throughout the planning process, hence their presence within a site is a material consideration.
- 5.1.4 Further frames of reference for individual species are provided by the Red Data Book system, such as the Vascular Plant Red Data List for Great Britain (Cheffings and Farrell 2006) or for birds by reference to the Birds of Conservation Concern (Stanbury *et al.* 2021).

**Table 8.** Ecological Evaluation Criteria

| Value/Importance            | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| International<br>(European) | <p><b>Habitats</b><br/>An internationally designated Site or candidate Site (Special Protection Area [SPA]), provisional SPA, Special Areas of Conservation (SAC), candidate SAC, Ramsar Site, Biogenetic / Biosphere Reserve, World Heritage Site or an area that would meet the published selection criteria for designation. A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat, which are essential to maintain the viability of a larger whole.</p> <p><b>Species</b><br/>Any regularly occurring population of internationally important species, threatened or rare in the UK (i.e. a UK Red Data Book species) or, of uncertain conservation status or, of global conservation concern. A regularly occurring, nationally significant population/number of an internationally important species.</p> |
| National<br>(English)       | <p><b>Habitats</b><br/>A nationally designated Site (Site of Special Scientific Interest [SSSI], National Nature Reserve [NNR], Marine Nature Reserve [MNR] or a discrete area), which would meet the published selection criteria for national designation (e.g. SSSI selection guidelines).</p> <p><b>Species</b><br/>A regularly occurring, regionally or county significant population/number of an internationally/nationally important species. Any regularly occurring population of a nationally important species, threatened or rare in the region or county.</p>                                                                                                                                                                                                                                                                                             |



| Value/Importance                                       | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Regional<br>(South east)                               | <p><b>Habitats</b><br/>Sites that exceed County-level designations, but fall short of SSSI selection criteria.</p> <p><b>Species</b><br/>Any regularly occurring, locally significant population of a species listed as being nationally scarce, which occurs in 16 of 100 10km<sup>2</sup> squares in the UK. A regularly occurring, locally significant population / number of a regionally important species. Sites maintaining populations of internationally/nationally important species that are not threatened or rare in the region or county.</p>                                                                                                                                                                                                                                                                                        |
| Authority Area<br>(e.g. County or District)<br>(Berks) | <p><b>Habitats</b><br/>Sites recognised by local authorities, e.g. Local Wildlife Sites (LWS). County/District Sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves (LNR). A diverse and/or ecologically valuable hedgerow network. Semi-natural ancient woodland greater than 0.25ha.</p> <p><b>Species</b><br/>Any regularly occurring, locally significant population of a considered regional rarity or localisation. Sites supporting populations of internationally/nationally/regionally important species that are not threatened or rare in the region or county, and not integral to maintaining those populations. Sites/features scarce in the County / District or that appreciably enrich the County/District habitat resource.</p> |
| Local<br>(immediate local area or village importance)  | <p><b>Habitats</b><br/>Areas of habitat that appreciably enrich the local habitat resource (e.g. species-rich hedgerows, ponds etc). Sites that retain other elements of semi-natural vegetation that due to their size, quality or the wide distribution within the local area are not considered for the above classifications. Semi-natural ancient woodland smaller than 0.25 ha.</p> <p><b>Species</b><br/>Populations/assemblages of species that appreciable enrich the biodiversity resource within the local context. Sites supporting populations of county/district important species that are not threatened or rare in the region or county, and are not integral to maintaining those populations.</p>                                                                                                                               |
| Site level<br>(Limited ecological importance)          | Sites that retain habitats and/or species of limited ecological importance due to their size, species composition or other factors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## 5.2 Site Evaluation

- 5.2.1 No part of the Site or the immediate surrounding area is covered by any form of designation on ecological grounds. The Thames Basin Heath SPA is, by definition, of **International** value.
- 5.2.2 Longmoor Bog SSSI is of **National** value, whilst the LWS's within 2km of the Site are considered to be of **County** Value.
- 5.2.3 The improved grassland and arable field within the Site are of **Negligible** ecological value.
- 5.2.4 The mature hedgerow and linear belts of trees around the periphery of the Site offer some biodiversity value and contribute to the overall ecological permeability of the Site, as such they have been assessed as being of **Local** value.



- 5.2.5 The hedgerows do not meet the criteria to be classified as 'Important' under the Hedgerow Regulations 2017 on either ecological or historical grounds. They are, however, generally species rich and would be classified as a Habitats of Principle Importance (HPI) under Section 41 of the NERC Act 2006. It should be noted, however, that Maddock (2008) estimated 84% of countryside hedgerows would be classified as HPIs.
- 5.2.6 The Site appears to support a limited grass snake population which would still be classified as being of **Local** value.
- 5.2.7 The breeding bird assemblage is limited, comprising mainly common widespread species typical of an urban fringe environment. However, two Species of Principle Importance (SPI) under Section 41 of the NERC Act 2006 - song thrush and starling – were encountered within the Site, as were two species on the Red List of BoCC and three on the Amber list. Hence, overall, the breeding bird assemblage would be considered to be of **Local** value.
- 5.2.8 Using the criteria presented by Reason & Wray (2023) the bat population recorded to date achieves a score of 13 so does not meet the threshold for County importance. Using Wray *et al* (2010), the foraging and commuting assemblage would be of **Local** value.

## 6 PREDICTED IMPACTS, MITIGATION AND ENHANCEMENTS

### 6.1 Predicted Impacts

#### *Designated Sites*

- 6.1.1 There is the potential for indirect impacts upon the Thames Basin Heath SPA as a result of increased informal recreation due to increased number of residents within a 5km zone of the SPA boundary. The potential impact would be avoided through the provision of Suitable Alternative Natural Green Space (SANG) in conjunction with contributions towards Sustainable Access, Management and Monitoring (SAMM) contributions. Further information on the potential impact and the avoidance measures are presented in a *Shadow Habitats Regulations Assessment* submitted with this application, hence are not discussed further here.

#### *Habitats*

- 6.1.2 The construction of the main development and landscaping would lead to the loss of the majority of the improved grassland and arable land within the Site, which has been assessed to be of **Negligible** ecological value. Hence, its loss, in the absence of mitigation, would result in a **Negligible** effect.
- 6.1.3 The access into the Site and the internal roads are likely to result in the removal of four ash trees and the partial removal of associated understorey in the vicinity of the trees within the linear tree belts and a hedgerow. As the mature tree belts and hedgerows have been assessed to be of **Local** value, the permanent removal of three small sections, in the absence of mitigation, is likely to result in permanent, adverse impact at a **Site** scale of significant.

#### *Species*

- 6.1.4 The construction of the development and landscaping would lead to the loss of much of the improved grassland and arable land on the Site, although it is envisaged that the peripheral vegetation will be retained *in situ* in the main. Nevertheless, there is the potential, in the absence of mitigation, there would be a partial loss of reptile habitat as well as the risk of injury or death to individual reptiles during site clearance works. Hence, this is likely to result in a possible, permanent impact at a **Site** scale of magnitude.
- 6.1.5 The construction of the development and landscaping would lead to the loss of much of the improved grassland and arable land on the Site, as well as three small sections of linear woodland and hedgerow. The linear woodland and hedgerow will provide foraging and nesting opportunities for birds; the arable and improved grassland may provide some limited sub-optimal foraging habitat. Given the extent of the habitat removal, this loss is likely to lead to a **Negligible** impact.
- 6.1.6 The construction of the development and landscaping would lead to the loss of much of the improved grassland and arable land on the Site, as well as three small sections of linear woodland and hedgerow. The hedgerow and linear woodland belt form commuting and foraging habitat for common bat species, whilst the grassland and arable provides some limited foraging opportunities. In the absence of mitigation, this

loss and severance of commuting routes is likely to lead to a permanent, adverse impact at a **Site** level.

- 6.1.7 Light spill from the operation of the scheme has the potential to adversely impact foraging and commuting bats, which, in the absence of mitigation, could lead to a permanent, adverse impact at a **Site** level.
- 6.1.8 Although difficult to quantify, the potential for localised increased levels of predation by domestic pets on both birds and reptiles is anticipated. In the absence of mitigation, this may result in an adverse impact at a **Site** scale on the reptile and breeding bird populations.

## 6.2 Mitigation and Enhancements

- 6.2.1 Habitat creation and ecological enhancements have been considered from the onset, with the landscape design being development with input from the ecology team from the start. Overall, over 60% of the Site is given over to green infrastructure and the creation of high-quality habitats. The access locations and internal roads have been considered giving regard to the trees and hedgerows features, ensuring the greatest impacts are avoided.
- 6.2.2 The main features of ecological value within the application site boundary, namely the hedgerows and linear tree belts, will be retained and enhanced wherever possible. Extensive new boundary planting is proposed to not only provide landscape screening to the Site, but to increase the biodiversity value of the feature as well as increasing the ecological permeability. Apart from the required access and internal road, there would be no built feature within 16m of retained hedgerows.
- 6.2.3 Additional habitat of high ecological value that will be created through the landscape design include:
- Over 8630m<sup>2</sup> of new native woodland planting;
  - 1120m<sup>2</sup> of native scrub, both dry and wet;
  - New wildflower meadow covering approximately 13560m<sup>2</sup>;
  - Species rich wet meadow of over 1510m<sup>2</sup>;
  - A new community orchard covering 820m<sup>2</sup>;
  - 115 new native trees.
- 6.2.4 . The location and extent of each of the above habitats is indicatively shown on the Landscape Strategy drawing prepared by CSA Environmental submitted with this application.
- 6.2.5 The creation of species rich meadow within Site will provide habitats of greater value for reptiles, creating improved foraging opportunities. Consideration will also be given to the creation of hibernacula and log pile in appropriate locations.
- 6.2.6 The woodland and scrub planting will also provide new foraging and nesting opportunities for breeding birds. This will be supplemented by the installation of an appropriate number of nest boxes of varying designs in retained trees around the Site.



- 6.2.7 The woodland and scrub planting will also provide improved foraging habitats for bats, especially when they are in close proximity to wildflower meadows which will have an increase in invertebrate assemblage. Additional roosting opportunities will also be provided by the installation of appropriate bat boxes within the Site.
- 6.2.8 The mitigation and enhancements are predicted to more than offset the potential impacts of the scheme with the residual impacts likely to be positive at a **Local** scale, given that over 60% of the Site will contribute to the green infrastructure. This is reinforced by the results of the Defra Biodiversity Net Gain metric which realised a 50.97% increase in the biodiversity value of habitats and 97.54% in relation to hedgerows within the site post development (Appendix 1), highlighting Croudace's commitment to provide in excess of the 10% minimum increase in BNG.
- 6.2.9 An Ecology Management Plan will be devised for the site to ensure that the maximum ecological benefits are realised on a long term, sustainable manner and that the predicted increase in the BNG of the site is delivered.

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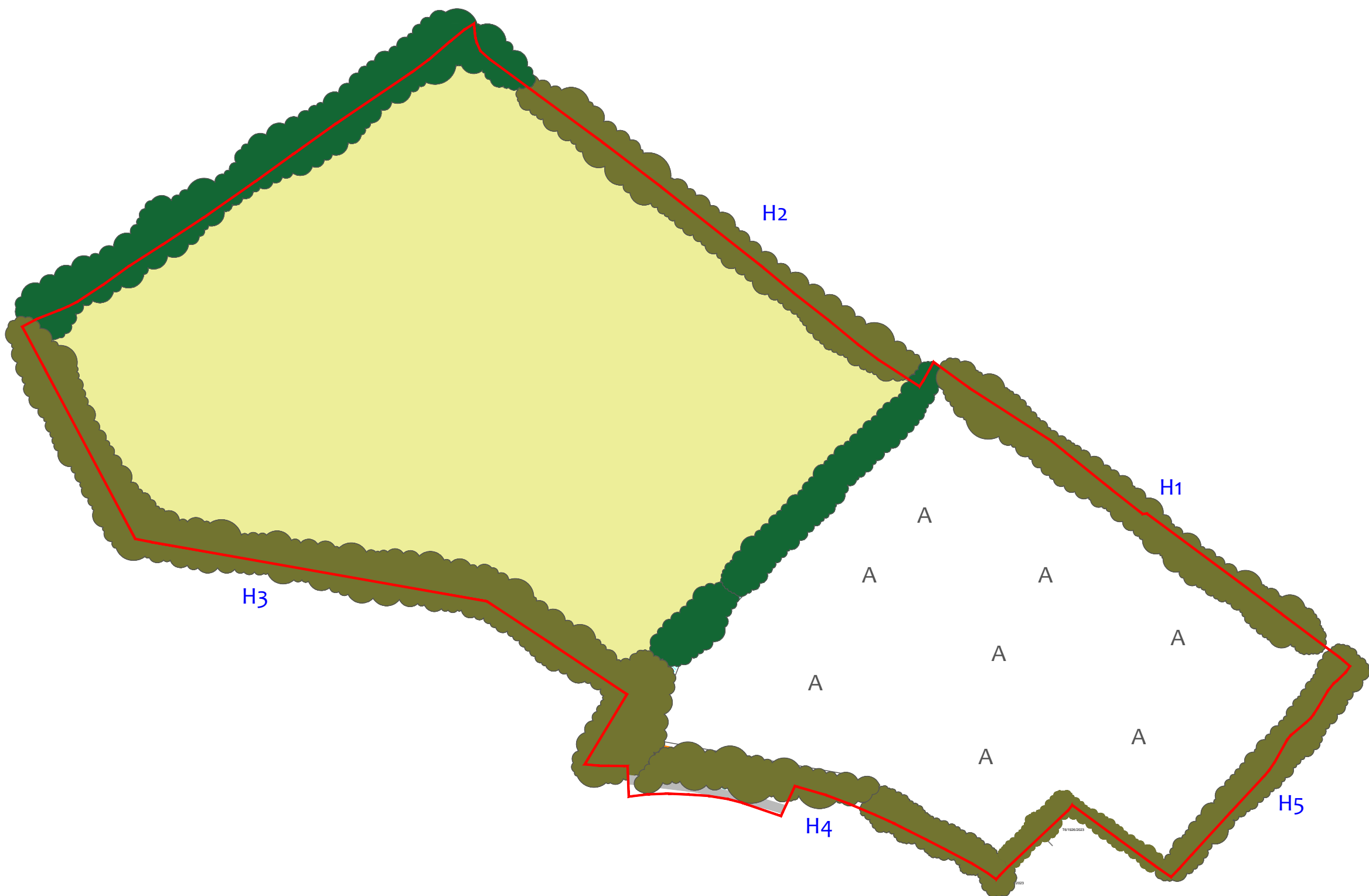
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- Legend
- Broad-leaved trees
  - Hegderows
  - Improved grassland
  - A Arable
  - Hardstanding
  - Application boundary

|                 |                           |
|-----------------|---------------------------|
| Drawing Number: | Figure 1                  |
| Title:          | Phase 1 Habitat Map       |
| Date:           | September 2024            |
| Project:        | Land north of School Road |
| Client:         | Croudace Homes            |



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Legend

- Refugia (approx)
- Grass snake record

|                 |                           |
|-----------------|---------------------------|
| Drawing Number: | Figure 2                  |
| Title:          | Reptile Refugia Locations |
| Date:           | September 2024            |
| Project:        | Land north of School Road |
| Client:         | Croudace Homes            |



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## Appendix 1.

### BNG Report

# Land north of School Road, Arborfield Cross

**Biodiversity Net Gain**

**September 2024**



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**COMMISSIONED BY**

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# **Land north of School Road, Arborfield Cross**

## **Biodiversity Net Gain**

**September 2024**

Report Ref: DFA24073

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## **1 INTRODUCTION**

### **1.1 Background**

1.1.1 Derek Finnie Associates was commissioned by Croudace Homes, Vortal Homes Limited & Falcon Developments (SE) Limited to provide ecological advice in relation to an area of land referred to as Land north of School Road, Arborfield Cross, herein referred to as the 'Site' (Figure 1). Croudace Homes and Vortal Properties Limited are seeking outline permission for a proposed residential development of up to 95 dwellings together with open space and associated works.

1.1.2 As part of the wider assessment a Biodiversity Net Gain calculation, using the Defra Statutory Metric (November 2023 version), was undertaken to provide an objective, quantitative assessment of the baseline ecological condition within the Site as well as the predicted increase in ecological value of the Site post development.

### **1.2 Current Policy and Guidance**

1.2.1 Within Section 98 of the Environment Act 2021, there is provision for achieving a 10% Biodiversity Net Gain (BNG) within a development, with the particulars being covered under Schedule 14 of the Act.

## 2 METHODOLOGY

### 2.1 Defra Metric

- 2.1.1 The Defra Metric looks at the biodiversity value of a site prior to the proposed development by assigning values to each habitat type, the quality or condition of the habitat and the extent of that habitat. This results in a combined value for the site presented in an arbitrary figure expressed as Biodiversity Units. A similar approach is also taken for linear features within a site, such as hedgerows and rivers, where applicable.
- 2.1.2 A second calculation is then undertaken for the post development scenario based on the proposed scheme layout in the absence of detailed landscape planting plans. The difference in units pre and post development is then expressed as a percentage for habitats, hedgerows and rivers (where applicable).
- 2.1.3 If a significant increase in BNG value cannot be achieved within the Site, there is the potential to provide off site enhancements to complement on-site works. Alternatively, it possible to 'purchase' biodiversity units from a third party.

### 2.2 Current Scheme

- 2.2.1 As the current scheme is an application for outline permission only it is not possible to provide a detailed assessment of the post development scenario as yet as these details are not fixed. However, Defra Guidance on an outline application is that decision maker may need to consider more broadly whether the biodiversity gain condition is *capable* of being successfully delivered within a site, rather than relying on details plans to demonstrate how it will be delivered. As the statutory framework for biodiversity net gain involves the discharge of the biodiversity gain condition following the grant of planning permission it would be generally inappropriate to refuse an application on the grounds that the biodiversity gain objective will not be met. (Defra Guidance 019 Reference ID: 74-019-20240214)

### 3 THE SITE

#### 3.1 Current description

- 3.1.1 An 'extended' Phase 1 Habitat Survey was carried out on 12<sup>th</sup> April 2024 which followed the methodology presented by the JNCC (2010). The Phase 1 technique aims to classify each habitat into categories based on the assemblage of plant species present, with the dominant plant species for each habitat being noted. In some cases, sub-divisions or modifications of the standard categories can be made where this is useful in providing further detail.
- 3.1.2 The Phase 1 survey provides sufficient information to allow the habitats present to be placed into a UKHabs V2 classification category, as used in the Defra Metric.
- 3.1.3 Additional information was also collected during the site survey to allow the condition of the habitats identified to be assessed based on pre-determined criteria. The Site, which covers approximately 8.25ha, comprises two fields delineated by outgrown hedgerows. In the past the fields have been reported as supporting horse grazed pasture, but a review of historic aerial photograph would appear to indicate that they have been ploughed and re-seeded, or used for arable crops, several times since 2018. In 2024 the eastern field was given over to arable crops (maize) whilst the western field supported an improved grassland.
- 3.1.4 The following Phase 1 habitats were encountered within, and adjacent to, the Site:
- Broad-leaved woodland (linear);
  - Scattered trees;
  - Hedgerows;
  - Improved grassland; and
  - Arable.
- 3.1.5 Further details of the habitat are presented within the Ecological Appraisal (Derek Finnie Associates Report Ref: DFA24071) submitted with the application and hence are not repeated here. For reference, there are no irreplaceable habitats as defined by the Biodiversity Gain Requirements (Irreplaceable Habitats) Regulation 2024 on site. And there is no evidence that any form of adverse, or destructive, management has taken within the Site which would affect the condition of the habitats present.
- 3.1.6 In terms of the BNG Metric, a summary of the habitats is present in Table 1.

**Table 1.** Summary of on-site habitats

| Habitat                                                             | Condition | Area/length |
|---------------------------------------------------------------------|-----------|-------------|
| Modified Grassland                                                  | Poor      | 4.9ha       |
| Cereal Crops                                                        | N/A       | 3.25ha      |
| Urban: sealed surface (existing road)                               | N/A       | 0.1ha       |
| Ecologically valuable line of trees - associated with bank or ditch | Moderate  | 0.159km     |
| Ecologically valuable line of trees                                 | Moderate  | 0.212km     |

| Habitat                         | Condition | Area/length |
|---------------------------------|-----------|-------------|
| Native hedgerow with trees (H1) | Moderate  | 0.197km     |
| Native hedgerow with trees (H2) | Moderate  | 0.134km     |
| Native hedgerow with trees (H3) | Moderate  | 0.27km      |
| Native hedgerow with trees (H4) | Moderate  | 0.167km     |
| Native hedgerow with trees (H5) | Moderate  | 0.07km      |

### 3.2 Post development

- 3.2.1 From the onset, consideration has been given to creating high quality, species rich habitats within the Site to ensure there is a long-term ecological benefit as a result of the development. There has also been a drive to manage the retained habitats in a more ecological sympathetic manner, with the aim of providing long term, sustainable benefits.
- 3.2.2 Within the landscape strategy for the Site, the creation of new, species rich habitats using native species wherever possible has been one of the principal drivers. These include:
- Over 8630m<sup>2</sup> of new native woodland planting;
  - 1120m<sup>2</sup> of native scrub, both dry and wet;
  - New wildflower meadow covering approximately 13560m<sup>2</sup>;
  - Species rich wet meadow of over 1510m<sup>2</sup>
  - A new community orchard covering 820m<sup>2</sup>;
  - 115 new native trees.
  - 1.5km of new native hedgerows
- 3.2.3 The location and extent of the habitat creation and enhancement is depicted on the Landscape Strategy drawing submitted with this application.

## 4 RESULTS

### 4.1 Headline Results

4.1.1 The headline results from the Biodiversity Metric for presented in Table 2.

**Table 2.**Headline Results

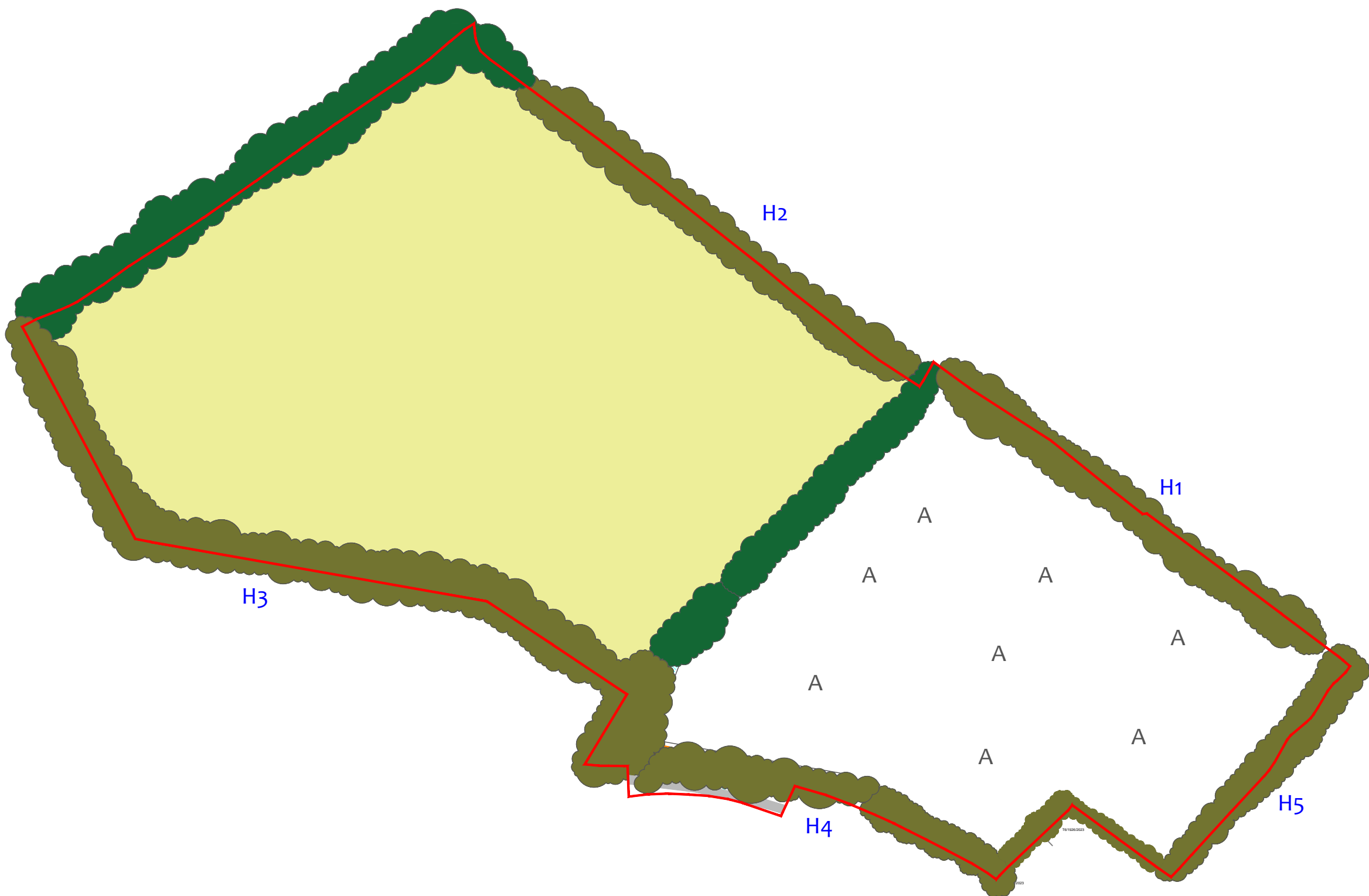
| FINAL RESULTS                                                                                         |                   |        |
|-------------------------------------------------------------------------------------------------------|-------------------|--------|
| Total net unit change<br>(Including all on-site & off-site habitat retention, creation & enhancement) | Habitat units     | 8.31   |
|                                                                                                       | Hedgerow units    | 10.38  |
|                                                                                                       | Watercourse units | 0.00   |
| Total net % change<br>(Including all on-site & off-site habitat retention, creation & enhancement)    | Habitat units     | 50.97% |
|                                                                                                       | Hedgerow units    | 97.54% |
|                                                                                                       | Watercourse units | 0.00%  |
| Trading rules satisfied?                                                                              | Yes ✓             |        |

| Unit Type         | Target | Baseline Units | Units Required | Unit Deficit |
|-------------------|--------|----------------|----------------|--------------|
| Habitat units     | 10.00% | 16.30          | 17.93          | 0.00         |
| Hedgerow units    | 10.00% | 10.64          | 11.70          | 0.00         |
| Watercourse units | 10.00% | 0.00           | 0.00           | 0.00         |

4.1.2 As can be seen from Table 2, a significant increase in the biodiversity value of the Site is achieved for the habitats' component (50.97%) and the hedgerows (97.54%). The full Metric has been submitted as a separate Excel workbook.

## **5 DISCUSSION**

- 5.1.1 As can be seen from Table 2, the proposed development is predicted to result in a net biodiversity gain when the habitat creation and enhancement scheme is implemented. It is proposed that a Landscape and Ecology Management Plan (LEMP) be prepared for each Phase of the scheme to ensure the long-term management of the habitats is undertaken, with appropriate monitoring and remedial works as necessary. The LEMP for each Phase will be detailed the BNG value for each Phase and how this contributed to the Site's overall percentage gain.



- Legend
- Broad-leaved trees
  - Hegderows
  - Improved grassland
  - A Arable
  - Hardstanding
  - Application boundary

|                 |                           |
|-----------------|---------------------------|
| Drawing Number: | Figure 1                  |
| Title:          | Phase 1 Habitat Map       |
| Date:           | September 2024            |
| Project:        | Land north of School Road |
| Client:         | Croudace Homes            |



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# Appendix 1

## Condition Sheets

| Condition sheet: HEDGEROW Habitat Types                                                                                                                                                                                                                                                                                                                                              |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------|----|----|---|--|---------------------------------------------------|--|--|--|-------------------------------|
| Habitat Type                                                                                                                                                                                                                                                                                                                                                                         |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| Native hedgerow<br>Native hedgerow - associated with bank or ditch<br>Native hedgerow with trees<br>Native hedgerow with trees - associated with bank or ditch<br>Species-rich native hedgerow<br>Species-rich native hedgerow - associated with bank or ditch<br>Species-rich native hedgerow with trees<br>Species-rich native hedgerow with trees - associated with bank or ditch |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| Habitat Description                                                                                                                                                                                                                                                                                                                                                                  |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| See the Statutory Biodiversity Metric Technical Annex 2 and UK Habitat Classification:                                                                                                                                                                                                                                                                                               |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  | <a href="#">ukhab – UK Habitat Classification</a> |  |  |  |                               |
| On-site or off-site, site name and location                                                                                                                                                                                                                                                                                                                                          | School Road, Arborfield                                        |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Survey date and Surveyor name                    | D Finnie, April 2024 |    |    |   |  |                                                   |  |  |  |                               |
| Limitations (if applicable)                                                                                                                                                                                                                                                                                                                                                          |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Survey reference (if relating to a wider survey) |                      |    |    |   |  |                                                   |  |  |  |                               |
| Condition Assessment Details                                                                                                                                                                                                                                                                                                                                                         |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| A series of ten attributes, representing key physical characteristics are used for this assessment. Each attribute is assigned to one of five functional groups (A – E) and the condition of a hedgerow is assessed according to the number of attributes from these functional groups which pass or fail the 'favourable condition' criteria.                                       |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| This assessment is based on the Hedgerow Survey Handbook <sup>1</sup> and Favourable Conservation Status document <sup>2</sup> . For further clarification please refer to the Hedgerow Survey Handbook.                                                                                                                                                                             |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| Best practice would be to record the species, age, spacing and other key information about all trees present along a hedgerow within the 'Habitat Description' box, as well as other key features of the hedgerow.                                                                                                                                                                   |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| Hedgerow favourable condition attributes                                                                                                                                                                                                                                                                                                                                             |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| Attributes and functional groupings (A, B, C, D and E)                                                                                                                                                                                                                                                                                                                               | Criteria - the minimum requirements for 'favourable condition' | Criteria description                                            | Habitat parcel reference                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                |                                                                 | H1                                                                                                                                                                                                                                                                                                                                                                                                                                                            | H2                                               | H3                   | H4 | H5 |   |  |                                                   |  |  |  |                               |
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                |                                                                 | Grid reference                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |                      |    |    |   |  |                                                   |  |  |  |                               |
| Core groups - applicable to all hedgerow types                                                                                                                                                                                                                                                                                                                                       |                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Criterion passed (Yes or No)                     |                      |    |    |   |  |                                                   |  |  |  | Notes (such as justification) |
| A1.                                                                                                                                                                                                                                                                                                                                                                                  | Height                                                         | >1.5 m average along length                                     | The average height of woody growth estimated from base of stem to the top of the shoots, excluding any bank beneath the hedgerow, any gaps or isolated trees.<br><br>Newly laid or coppiced hedgerows are indicative of good management and pass this criterion for up to a maximum of four years (if undertaken according to good practice).<br><br>A newly planted hedgerow does not pass this criterion (unless it is >1.5 m height).                      | Y                                                | Y                    | Y  | Y  | Y |  |                                                   |  |  |  |                               |
| A2.                                                                                                                                                                                                                                                                                                                                                                                  | Width                                                          | >1.5 m average along length                                     | The average width of woody growth estimated at the widest point of the canopy, excluding gaps and isolated trees.<br><br>Outgrowths (such as blackthorn <i>Prunus spinosa</i> suckers) are only included in the width estimate when they are >0.5 m in height.<br><br>Laid, coppiced, cut and newly planted hedgerows are indicative of good management and pass this criterion for up to a maximum of four years (if undertaken according to good practice). | Y                                                | Y                    | Y  | Y  | Y |  |                                                   |  |  |  |                               |
| B1.                                                                                                                                                                                                                                                                                                                                                                                  | Gap - hedge base                                               | Gap between ground and base of canopy <0.5 m for >90% of length | This is the vertical 'gappiness' of the woody component of the hedgerow, and its distance from the ground to the lowest leafy growth.<br><br>Certain exceptions to this criterion are acceptable (see page 65 of the Hedgerow Survey Handbook).                                                                                                                                                                                                               | Y                                                | Y                    | Y  | Y  | Y |  |                                                   |  |  |  |                               |

|                                                            |                                             |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |
|------------------------------------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|
| B2.                                                        | Gap - hedge canopy continuity               | Gaps make up <10% of total length; and<br>No canopy gaps >5 m                                                                                                                                                                                                    | This is the horizontal 'gappiness' of the woody component of the hedgerow. Gaps are complete breaks in the woody canopy (no matter how small).<br><br>Access points and gates contribute to the overall 'gappiness' but are not subject to the >5 m criterion (as this is the typical size of a gate).                                                                                                                                                                                                          | N | N | N | N | N |  |  |  |  |  |  |  |  |  |  |
| C1.                                                        | Undisturbed ground and perennial vegetation | >1 m width of undisturbed ground with perennial herbaceous vegetation for >90% of length:<br>· Measured from outer edge of hedgerow; and<br>· Is present on one side of the hedgerow (at least).                                                                 | This is the level of disturbance (excluding wildlife disturbance) at the base of the hedgerow.<br><br>Undisturbed ground is present for at least 90% of the hedgerow length, greater than 1 m in width and must be present along at least one side of the hedgerow.<br><br>This criterion recognises the value of the hedgerow base as a boundary habitat with the capacity to support a wide range of species. Cultivation, heavily trodden footpaths, poached ground etc. can limit available habitat niches. | N | N | N | N | N |  |  |  |  |  |  |  |  |  |  |
| C2.                                                        | Nutrient-enriched perennial vegetation      | Plant species indicative of nutrient enrichment of soils dominate <20% cover of the area of undisturbed ground.                                                                                                                                                  | The indicator species used are nettles <i>Urtica</i> spp., cleavers <i>Galium aparine</i> and docks <i>Rumex</i> spp. Their presence, either singly or together, does not exceed the 20% cover threshold.                                                                                                                                                                                                                                                                                                       | N | N | N | N | N |  |  |  |  |  |  |  |  |  |  |
| D1.                                                        | Invasive and neophyte species               | >90% of the hedgerow and undisturbed ground is free of invasive non-native plant species (including those listed on Schedule 9 of WCA <sup>3</sup> ) and recently introduced species.                                                                            | Recently introduced species refer to plants that have naturalised in the UK since AD 1500 (neophytes). Archaeophytes count as natives. For information on archaeophytes and neophytes see the JNCC website <sup>4</sup> , as well as the BSBI website <sup>5</sup> where the 'Online Atlas of the British and Irish Flora' <sup>6</sup> contains an up-to-date list of the status of species. For information on invasive non-native species see the GB Non-Native Secretariat website <sup>7</sup> .           | Y | Y | Y | Y | Y |  |  |  |  |  |  |  |  |  |  |
| D2.                                                        | Current damage                              | >90% of the hedgerow or undisturbed ground is free of damage caused by human activities.                                                                                                                                                                         | This criterion addresses damaging activities that may have led to or lead to deterioration in other attributes.<br><br>This could include evidence of pollution, piles of manure or rubble, or inappropriate management practices (for example, excessive hedgerow cutting).                                                                                                                                                                                                                                    | Y | Y | Y | Y | Y |  |  |  |  |  |  |  |  |  |  |
| Additional group - applicable to hedgerows with trees only |                                             |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |
| E1.                                                        | Tree class                                  | There is more than one age-class (or morphology) of tree present (for example: young, mature, veteran and or ancient <sup>8</sup> ), and there is on average at least one mature, ancient or veteran tree present per 20 - 50m of hedgerow.                      | This criterion addresses if there are a range of age-classes or morphologies which allow for replacement of trees and provide opportunities for different species.                                                                                                                                                                                                                                                                                                                                              | Y | Y | Y | Y | Y |  |  |  |  |  |  |  |  |  |  |
| E2.                                                        | Tree health                                 | At least 95% of hedgerow trees are in a healthy condition (excluding veteran features valuable for wildlife). There is little or no evidence of an adverse impact on tree health by damage from livestock or wild animals, pests or diseases, or human activity. | This criterion identifies if the trees are subject to damage which compromises the survival and health of the individual specimens.                                                                                                                                                                                                                                                                                                                                                                             | Y | Y | Y | Y | Y |  |  |  |  |  |  |  |  |  |  |

The hedgerow condition assessment generates a weighting (score) ranging from 1 - 3, which is used within the Statutory Biodiversity Metric. The scores for each are set out in the tables below.

#### Condition categories for hedgerows without trees

| Category | Category Requirements                                                                                                                                                                             | Metric Score |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Good     | No more than 2 failures in total;<br><b>AND</b><br>No more than 1 failure in any functional group.                                                                                                | 3            |
| Moderate | No more than 4 failures in total;<br><b>AND</b><br><u>Does not fail both attributes</u> in more than one functional group (for example, fails attributes A1, A2, B1 and C2 = Moderate condition). | 2            |

|                                                                |                                                                                                                                                                                                |              |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Poor                                                           | Fails a total of more than 4 attributes;<br><b>OR</b><br>Fails both attributes in more than one functional group (for example, fails attributes A1, A2, B1 and B2 = Poor condition).           | 1            |
| Score achieved:                                                |                                                                                                                                                                                                |              |
| Condition categories for hedgerows with trees                  |                                                                                                                                                                                                |              |
| Category                                                       | Category Requirements                                                                                                                                                                          | Metric score |
| Good                                                           | No more than 2 failures in total;<br><b>AND</b><br>No more than 1 failure in any functional group.                                                                                             | 3            |
| Moderate                                                       | No more than 5 failures in total;<br><b>AND</b><br>Does not fail both attributes in more than one functional group (for example, fails attributes A1, A2, B1, C2 and E1 = Moderate condition). | 2            |
| Poor                                                           | Fails a total of more than 5 attributes;<br><b>OR</b><br>Fails both attributes in more than one functional group (for example, fails attributes A1, A2, B1 and B2 = Poor condition).           | 1            |
| Score achieved:                                                |                                                                                                                                                                                                |              |
| Suggested enhancement interventions to improve condition score |                                                                                                                                                                                                |              |
|                                                                |                                                                                                                                                                                                |              |

|                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---|--------------------------------------------------|---|----------------------|--|--|--|--|--|--|--|-------------------------------|--|
| Condition Sheet: LINE OF TREES Habitat Type                                                                                      |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Habitat Types                                                                                                                    |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Line of trees                                                                                                                    |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Line of trees – associated with bank or ditch                                                                                    |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Ecologically valuable line of trees                                                                                              |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Ecologically valuable line of trees – associated with bank or ditch                                                              |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Habitat Description                                                                                                              |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
|                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| See the Statutory Biodiversity Metric User Guide.                                                                                |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| This assessment is based on the Hedgerow Survey Handbook <sup>1</sup> . For further clarifications please refer to the Handbook. |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Where ancient and veteran trees are present within the line of trees, see Footnote 2 for standing advice.                        |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| On-site or off-site, site name and location                                                                                      |                                                                                                                                                                                                                                                                                      | School Road Arborfield     |   | Survey date and Surveyor name                    |   | D Finnie, April 2024 |  |  |  |  |  |  |  |                               |  |
|                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                            |   | Survey reference (if relating to a wider survey) |   |                      |  |  |  |  |  |  |  |                               |  |
| Limitations (if applicable)                                                                                                      |                                                                                                                                                                                                                                                                                      |                            |   | Habitat parcel reference                         |   |                      |  |  |  |  |  |  |  |                               |  |
|                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                            |   | 1                                                | 2 |                      |  |  |  |  |  |  |  |                               |  |
|                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                            |   | Grid reference                                   |   |                      |  |  |  |  |  |  |  |                               |  |
| Condition Assessment Criteria                                                                                                    |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
|                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                            |   | Criterion passed (Yes or No)                     |   |                      |  |  |  |  |  |  |  | Notes (such as justification) |  |
| A                                                                                                                                | At least 70% of trees are native species.                                                                                                                                                                                                                                            | Y                          | Y |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| B                                                                                                                                | Tree canopy is predominantly continuous with gaps in canopy cover making up <10% of total area and no individual gap being >5 m wide.                                                                                                                                                | Y                          | Y |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| C                                                                                                                                | One or more trees has veteran features and or natural ecological niches for vertebrates and invertebrates, such as presence of standing and attached deadwood, cavities, ivy or loose bark.                                                                                          | N                          | N |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| D                                                                                                                                | There is an undisturbed naturally-vegetated strip of at least 6 m on both sides to protect the line of trees from farming and other human activities (excluding grazing). Where veteran trees are present, root protection areas should follow standing advice <sup>2</sup> .        | N                          | N |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| E                                                                                                                                | At least 95% of the trees are in a healthy condition (deadwood or veteran features valuable for wildlife are excluded from this). There is little or no evidence of an adverse impact on tree health by damage from livestock or wild animals, pests or diseases, or human activity. | Y                          | Y |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Number of criteria passed                                                                                                        |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Condition Assessment Result (out of 5 criteria)                                                                                  |                                                                                                                                                                                                                                                                                      | Condition Assessment Score |   | Score Achieved ×/✓                               |   |                      |  |  |  |  |  |  |  |                               |  |
| Passes 5 criteria                                                                                                                |                                                                                                                                                                                                                                                                                      | Good (3)                   |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Passes 3 or 4 criteria                                                                                                           |                                                                                                                                                                                                                                                                                      | Moderate (2)               |   | X                                                | X |                      |  |  |  |  |  |  |  |                               |  |
| Passes 2 or fewer criteria                                                                                                       |                                                                                                                                                                                                                                                                                      | Poor (1)                   |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Suggested enhancement interventions to improve condition score                                                                   |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
|                                                                                                                                  |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |
| Footnotes                                                                                                                        |                                                                                                                                                                                                                                                                                      |                            |   |                                                  |   |                      |  |  |  |  |  |  |  |                               |  |