A2 Bean and Ebbsfleet Junction Improvements

Environmental Statement

Volume 2 - Appendix G.4 Biodiversity Options Phase Ecology Baseline Report

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Notice

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Chapter Pages

Executive Summary

Atkins were commissioned by Highways England to undertake a programme of ecological surveys to inform the detailed design of the Scheme. The scope of these surveys was based on the ecological survey results obtained previously by HHJV during the Option Selection Stage.

This report presents the baseline ecological survey results obtained previously by HHJV in 2014, 2015 and 2017. The information in this report has been used in combination with the results of the 2018 ecological surveys undertaken by Atkins to identify and assess the potential implications of the Scheme and inform the requirements for mitigation and compensation for notable habitats and notable and legally protected species. It should be noted that the results in this report provide background data for the Scheme and are now in some cases superseded by ecological data obtained during 2018 (as reported in Appendix G.2).

National legislation and planning policy guidance exists to protect and conserve notable habitats and notable and legally protected species.

The surveys fulfilled their objectives in recording the baseline ecological conditions of the Scheme during the Options Phase. A complete assessment of potential impacts for the Scheme regarding notable habitats and notable and legally protected species is provided in the ES, along with details of mitigation and compensation measures as appropriate.

1. Introduction

1.1 Scope of the Document

1.1.1 This report presents the baseline ecological survey results obtained during the Options Phase in 2014, 2015 and 2017 for notable habitats and notable and legally protected species relevant to the Scheme. The information in this report has been used together with the updated ecological survey results obtained in 2018 (provided in Appendix G.2) to identify and assess the potential implications of the Scheme and inform mitigation and compensation for impacts to ecological receptors relevant to the Scheme.

1.1.2 HHJV were previously commissioned by Highways England to undertake the surveys described in this report. The survey methodoligies and results are provided.

Annex 1 (Options Phase Ecology Baseline Report)

Stage 3 Ecology Baseline Report

A2 Bean & Ebbsfleet Junction Improvements

Document Control

The Project Manager is responsible for production of this document, based on the contributions made by his/her team existing at each Stage.

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The Project SRO is accountable for the content of this document.

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1.1.2 This report presents the baseline conditions with respect to ecology for the Bean Interchange, Ebbsfleet Junction and the adjoining section of the A2. The report provides all information collected from the Options phase (Stage 1 and 2) and the Development phase (Stage 3) of the project.

1.1.3 No sites of international importance for nature conservation are located within 2 km (or 30km for sites designated for bats) search area around the Stage 3 scheme extent. One nationally designated site for nature conservation, Darenth Wood SSSI, was present within the 2km desk study search area, adjacent to the Stage 3 scheme extent. Two non-statutory sites designated for nature conservation were present within the 2km desk study search area.

1.1.4 The Study area supported common and widespread habitats. These included several habitats of principle importance to nature conservation, namely lowland mixed deciduous woodland, some of which is also ancient woodland; lowland meadow; lowland calcareous grassland; rivers; ponds and hedgerows.

1.1.5 Great crested newt environmental DNA and population surveys identified no great crested newts within 250m of the Stage 3 scheme extent. One pond (24a) provided a positive result. This pond is located within the study area but more than 500m from the Stage 3 scheme extent. Any great crested newts breeding within it are unlikely to be present within the scheme.

1.1.6 Suitable habitat for reptiles was found across the Study area and incidental sightings of slow-worm and common lizard have been recorded within the Stage 3 scheme extent. Further surveys to assess the reptile population in these habitats were undertaken in August and September 2017 and identified slow-worm, common lizard and grass snake in ‘low’ to ‘good’ numbers.

1.1.7 Hazel dormouse presence has been recorded at five of the survey locations across the Study area, including habitats within the Stage 3 scheme.

1.1.8 No bats were recorded roosting within Ightham Cottages. Two bat activity surveys identified low activity of mainly common and soprano pipistrelle, with occasional noctule, *Nyctalus* and *Myotis* species. There was one tree within the Stage 3 scheme extent with

low potential to support roosting bats that would be lost during construction of the Bean Junction.

1.1.9 No evidence of otter or water vole has been recorded from the Stage 3 scheme extent and the section of the Ebbsfleet adjacent to the A2 has been assessed as of low value to these species.

1.1.10 Badger setts were recorded in the Study area.

2 Introduction

2.1 Introduction and Background

2.1.1 Highways England plan to carry out improvements to the Bean Interchange and Ebbsfleet Junction, on the A2 in Kent. Halcrow Hyder Joint Venture (HHJV) was commissioned by Highways England in 2014 to carry out the Options phase (Major Projects lifecycle Stage 1 and Stage 2) for improvements. Under this commission, HHJV undertook ecological surveys in 2014 and 2015 to inform the options appraisal outlined in the Stage 1 and Stage 2 Environmental Assessment Reports (Halcrow Hyder JV, 2015; 2016) for the scheme.

2.1.2 HHJV was subsequently commissioned in 2017 to update the ecological information obtained in 2014 and 2015 and undertake further surveys to inform the Development phase (Stage 3) of the project.

2.1.3 This report presents the baseline conditions with respect to ecology for the Bean Interchange, Ebbsfleet Junction and the adjoining section of the A2. The report provides all information collected from the Options phase (Stage 1 and 2) and the Development phase (Stage 3) of the project. The aim of the study was to provide sufficient detail to assess the conservation value of the Scheme (as defined below); investigate the likely presence of rare or protected species; and to identify any features, habitats or species which would constitute potential key ecological constraints to the proposals for improvements to the two junctions.

2.2 Study area and Scheme extent

2.2.1 The scheme extent for Stage 1 and Stage 2 included all land that could be impacted by the various design options that were being considered in the initial phase of the project. For clarity, this area is referred to as ‘the Study area’. The Study area is the outer limit over which ecological surveys were carried out in 2014, 2015 and 2017.

2.2.2 The Stage 3 scheme extent only includes land that falls within the footprint of the chosen design options. As such the area within the Stage 3 red line boundary is substantially reduced. The area with the Stage 3 scheme extent is referred to as ‘the Scheme’.

2.2.3 The Study area and the Scheme extent are shown on Figure 2 (Drawing Number: HA543-HHJV-HGN-ZZZZ-SK-EN-0006).

2.3 Survey timing

2.3.1 The ecological surveys were undertaken in 2014, 2015 and 2017 following consultation with Highways England. Surveys were proportional to the Lifecycle Stage of the project and focussed in areas where impacts would be anticipated. The surveys carried out in 2014 and 2015 were to inform the three options for junction improvement (Stage 1

Environmental Assessment Report (HHJV, 2015)) and the 2017 surveys (Stage 3) were focussed on filling data gaps relevant to the chosen option only.

2.3.2 Table 2-1 (below) outlines the surveys that were carried out and when they were undertaken. The detailed methodology for each can be found in Section 3.

2.3.3 All surveys were undertaken by suitably experienced and, where necessary, licensed ecologists employed by HHJV. All surveys followed the best practice guidance that was in effect at the time of the surveys (limitations to surveys are detailed in Section 3.8 of this report). Refer to Appendix A for scheme specific relevant planning policies and legislation.

Table 2-1 Summary of ecological baseline surveys (in date order)

Survey (including target species/group as appropriate)	Date
Desk study	May 2014; May 2017
Extended Phase 1 habitat and protected species walkover survey	April 2014; May 2015; June 2017
Habitat Suitability Index (HSI) survey of ponds	May 2015, May 2017
Great crested newt (*Triturus cristatus*) environmental DNA (eDNA) survey	June 2015; May 2017
Great crested newt population survey	May 2017
Hazel dormouse (*Muscardinus avellanarius*) surveys	July – December 2014; May – November 2017
Internal / external bat inspection survey	May 2017
Tree assessment for bats	June 2017
Bat activity survey(s)	June 2017; September 2017
Reptile surveys	August to September 2017

3 Methodology

3.1 Desk study

3.1.1 Existing ecological information relating to the Scheme and its surroundings was obtained from the Kent and Medway Biological Records Centre (KMBRC) in March 2014 and May 2017. Recent records (within the last 10 years) were obtained for the following ecological features:

- Statutory and non-statutory designated sites for nature conservation within 2km of the Study area;
- Ancient woodland and habitats of principal importance for the conservation of biodiversity listed in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, (HMSO, 2006) within 1km of the Study area;
- Protected species, species of principle importance for the conservation of biodiversity listed in Section 41 of the NERC Act 2006 (HMSO, 2006) and species of conservation concern up to 1km from the Study area; and
- Non-native invasive species within 1km of the Study area.

3.1.2 The Multi-Agency Geographic Information for the Countryside (MAGIC) website (MAGIC, 2017) was consulted for records of statutory designated sites, ancient woodland, habitats of principal importance and protected species mitigation licences.

3.1.3 The Woodland Trust Ancient Tree Hunt Interactive Map was searched for records of veteran trees held on the Woodland Trust's database (Woodland Trust, 2017).

3.1.4 The Kent Biodiversity Action Plan (KBAP) was reviewed with reference to the priority habitats and species present, or likely to be present, within or adjacent to the Study area (KBAP, 2017).

3.1.5 Land Securities, the owners of Eastern Quarry, which is located immediately to the north of the Bean to Ebbsfleet stretch of the A2, were approached for ecological data in 2015 and 2017 for the development and implementation of the Biodiversity Action Plan Monitoring and Management Plan for the Eastern Quarry site.

3.1.6 The Bluewater Retail Park was approached in 2014 for ecological data which has been obtained from survey work that had been undertaken within their grounds.

3.1.7 The West Kent Badger Group was contacted in 2014 to obtain badger (*Meles meles*) records from within 1km of the Study area.

3.1.8 The developers of Paramount Park, which is located to the north-west of the proposed A2 improvements and includes some of the A2 within the Stage 1 red line boundary, were approached. They provided details of surveys to be undertaken within the A2 project area in relation to their development (pers. comm. Bill Wadsworth, Associate Ecologist, Chris

Blandford Associates). These potentially include aquatic invertebrate, brown hare (*Lepus europaeus*), terrestrial invertebrate, breeding birds, amphibian, and reptile surveys.

3.1.9 The Dartford Borough council planning portal (Dartford, 2017) was reviewed in 2017 for documents relating to other local developments where ecological surveys had been carried out.

3.1.10 The 2014 Halcrow Hyder A2 Bean & Ebbsfleet Junction Improvements – Preliminary Ecological Appraisal (Halcrow Hyder JV, 2015) was also reviewed as part of the desk study process.

3.2 Extended Phase 1 habitat survey

3.2.1 An extended Phase 1 habitat survey was carried out in May 2014 and June 2015. An update to the initial extended Phase 1 habitat survey was carried out in June 2017. Dominant habitat types were mapped following a standard methodology (JNCC, 2010). For each habitat, notes were taken on the plant community including dominant species; species indicative of specific conditions (e.g. pH, soil moisture etc.); non-native invasive plant species; and notable or protected plant species. Other habitat features such as structure, age, and management were also noted. No attempt was made to compile an exhaustive species list of all plant species present in a habitat. Botanical names follow Stace (2010).

3.2.2 In addition to recording information on habitats, the survey was extended to include an assessment of the potential for the Study area to support protected or notable species. This included consideration of the following:

- The value of the Study area for supporting a breeding bird population or any birds of conservation concern;
- The likely value of any aquatic and / or terrestrial habitat within the Study area for use by foraging and hibernating amphibians, particularly with regard to protected species such as great crested newt;
- Buildings or trees with features that have the potential to support roosting bats;
- A search for any characteristic signs of badger activity, including setts, latrines, paths, footprints, hairs and feeding signs;
- An assessment of habitats to support reptiles;
- An assessment of hedgerow and woodland habitat within the Study area to support hazel dormouse;
- The presence of any invasive species such as Japanese Knotweed (*Fallopia japonica)*, Indian (Himalayan) Balsam (*Impatiens glandulifera)*, or Giant Hogweed (*Heracleum mantegazzianum)*; and
- An assessment of the likely value of the Study area for other protected or otherwise notable species or groups including invertebrates.

3.2.3 In 2014 and 2015, data was collected on paper maps and forms. In 2017, all data was collected via the Collector application for ArcGIS on a GPS enabled tablet device.

3.3 Great crested newts

3.3.1 A review of aerial photography and the 1:25,000 Ordnance Survey (OS) map of the area was undertaken to identify waterbodies within, and up to, 500m from the Study area where

there would be no major barrier to the movement of newts (e.g. major roads, residential areas) between these waterbodies and the Study area. This review excluded the seven lakes at Bluewater Retail Park and the ponds within Eastern Quarry because recent great crested newt survey information was already available for these waterbodies.

Habitat Suitability Index assessment of waterbodies

3.3.2 Ponds within 500m of the Study area that were accessible to survey were assessed for their potential to support great crested newts using the Habitat Suitability Index (HSI) tool developed by Oldham *et al.* (2000), (ARC, 2010). This index grades the ponds in terms of how suitable they are for great crested newts based on ten features of a waterbody. This enables identification of ponds with potential for supporting great crested newts and which require further survey, in this case eDNA testing and population surveys (see Section 3.3.2 and 3.3.3). The index defines suitability of a pond as:

- < 0.5: poor suitability,
- 0.5 – 0.59: below average suitability;
- 0.6 – 0.69 average suitability;
- 0.7 – 0.79 good suitability and;
- > 0.8 excellent suitability;

3.3.3 The HSI score cannot be used to state that GCN are present or absent in a pond, but that they are more or less likely to be present in a waterbody. As such, HSI scores alone cannot be used to rule ponds in, or out, from further survey.

3.3.4 A total of ten waterbodies were assessed using the HSI in 2015. Ponds within the Eastern Quarry land Bluewater Retail Park were excluded from surveys as these ponds had previously been subjected to great crested newt surveys by other consultancies. These surveys followed the standard protocols used for the HHJV surveys; thus, the results are considered comparable. Ponds with an HSI of average or above (> 0.6) were sampled for great crested newt eDNA (see Section 3.3.5 below).

3.3.5 The HSI results can be found in Appendix C.

eDNA surveys

3.3.6 Ponds with a HSI greater than 0.6 (i.e. average suitability or above) and had an accessible bank from which to safely collect water samples were subject to eDNA survey. In June 2015, water samples were taken from seven ponds. In May 2017, an additional eDNA survey was carried out at one pond (Pond 13), and a re-sample was taken from a second pond (Pond 22a) as access in 2015 was limited to the inlet pipe. Samples were taken from locations around the circumference of each pond where access allowed following a standard protocol (Biggs *et al.* (2014)).

3.3.7 Laboratory analysis of these water samples was undertaken by FERA (2015) and Sure Screen Scientifics (2017) to identify if great crested newt DNA was present. A positive result would indicate that great crested newt DNA was present in the water and that they are using the waterbody. A negative result indicates that no great crested newt DNA was present in the sample and so not using the waterbody.

3.3.8 The eDNA surveys were undertaken by licensed great crested newt surveyors (Polly Tayler – Great Crested Newt Licence Number: 2015-18485-CLS-CLS and Mike Head –

Great Crested Newt Licence Number: 2014-6208-CLS-CLS). Survey limitations are detailed in Section 3.8.

3.3.9 The full eDNA results can be found in Appendix C.

Population and presence / absence surveys

3.3.10 Two ponds (Pond 13 and 22a) were also targeted for further surveys in spring 2017. Pond 22a had a positive eDNA result in 2015 and was subject to population surveys; Pond 13 had previously not been surveyed and was subject to presence / absence surveys.

3.3.11 Great crested newt surveys were undertaken in accordance with the Great Crested Newt Mitigation Guidelines (GOV, 2015; English Nature, 2001). Survey visits followed the Guidelines which state that:

"*presence / absence surveys should be carried out over 4 visits in suitable weather conditions between mid-March and mid-June with at least 2 visits in peak season (usually mid-April to mid-May)"*

and

"*population size class assessment surveys should be undertaken over 6 visits in suitable weather conditions from mid-March to mid-June, with at least 3 of these visits during mid-April to mid-May*."

3.3.12 To ensure the surveys were carried out within the restricted window for great crested newts, population surveys were undertaken in conjunction with eDNA surveys. The eDNA samples were taken before the traditional surveys commenced. Where a negative result was confirmed from the eDNA surveys, the population and presence/absence surveys ceased prior to required number of visits.

3.3.13 Three survey techniques were used per each visit, where possible from the following:

- *bottle trapping* - bottle traps (made from 2-litre plastic bottles) were set out around the edge of the ponds and left overnight at a density of one trap per 2m of bank at locations where the bank was accessible;
- *egg search* - any live or dead submerged vegetation that was within reach from the pond margin, especially folded leaves, were examined for newt eggs, where vegetation was not accessible or present within the pond artificial eggs strips were added to allow egg searching to take place;
- *torch survey* - the ponds were searched for great crested newt at night by shining a powerful 1,000,000 candlepower torch around the pond margins to reveal any newts present; and
- *netting* - a perimeter walk of the pond margins was undertaken and a long-handled dip net was used to sample the area around the pond edge where access to open areas of water was possible.

3.3.14 All surveys were carried out by licensed newt surveyor Polly Tayler – Great Crested Newt Licence Number: 2015-18485-CLS-CLS.

3.3.15 Limitations to the survey are detailed in Section 3.8.

3.4 Reptiles

Reptile habitat assessment

3.4.1 In 2017, a reptile habitat assessment was undertaken during the extended Phase 1 habitat survey. This assessment mapped areas of habitat considered to be of moderate or high suitability for reptiles. Habitats favoured by reptiles tend to be sunny, open, undisturbed, well-drained and often south-facing. The habitat assessment was based on the presence of these habitat features as well as dense vegetation structure, aspect and topography, connectivity to other habitats likely to be of value to reptiles, availability of food sources and the presence of overwintering habitat.

Reptile surveys

3.4.2 Following the habitat assessment, targeted reptile surveys were undertaken in accordance with best practice guidelines contained within the Herpetofauna workers' manual (Gent & Gibson 1998) in August - September 2017.

3.4.3 Artificial refugia consisting of a mix of roofing felt tiles and bituminous corrugated sheets cut to approximately 0.5m^2 were laid out on 22nd August 2017 in ten areas highlighted by the reptile habitat assessment (Areas A – J, Figure 4 (Drawing: HA543917-HHJV-HGN-ZZZZ-SK-EN-0008)). A density of no fewer than 10 artificial refuges per hectare were placed, with greater concentrations around key habitat features such as hedgerows, grassy banks, verges and scrub edges. Refugia placed along road verges were pegged down with camping pegs to prevent them blowing onto adjacent roads. Refuges were allowed seven days to 'bed in' before the first inspection, to give sufficient time for discovery and utilisation by reptiles.

3.4.4 Surveying commenced on 31st August 2017 and consisted of six survey visits from the end of August to the end of September. The following methods were adopted during survey visits:

- Direct observation: reptiles observed basking in the open were recorded; and
- Artificial refugia searches: on each survey visit, all reptiles observed under, on top of, or next to the refugia were recorded.

3.4.5 The optimum conditions for surveying reptiles are periods of intermittent sunshine, with little or no wind, with an air temperature between 9 and 18ºC. Survey visits were conducted during optimum conditions as far as was practically possible.

3.4.6 Classification of the relative size of reptile populations (low, good and exceptional) followed criteria set out in Froglife Advice Sheet 10 (Froglife, 1999) based on the maximum number of reptiles counted in one area in one survey effort. Populations of reptiles recorded in the surveyed areas were assessed as:

- Low - five or fewer adult reptiles seen, by observation or under refugia, in one area, in one day.
- Good - five to ten grass snake (*Natrix natrix*) / adder (*Vipera berus*) or five to 20 common lizard (*Zootoca vivipara*) / slow-worm (*Anguis fragilia*) adults seen, by observation or under refugia, in one area, in one day; or
- Exceptional - greater than ten grass snake/adder or 20 common lizard/slow-worm adults seen, by observation or under refugia, in one area, in one day.

3.4.7 Limitations to the survey are detailed in Section 3.8.

3.5 Bat surveys

Preliminary bat roost assessment – buildings / structures and bat box inspections

3.5.1 The extended Phase 1 habitat survey identified several buildings / structures within the Scheme as being potentially suitable for roosting bats. A daytime internal / external inspection was undertaken of properties on Bean Lane (Ightham Cottages) where access was permitted and on a stable and three outbuildings. The surveys were carried out on 10th and 11th May 2017 and on the 28th June 2017 following the methodology outlined in the Bat Conservation Trust's Bat Surveys: Good Practice Guidelines (Collins, 2016).

3.5.2 The exteriors of the buildings were searched for evidence of use by bats, and for features offering roosting potential or allowing access into the interior of the buildings. Where possible, the attics of the buildings were searched for bats and evidence of bats, such as droppings, feeding remains, urine staining, scratch marks and the remains of dead bats. All accessible roof areas were searched paying special attention to the areas along and beneath ridge beams and ridge junctions, chimneys, gable walls and eaves. A high-powered torch, binoculars, and a ladder were used, as appropriate, during the survey.

3.5.3 Based on the findings of the internal / external inspection, and with reference to best practice guidance, each building was assessed as having negligible, low, moderate or high potential to support roosting bats.

3.5.4 Two bat boxes located within the Scheme were inspected for evidence of use by roosting bats on 28th June 2017 by a licenced bat surveyor.

3.5.5 All buildings / structures considered to have potential were subject to dawn re-entry surveys.

3.5.6 The buildings / structures surveyed are illustrated on Figure 6 (Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0010).

3.5.7 The surveys were carried out by licenced bat surveyors Patrick James (licence number 2015-14826-CLS-CLS) and Katherine Cooper (Licence number 2015-12413-CLS-CLS).

Preliminary ground level bat roost assessment – trees

3.5.8 A preliminary assessment of trees within the Scheme was undertaken during the extended Phase 1 habitat survey to determine whether they offer potential features for roosting bats, following the Bat Conservation Trust Survey Guidelines (Collins, 2016). A preliminary ground level assessment was carried out to identify any features within the trees which could be used by roosting bats such as rot holes, woodpecker holes, snapped branches

and cracks in the trunk. Trees were assessed to ascertain whether they had negligible, low, moderate or high potential to support bats.

3.5.9 Where trees within the Stage 3 scheme extent were not easily accessible or considered to be of high or moderate potential for bats they were noted for further inspection using a fiberscope from a ladder.

3.5.10 The trees found to be offering potential for roosting bats are illustrated on Figure 6 (Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0010).

3.5.11 The assessment was undertaken by licensed bat surveyor (Katherine Cooper – Bat Survey Licence number 2015-12413-CLS-CLS).

Bat activity surveys

3.5.12 Two bat activity transects were carried out in the location of the new A2 eastbound on-slip of the Bean Interchange. This included part of a horse paddock to the east of the stables and a section of Bean Lane adjacent to Ightham Cottages. The purpose of the surveys was to identify how bats used this area and whether bat foraging or commuting routes could be impacted by the proposed east bound on-slip.

3.5.13 A summer activity survey was carried out in June 2017 and an Autumn survey in September 2017 following best practice guidance (Collins 2016).

3.5.14 The transects incorporated the eastern paddock and field boundary features which included hedgerows and tree lines to the east and around part of a pond. The transects were walked by a pair of bat surveyors at a measured pace and any bats observed and the direction of flight was recorded. The surveys were undertaken using batloggers that allowed bat calls to be recorded for subsequent identification using BatSound software.

3.5.15 Figure 6 (Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0010) shows the activity transect survey routes.

Bat roost dawn re-entry survey

3.5.16 A dawn re-entry survey was undertaken on the accessible buildings located within the Scheme which offered potential roosting sites to bats. The survey was undertaken by experienced surveyors, using batloggers, allowing bat calls to be recorded for subsequent identification using BatSound software.

3.5.17 The survey was undertaken on 29th June 2017 in accordance with the best practice guidance (Collins 2016), which details the number of emergence surveys recommended to provide confidence in a negative roost assessment based on the value of the building as a bat roost, survey effort in relation to roost suitability is detailed below.

- Low roost suitability – one dusk emergence or dawn re-entry survey between May and September (optimal period May to August).
- Moderate roost suitability – two separate survey visits - one dusk emergence and a separate dawn re-entry survey between May and September.

- High roost suitability – three separate survey visits - at least one dusk emergence and a separate dawn re-entry survey. The third visit could be carried out at either dusk or dawn.

3.5.18 The surveyors were in place two hours before sunrise and continued to survey until sunrise (by this time any bats using a roost are likely to have returned).

3.6 Hazel dormouse survey

3.6.1 Habitats within the Study area were assessed during the extended Phase 1 habitat survey for suitability to support hazel dormouse. The assessment considered availability of food sources; connectivity to other suitable habitats; and the size, age, structure and condition of habitat. This information was used to make a qualitative assessment of the likely suitability of each habitat feature for hazel dormouse.

3.6.2 The results of the habitat assessment combined with the desk study information were used to decide whether a dormouse survey was necessary.

3.6.3 A dormouse survey was undertaken with reference to guidance provided in The Dormouse Conservation Handbook (Bright et al 2006). The main survey method used was a 'dormouse nest-tube survey', whereby specially constructed artificial nesting tubes were fastened underneath horizontal tree/shrub branches in areas of suitable habitat and left in place over a period of several months. When present, dormice often find and make nests in these tubes, and their presence can then be detected by means of periodic monitoring to find actual animals, nest remains, feeding remains, droppings or hairs, all of which are distinctive.

3.6.4 The standard survey methodology requires the deployment of at least 50 nest tubes per area and uses a scoring system based on the likelihood of a nest tube being occupied in any specific month. Nest tubes are most frequently occupied in May, August and September and so these months score the highest. A survey effort score of 20 or above should be achieved before the absence of dormice can be assumed. The Index of probability (the score) for each month is given in Table 3-1, below.

Table 3-1 Dormouse survey Index of probability scores for each month

Month	Index of Probability (score)
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

3.6.5 One hundred and sixty-one dormouse tubes were installed in suitable habitats, where access permitted to the north and south of the A2 between 7th and 11th July 2014, tubes were left in place and checked until December 2014. The 2014 surveys achieved a survey score effort of 16 as the tubes were in place for August, September, October and November (Table 3-2, below).

3.6.6 Access to The Thrift ancient woodland and road verges around Bean Lane was not possible during the 2014 surveys so additional surveys were carried out in 2017. Seventy-five tubes were installed (55 in The Thrift and 20 in the road verge between the westbound A2 carriageway and Bean Lane) on 17th and 18th May 2017, tubes were left in place and checked monthly until November 2017. The 2017 surveys achieved a survey score effort of 20 as the tubes were in place for June, July, August, September, October and November (Table 3-2, below).

3.6.7 Checks were carried out on dates shown in Table 3-2, below.

Table 3-2 Dormouse survey dates

Visit number	Date
2014	
1	18th & 19th August 2014
2	2nd & 3rd October 2014
3	3rd & 4th November 2014
4	4th & 5th December 2014
2017	
1	13th June 2017
2	12th July 2017
3	21st August 2017
4	12th September 2017
5	18th October 2017
6	7th November 2017

3.6.8 The 2014 surveys were carried out by licensed dormouse surveyor Benjamin Goodger (WML-CL10A/CLS000493) and the 2017 surveys were carried out by licensed dormouse surveyor Georgina Tayler (2017-28430-CLS-CLS).

3.6.9 Habitats considered suitable to support hazel dormouse and the locations of the nest tubes are identified on Figure 5 (Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0009).

3.7 Badger

3.7.1 Badger surveys were undertaken during the extended Phase 1 habitat survey to establish whether badgers were present within the Study area. The survey involved a walkover of

the Study area concentrating on habitat suitable for badgers and searching for characteristic signs of badger activity including setts, latrines, paths, footprints, hairs and signs of foraging. Any badger setts and their entrance holes were located then classified in accordance with the criteria below (Harris, 1989; **Error! Reference source not found.**-2).

Table 3-3 Badger sett description criteria

Sett type	Description
Main	These are in continuous use; they are large, well-established, and often extensive, large spoil heaps outside the entrances may also be present. There are likely to be well-worn paths leading to the sett.
Annexe	These occur in close association with the main sett (usually within 150m), and are linked to the main sett by clear, well-used paths. Annexe setts consist of several holes, but they are not necessarily in use all the time, even if the main sett is very active.
Subsidiary	These usually comprise five holes or more, but are not in continuous use and are usually some distance from the main sett (50m or more). There is no obvious path connecting them to the main sett and their 'ownership' can often only be determined by bait marking.
Outlier	These consist of only one or two holes. They can be found anywhere within the territory and usually have small spoil heaps, indicating that they are not very extensive underground. There are no obvious paths connecting them to other setts, they are only used sporadically and often used by foxes or rabbits when not occupied by badgers.

3.7.2 The size, status and level of activity of each sett was assessed by counting the number of entrance holes. The degree of use of each entrance hole can be classified using the descriptions presented in Table 3-3, below (Harris, 1989).

Table 3-4 Badger hole use description criteria

Hole status	Description
Well-used holes	These are clear of any debris or vegetation and are obviously in regular use. There may be evidence of recent excavation or fresh prints.
Partially-used holes	These are not in regular use and have debris such as twigs or leaves in the entrance and moss or other plants growing in or around the entrance. A minimal amount of clearance would be necessary for badgers to continue using the hole.
Disused holes	These are holes which have not been in use for some time and would require a considerable amount of clearance before they could be used. A very long-disused hole may be just a depression in the ground and the remains of a spoil heap.

3.8 Limitations

Desk study

3.8.1 Data held by the local record centre is submitted by members of the public on an *ad hoc* basis. It is not a comprehensive list of all species that could be present.

3.8.2 Statutory and non-statutory sites that are designated for their geological interest are not reported in this document.

Phase 1 habitat survey

3.8.3 Residential or commercial properties within the Study area were not accessed when no impact was anticipated (e.g. properties within the Bean Triangle). Access was not permitted to five properties at Ightham Cottages. All other land within the Scheme was accessed during the 2014 and/or 2017 surveys.

Great crested newt surveys

3.8.4 In 2015, access to Pond 22a was limited resulting in the eDNA sample being taken from one location only, close to the water inlet, this had the potential to create false negatives or false positives on the eDNA result. Due to this limitation Pond 22a was re-surveyed in 2017 using eDNA once more comprehensive access had been granted, this is therefore not considered a limiting factor of the eDNA surveys.

3.8.5 Population surveys at Pond 22a were restricted due to steep concrete sides and turbid water. Safe access to the water's edge to carry out bottle trapping and egg searching was not possible. Recommended survey effort was not undertaken at Pond 22a. To compensate an additional eDNA survey was undertaken along with torching in sub-optimal conditions and the use of egg strips. These survey methods identified smooth newts (*Lissotriton vulgaris*); and so, would have likely picked up great crested newts if present.

3.8.6 HHJV have not carried out surveys on ponds where there is extant ecological data, for example in development sites adjacent to the scheme. All third-party reports follow the same standards and survey methods, and so are sufficiently robust.

Reptile surveys

3.8.7 Suitable reptile habitat in the north-west corner of the Bean triangle was not surveyed due to the presence of used syringes found when laying down artificial refugia (RTN1, Figure 6, Drawing: HA543917-HHJV-HGN-ZZZZ-SK-EN-0008). Slow worm had previously been

found in this area during the Phase 1 habitat survey and it is assumed that other species of reptile are also likely to be present.

3.8.8 It was not possible to survey land within the horse sanctuary due to likely disturbance of artificial reptile refugia by the horses and likely disturbance of the horses by undertaking surveys (RTN2, Figure 6).

3.8.9 Two areas: land between the A2 westbound Bean on and off slip (RTN3, Figure 6) and land between A2 Ebbsfleet westbound on and off slip (RTN4, Figure 6), highlighted in the reptile habitat assessment as containing favourable reptile habitat were inaccessible due to high volumes of traffic and no safe way to cross.

3.8.10 The road verge north of the eastbound off slip and roundabout to the south of reptile survey Area D at the Bean Interchange was mown after artificial refugia were placed, destroying the refugia. The short sward that followed the mowing made these areas unsuitable for reptiles.

3.8.11 Despite these limitations, general coverage across the Scheme was good and is considered to provide a sufficient indication of the likely reptile populations present within the Scheme.

Bat surveys

3.8.12 Access to survey Ightham cottages was limited, access was not permitted to cottages No. 2, 4, 6, 7 and 9. Access was agreed for external inspections only at two cottages: 3 and 10.

3.8.13 The front of the cottages were subject to dusk/dawn surveys as they could be undertaken without interfering with residents at unsociable hours. The rear of the properties could not be surveyed, and the presence of bats should not be fully ruled out.

3.8.14 To ensure the animals within the horse sanctuary were not adversely affected by the bat transect survey, it was limited to one hour only with access permitted to the east end of the paddock. While the time was not in line with best practice guidance the location of the survey was considered to encompass the most suitable habitat for bats and activity in the vicinity would have been picked up on the detectors. The direction in which bats were flying was estimated by observations made along the transect.

3.8.15 The recommended survey effort for bat transects is for three transects one in spring, summer and autumn. Only two bat transect surveys were carried out in the summer and autumn 2017. Based on the low levels of bat activity it is not considered that a spring survey would be necessary.

Hazel dormouse surveys

3.8.16 Due to access issues during the 2014 surveys the tubes were not in place early enough to reach a recommended survey score effort of 20 needed to assume absence. This was not considered a major limitation as dormouse were subsequently found to be present at several locations including within roadside planting. Based on this survey data and

supported by desk study information it was agreed with Highways England that dormouse presence would be assumed in all suitable habitats that were surveyed.

Badger surveys

3.8.17 An area of dense scrub and landscape planting on the south side of the A2 was too dense to survey adequately for badgers. No other evidence of badger activity e.g. latrines or paths was recorded, but as a precaution their presence should not be ruled out.

4 Baseline Ecological Conditions

4.1 Sites designated for conservation value

Statutory designated sites

4.1.1 There were no statutory designated sites of international importance to nature conservation within 2km of the Study area, and no Special Areas of Conservation for which bats are a qualifying feature within 30km of the Study area.

4.1.2 There is one statutory designated site of national importance for nature conservation within 2km of the A2 Study area (see Figure 1; Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0005). Darenth Wood Site of Special Scientific Interest (SSSI) is adjacent to the Scheme. The woodland is considered one of the most valuable areas of ancient semi-natural woodland in north-west Kent with many rare species of invertebrates and plants including White Helleborine (*Cephalanthera damasonium*) and Field Eryngo (*Eryngium campestre*), Ground Pine (*Ajuga chamaepitys*) and Man Orchid (*Orchis anthropophora*) as well as hazel dormouse.

Non-statutory designated sites

4.1.3 There are two non-statutory designated sites of importance to nature conservation within 2km of the A2 Study area. Ebbsfleet Marsh Local Wildlife Site (LWS) is situated 0.2km east of the Ebbsfleet Junction. The site comprises scrubby marshland and reedbeds with rare invertebrates, amphibians, waterfowl, wading birds and water vole (*Arvicola amphibius*). Beacon Wood Country Park LWS is situated 0.4km south of the Ebbsfleet Junction. The site supports pockets of ancient semi-natural woodland and a large water body, with rare plants (including Sea Club-rush (*Bolboschoenus maritimus*), aquatic moss and Round-leaved Wintergreen (*Pyrola rotundifolia*)), fungi and invertebrates, amphibians, woodland and farmland birds, badger and hazel dormouse.

4.1.4 A Kent Wildlife Trust Roadside Nature Reserve is present approximately 1200m north of the Scheme on the north-east side of Mounts Road, Greenhithe. From aerial images and Google Street View photographs the verge appears to consist of a hedge only.

4.2 Plants and habitats

Habitats

4.2.1 Habitats identified during the extended Phase 1 habitat survey are described below and shown on Figure 2 (Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0006). Habitats and features of particular value are identified by Target Notes (TN) on the map and listed in Appendix B.

Woodland and scrub

Ancient woodland and veteran trees

4.2.2 There are five areas of ancient woodland within the 1km Study area (see Figure 1; Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0006):

- Darenth Wood SSSI (TN1, Figure 2), located west of the Bean Interchange. The woodland had a mixed canopy of tree species which included Sessile Oak (*Quercus petraea*), Pedunculate Oak (*Quercus robur*), Hornbeam (*Carpinus betulus*) and Ash (*Fraxinus excelsior)* with a Hazel (*Corylus avellana*) and Hawthorn (*Crataegus monogyna*) understorey. The ground flora included ancient woodland species such as Bluebell (*Hyacinthoides non-scripta*), Butcher's-broom (*Ruscus aculeatus*), Spurge Laurel (*Daphne laureola*) and Wood Anemone (*Anemone nemorosa*).
- The Thrift, located south of the A2 (TN2, Figure 2; Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0006). This woodland had a mixed canopy which included Sessile Oak and Hornbeam, Ash and Wild Service-tree (*Sorbus torminalis*). Several ancient woodland indicator species were present in the ground flora, including Bluebell and Wood Anemone.
- Two small areas of woodland, possibly remnants of The Thrift located within the A2/A296/Bean Lane triangle (TN3 and TN4, Figure 2; Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0006); and
- Parkhill Wood, approximately half way between the Bean and Ebbsfleet Junctions, south of the A2 (TN5, Figure 2).

4.2.3 Each of these five areas supported semi-natural broadleaved woodland and qualify as 'lowland mixed deciduous woodland'; a habitat of principal importance under the NERC Act 2006 (HMSO 2016). 'Mixed broad-leaved woodland and plantations on ancient woodland sites' is also KBAP priority habitat.

Semi-natural broadleaved woodland (excluding ancient woodland)

4.2.4 The extended Phase 1 survey identified additional areas of broadleaved woodland within or adjacent to the Scheme, the majority of which were located around the Bean Interchange. These comprise:

4.2.5 Two areas of woodland partially within the Scheme. The first of these is a block of semi-mature woodland north and east of Ightham Cottages (TN6, Figure 2). The woodland canopy supported Sycamore (*Acer pseudoplatanus*) with scattered Sessile Oak and Hornbeam trees. The densely shaded woodland had an Ivy (*Hedera helix*)-dominated ground flora.

4.2.6 The second of these woodland blocks is the north-west corner of the Thrift (TN9, Figure 2). The woodland is broadly similar in character to the Thrift, but not considered ancient.

4.2.7 There are two semi-natural broadleaved woodlands entirely outside, but adjacent to the Scheme. The largest of these is within the Bean Interchange (TN7, Figure 2). This woodland has a canopy of Hornbeam, Ash, Beech (*Fagus sylvatica*) and Wild Cherry

(*Prunus avium*) with a Hazel understorey and several of ancient woodland indicator species including Butcher's-broom and Spurge Laurel.

4.2.8 Another woodland within the Bean Interchange (TN8, Figure 2) is north of, and continuous with, a block of ancient woodland (TN3, Figure 2), north of the A2. The canopy of this woodland comprised Silver Birch (*Betula pendula*), Ash and oak (*Quercus spp.*).

4.2.9 Each of these four areas supported semi-natural broadleaved woodland and qualify as 'lowland mixed deciduous woodland'; a habitat of principal importance under the NERC Act 2006 (HMSO 2016). 'Mixed broad-leaved woodland and plantations on ancient woodland sites' is also a KBAP priority habitat.

4.2.10 An additional area of wet woodland was identified along the Ebbsfleet River (TN 10, Figure 2), outside of the Scheme northwest of the Ebbsfleet Junction. The canopy comprised Crack-willow (*Salix fragilis*) and Grey Willow (*Salix cinerea*) with a wet ground flora including Watercress (*Nasturtium officinale*). Wet woodland is a habitat of principal importance under the NERC Act (HMSO, 2006) and a KBAP priority habitat.

Plantation broadleaved woodland

4.2.11 Extensive areas of plantation broadleaved woodland are found throughout the Study area and within the Scheme itself. These are entirely landscape planting around the A2, Bean Interchange and Ebbsfleet Junctions. The densely planted trees are between 15 and 20 years old and comprise species such as Hawthorn, Wayfaring tree (*Viburnum lantana*), Wild Cherry, Blackthorn (*Prunus spinosa*), Damson (*Prunus domesticus* subs. *insititia*), Ash and Horse-chestnut (*Aesculus hippocastanum*). Patches of rough grass are scattered throughout, with larger areas west of the B255 road and south of the A2 westbound on-slip at Ebbsfleet Junction.

Scrub

4.2.12 An area of dense scrub was identified within the 'Bean Triangle'. The scrub consisted of Butterfly-bush (*Buddleja davidii*), Gorse (*Ulex europaeus*), Elder (*Sambucus nigra*) and Hawthorn. Other large areas of scrub were located along the carriageway north of Bean interchange opposite Bluewater Retail Park and to the north of the Bean triangle along the carriageway of the A296. This comprised relatively diverse, semi-mature landscape planting. The other major area of scrub was located at TN13. Here semi-improved / improved grassland included stands of scattered scrub comprising Hawthorn, Bramble (*Rubus fruticosus* agg.), Dogwood (*Cornus sanguinea*), Butterfly-bush and Spindle (*Euonymus europaeus*). Other, smaller areas of scrub were located throughout the Study area.

4.2.13 Grassland

Neutral grassland

4.2.14 An area of unimproved neutral grassland was recorded on the road verge adjacent to the A292 and Eastern Quarry and supported a colony of Man Orchid.

4.2.15 Two narrow strips of species-rich semi-improved grassland were present within the Study area: The first of these is within the Scheme, on the road island at Bean Lane. The second is outside of the Scheme, alongside the A296 and around the Ebbsfleet Junction.

4.2.16 The most common grasses recorded in the areas of neutral grassland were Cock's-foot (*Dactylis glomerata*), Annual Meadow-grass (*Poa annua*) and Red Fescue (*Festuca rubra*). A variety of forbs were present, including Common Knapweed (*Centaurea nigra*), Oxeye Daisy (*Leucanthemum vulgare*), Common Broomrape (*Orabanche minor*) and Black Medick (*Medicago lupulina*).

4.2.17 The grassland around the Ebbsfleet Junction also supported Barren Brome (*Anisantha sterilis*), Soft-brome (*Bromus hordeaceus*), Smooth Meadow-grass (*Poa pratensis*), Narrow-leaved Meadow-grass (*Poa angustifolia*), Spotted Medick (Medicago arabica), Cut-leaved Crane's-bill (*Geranium dissectum*), Goat's-rue (*Galega officinalis*), Lucerne (*Medicago sativa*), Field Scabious (*Knautia arvensis*) and Grass Vetchling (*Lathyrus nissolia*). Large numbers of Pyramidal Orchid (*Anacamptis pyramadalis*) were present throughout. A cultivated form of White Clover (*Trifolium repens*) was also present in this area, indicating that these areas could have been seeded.

4.2.18 These areas are classified as 'Lowland Meadows' a habitat of principal importance under the NERC Act 2006 (HMSO, 2006) and a KBAP priority habitat.

Calcareous grassland

4.2.19 Semi-improved calcareous grassland was recorded at three locations. The largest of these is within a fenced compound west of the Bean interchange entirely within the Scheme (TN12, Figure 2). The other two areas were found of the road verges of the Bean Interchange. Species typical of the grasslands included Black Medick, Red Fescue, Grass Vetchling and Wild Carrot with calcareous indicators such as Yellow-wort (*Blackstonia perfoliata*), Marjoram (*Origanum vulgare*), Wild Basil (*Clinopodium vulgare*) and Yellow Oat-grass (*Trisetum flavescens*).

4.2.20 These areas are classified as 'Lowland Calcareous Grassland' a habitat of principal importance under the NERC Act 2006 (HMSO, 2006) and a KBAP priority habitat.

Improved grassland

4.2.21 Within the Bean Interchange was a horse-grazed improved grassland. The grassland is partially within the Scheme (TN13, Figure 2). Most of the fields in the wider landscape south of the A2 supported improved grassland.

Species-poor semi-improved grassland

4.2.22 There was one large area of species-poor semi-improved rough grassland east of Ebbsfleet (TN14, Figure 2), adjacent to the Ebbsfleet Junction. This grassland supported scattered scrub consisting of Hawthorn and Elder.

4.2.23 Narrow strips of regularly mown species-poor amenity grassland were present alongside many of the carriageways. Pyramidal Orchid was found within roadside grassland throughout the Study area.

4.2.24 Open water

Running water

4.2.25 One river (TN15, Figure 2), the Ebbsfleet was identified within the Study area which passed through Ebbsfleet Marshes LWS (see Section 4.1.2). The river had very little flow and wet woodland was present on the banks. Rivers are a habitat of principal importance under the NERC Act 2006 (HMSO, 2006) and 'Chalk Rivers' are a KBAP priority habitat.

Standing water

4.2.26 Several of ponds were identified within the Study area and up to 500m from it. Two of these ponds were located within the Scheme. The ponds varied from permanently dry dene holes (an underground structure consisting of small chalk caves entered by a vertical shaft), overflow balancing ponds and undisturbed ponds with associated aquatic vegetation. Ponds present within the Study area meet the criteria for 'pond' habitat of principal importance under the NERC Act 2006 (HMSO, 2006). Standing open water is a KBAP priority habitat. Descriptions of the ponds are in Table 4-1, Section 4.3.6 – 4.3.16 (Amphibians).

4.2.27 Hedgerows

4.2.28 A total of seven hedgerows were identified within the Study area, one of which is within the Scheme. All the hedgerows comprised native tree and shrub species and meet the criteria for hedgerow habitat of principal importance under the NERC Act 2006 (HMSO, 2006).

4.2.29 Each hedgerow was assessed in accordance with the Hedgerows Regulations 1997 (HMSO, 1997), one hedgerow was classified as important due to its intact nature and species diversity: Hawthorn, Hazel, Goat Willow, Ash, English Elm (*Ulmus procera*), Field Maple (*Acer campestre*), Dogwood, and Apple (*Malus pumila*) with a ground flora that included False Brome (*Brachypodium sylvatica*), Hedge Garlic (*Alliaria petiolata*) and Herb-Robert (*Geranium robertianum*).

4.2.30 Other habitats

Ephemeral/ short perennial (TN16)

4.2.31 An area of ephemeral /short perennial vegetation is found with the Bean Interchange. Vegetation on the bare chalky/flint substrate was sparse, but included several calcareous species including Marjoram, Viper's-bugloss (*Echium vulgare*), Salad Burnet (*Poterium sanguisorba*) and Yellow-wort. Vegetation was increasingly dense as it graded into the surrounding scrub.

Arable

4.2.32 Arable land was found to the west of Bean Interchange and south of the A2. The cereal monocultures were of low ecological value, no evidence of a valuable arable weed flora was recorded.

Other habitats

4.2.33 A small area of reedbed comprising Common Reed (*Phragmites australis*) was identified during the desk study within Ebbsfleet Marshes LWS. Reedbed is a habitat of principal importance in under the NERC Act 2006 (HMSO, 2006), and a KBAP priority habitat (KBAP, 2017).

4.2.34 Other habitats recorded with the Study area, but typically of low value include amenity grassland and tall ruderal vegetation.

4.2.35 Notable plant species

4.2.36 KMBRC provided numerous records of plants of conservation concern within 1km of the Study area. Two species (Field Eryngo, *Eryngium campestre* and Ground-pine, *Ajuga chamaeptis*), listed on Schedule 8 of the Wildlife and Countryside Act (as amended) (HMSO 1981), and species of principal importance under the NERC Act 2006 (HMSO, 2006), are considered unlikely to be present within the Scheme. There are recent records for four orchid species Man Orchid, Common Spotted-orchid (*Dactylorhiza fuchsia*), Pyramidal Orchid and Bird's-nest Orchid (*Neottia nidus-avis*). All but the latter were recorded within the Scheme. Man Orchid, a species of principal importance in under the NERC Act 2006 (HMSO, 2006) and a KBAP priority species, was recorded at three locations within the Scheme (TN17, Figure 2).

4.2.37 Invasive non-native species

4.2.38 KMBRC provided records of invasive non-native species of plants within 1km of the Study area. Most recent records include Canadian Waterweed (*Elodea canadensis*), Virginia Creeper (*Parthenocissus quinquefolia*), New Zealand Pygmyweed (*Crassula helmsii*) and Yellow Archangel (*Lamiastrum galeobdolon subsp. argentatum*).

4.2.39 Japanese Knotweed was recorded at two locations within the Bean Triangle along the A296 (TN18, Figure 2). Japanese Rose (*Rosa rugosa*) (TN19, Figure 2) was also found in

the Bean Interchange and Giant-rhubarb (*Gunnera tinctoria.*) was found along the Ebbsfleet River (TN10, Figure 2). All three of these species are listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended; HMSO, 1981).

4.3 Protected species and species of conservation concern

4.3.1 Protected species and species of conservation concern were identified through the extended Phase 1 habitat survey and species-specific surveys. Baseline information for species groups are described below and shown on Figures 2 to 6 with features of value identified on Figure 2 by Protected Species Target Notes (PSN) and listed in Appendix B.

4.3.2 **Invertebrates**

4.3.3 Large numbers of records of terrestrial invertebrates of conservation concern were identified during the desk-study from within 1km of the Study area. The majority were records of moths, but there were also records of four butterflies: grizzled skipper (*Pyrgus malvae*); small heath (*Coenonympha pamphilus*); grayling (*Hipparchia semele*); and wall (*Lasiommata megera*). Also: Duffey's bell-head spider (*Baryphyma duffeyi*); stag beetle (*Lucanus cervus*); phoenix fly (*Dorycera graminum*); brown-banded carder-bee (*Bombus (Thoracobombus*) *humilis*); moss carder-bee (*Bombus (Thoracobombus) muscorum*); red-shanked carder-bee (*Bombus (Thoracobombus*) *ruderarius*); five-banded weevil-wasp (*Cerceris quinquefasciata*) and black-headed mason wasp (*Odynerus (Odynerus) Melanocephalus*). All of these are species of principal importance in under the NERC Act 2006 (HMSO, 2006).

4.3.4 Habitats of potential value to terrestrial invertebrates within the Study area include species-rich grassland and the area of mature coppice woodland within Darenth Wood that were identified during the extended Phase 1 habitat survey. Small areas of broad-leaved woodland within the Scheme also provides potential habitat for terrestrial invertebrates.

4.3.5 The areas of recently-planted woodland, scrub and regularly-mown grassland within the Scheme are only likely to support limited assemblages of common terrestrial invertebrate species, and none are considered sufficiently large or diverse to support assemblages of notable invertebrates.

4.3.6 Amphibians

4.3.7 Records for great crested newts were identified within 1 km of the Study area during the 2014 and 2017 desk-study. Records of common toad, *Bufo bufo* (a species of principal importance under the NERC Act 2006 (HMSO, 2006)), and three other species of amphibian (palmate newt (*Lissotriton helveticus*), smooth newt and common frog (*Rana temporaria*)) were also identified. The citation for Ebbsfleet Marsh LWS confirms that great crested newts have been observed within the site. There were also historical records

(maximum 67 adults in 1996) from Beacon Wood Country Park, which is located to the south of Bean and the A2.

4.3.8 A review of OS maps revealed 14 waterbodies with a further three identified during the extended Phase 1 habitat survey.

4.3.9 The latest great crested newt monitoring report for the Eastern Quarry (Middlemarch, 2016a) described a translocation operation that was undertaken under a mitigation licence in 2005. One great crested newt was captured during a trapping programme undertaken in the eastern and western sections of the quarry. This newt was moved to the area of ponds in the north-west part of the quarry. No great crested newts have since been recorded in the annual monitoring of the quarry ponds.

4.3.10 Surveys for great crested newts and other amphibians were also undertaken at Bluewater Retail Park in 2013 (Wildthing Wildlife Consultants, 2013). All seven lakes were assessed as being average, or below average, suitability for great crested newts using the HSI. The absence of this species from all seven lakes was confirmed from survey.

4.3.11 Great crested newt survey data was found on the Dartford Borough council planning portal (Dartford, 2017) for one pond (Pond 16). Surveys of this pond, which is within the development at the Royal Oak public house found great crested newt to be absent from the pond (Landscape Planning Limited, 2013).

4.3.12 A total of 10 waterbodies within 500m of the Study area were assessed using the HSI. Seven of these were sampled for great crested newt presence using eDNA in 2015 and a further one sampled in 2017. A second pond (Pond 22a) was resampled using eDNA as original samples were taken from the inlet only which could have affected the result. Table 4-1, below provides a description of each waterbody along with the HSI and eDNA results. Ponds are shown on Figure 3, Drawing Number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0007.

Table 4-1 Summary of HSI and eDNA results

Pond Number	Description	HSI Score	Habitat Value	eDNA Result	eDNA Survey Year
1	Discussion with ecologist Alan Beaumont at AA Environmental LLP revealed that the pond had been removed as part of the St Clements Development.	N/A			
13	Large pond with Common Reed and Reed Sweet-grass (*Glyceria maxima*) around most of the circumferance.	0.6	Average	Negative	2017
14	Large pond with overgrown thick scrub on all sides. Common Reed fringed most of the pond, with only a small area of open water.	0.52	Below Average	Negative	2015

Pond Number	Description	HSI Score	Habitat Value	eDNA Result	eDNA Survey Year
15	Pond surrounded by dense Bramble scrub, with emergent Bulrush *(Typha latifolia)* and Yellow Iris (*Iris pseudacorus*) bordered by arable fields, a garden and a hedgerow.	0.59	Below Average	Negative	2015
16	Small pond surrounded by hardstanding, a development and a road. Inacccesible for detailed survey. Survey data on Dartford Council Planning Portal identified that great crested newt were absent.	0.49	Poor	N/A	N/A
17	Permanently dry dene hole (an underground structure consisting of small chalk caves entered by a vertical shaft).	N/A			
18	Permanently dry dene hole	N/A			
19	No access to Redrow development. Communication with Josef Saunders of Ecology Solutions about the site concluded : *"…we did not have any wet habitats on site during the various newt breeding seasons when surveys were completed, with those in the north-east of the site ephemeral in nature and not offering suitable habitats for great crested newts*" (pers. comm 2015).	N/A			
20	Pond surrounded by semi-improved grassland and scrub, bordered by a railway track to the east. Vegetated banks with emergent Common Reed and Yellow Iris.	0.73	Good	Negative	2015
21	Large lake with fish and waterfowl. Surroundings include scrub, woodland with railway and roads in vicinity. Little emergent vegetation.	0.29	Poor	N/A	N/A
22	Permanently dry	N/A			
22a	Overflow pond for highway with concrete banks. Emergent vegetation comprised Bulrush. Surrounding habitat semi-improved grassland with young planted broad-leaved woodland.	0.64	Average	Positive / Negative	2015 / 2017
23	Permenently dry	N/A			
24	Overflow pond for road scheme with concrete banks. Emergent vegetation comprised Common Reed round periphery and encroaching into pond. Surrounding habitat semi-improved grassland and planted broad-leaved woodland.	0.62	Average	Negative	2015

Pond Number	Description	HSI Score	Habitat Value	eDNA Result	eDNA Survey Year
24a	Overflow pond for road scheme with concrete banks. No emergent vegetation. Surrounding habitat semi-improved grassland and planted broad-leaved woodland.	0.64	Average	Positive	2015
25	Permanently dry	N/A			
26	Unnamed river that appeared to stop at Ebbsfleet, no culvert found. Very slow flowing creating potential habitat for great crested newts. Vegetated banks and emergent vegetation.	0.74	Good	Negative	2015

4.3.13 The results show that, of the ponds surveyed, two produced positive eDNA results; Pond 22a and Pond 24a (Figure 3, Drawing Number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0007) both of which are balancing ponds within 500m of the Study area.

4.3.14 Having re-assessed these ponds in 2017 against the Stage 3 Scheme boundary, Pond 24a was more than 1km from the Scheme and any great crested newts present within this pond would not be affected by the proposed works. No further population surveys were undertaken at Pond 24a.

4.3.15 Pond 22a is within 500m of the Scheme and was subject to population surveys in May 2017. The eDNA survey and four population surveys recorded no great crested newts or great crested newt eggs within Pond 22a. As great crested newts were not recorded surveys ceased in line with the survey guidance for presence / absence surveys (English Nature, 2001). The surveys recorded the presence of smooth newt.

4.3.16 The detailed results of the HSI, eDNA and population surveys are provided in Appendix C and Appendix D.

4.3.17 Reptiles

4.3.18 Records of slow-worm, common lizard, grass snake and adder were identified in the desk-study.

4.3.19 Slow-worm, common lizard and grass snake have been recorded consistently during annual monitoring surveys undertaken between 2006 and 2016 within Eastern Quarry (Middlemarch, 2016b). There were also four records of adder from locations within Beacon Wood Country Park and Darenth Wood. The Kent Wildlife Trust citation for Ebbsfleet Marshes LWS states that slow-worm and grass snake have been observed within the site, and this was confirmed by the records provided by KMBRC.

4.3.20 Slow-worm and common lizard were both recorded within the Study area during the extended Phase 1 survey in 2014 and 2017:

- Slow-worms were observed to the west of Bean Lane within areas of landscape

planting with semi-improved grassland (PSN2, Figure 2, Drawing Number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0006).

- Slow-worms were recorded at two locations (PSN3 and PSN4, Figure 2) in the north-west corner of the triangle of land between the A2 and the A296 where areas of bare ground and dense scrub provided basking sites.
- Slow-worm and common lizard were observed in the grassland within the species-poor grassland and scrub habitat east of Ebbsfleet Junction (PSN14, Figure 2).
- Slow-worm and common lizard were observed in the unimproved neutral grassland within the Eastern Quarry land (PSN15, Figure 2).

4.3.21 Habitats with the potential to support reptiles have been identified on Figure 4 (Drawing Number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0008) these include areas of rough grassland, scrub and bare ground.

4.3.22 Reptile surveys were undertaken in August and September 2017 to identify the distribution and population size estimates of these species. Reptile surveys focused on 10 areas identified on Figure 4 (Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0008). Three species of reptile: slow-worm, common lizard and grass snake, were recorded within the reptile survey areas in relatively low numbers as shown in

4.3.23 Table 4-2, below, with two areas having a good population. Where the count is nil, it is considered reptile species are likely to be absent from the survey area.

Table 4-2 Reptile survey results showing maximum numbers of individuals (including sub adult and juveniles) and adults found and population age class estimation for each species within each reptile survey area

Reptile survey area	Slow-worm			Common lizard			Grass snake		
	Max No. of individuals	Max No. of adults	Population score	Max No. of individuals	Max No. of adults	Population score	Max No. of individuals	Max No. of adults	Population score
A	0	0	Likely absent	1	0	Low	0	0	Likely absent
B	5	2	Low	0	0	Likely absent	0	0	Likely absent
C	4	3	Low	2	1	Low	2	1	Low
D	22	15	Good	33	11	Good	0	0	Likely absent
E	0	0	Likely absent	29	9	Good	0	0	Likely absent
F	2	2	Low	0	0	Likely absent	0	0	Likely absent
G	0	0	Likely absent	0	0	Likely absent	0	0	Likely absent
H	6	3	Low	3	1	Low	0	0	Likely absent

Reptile survey area	Slow-worm			Common lizard			Grass snake		
	Max No. of individuals	Max No. of adults	Population score	Max No. of individuals	Max No. of adults	Population score	Max No. of individuals	Max No. of adults	Population score
I	0	0	Likely absent	0	0	Likely absent	0	0	Likely absent
J	0	0	Likely absent	0	0	Likely absent	0	0	Likely absent

4.3.24 Anecdotal evidence of adder was reported as present within the horse sanctuary, but none were recorded within any of the surveyed areas and are therefore considered to be present in low numbers if present at all.

4.3.25 Birds

4.3.26 Desk study records of birds were mainly associated with the quarries and wetland habitat to the north of the A2. This included four species listed on Schedule 1 of the Wildlife and Countryside Act 1981 as amended (HMSO 1981), namely peregrine falcon (*Falco peregrinus*), hobby (*Falco subbuteo*), black redstart (*Phoenicurus ochruros*) and kingfisher (*Alcedo atthis*).

4.3.27 A breeding bird survey was undertaken in Eastern Quarry in 2014 and 2016 for the Biodiversity Action Plan Monitoring and Management Plan for the development site (Middlemarch, 2016c). The survey found that the site supported a diverse range of breeding bird species, several of which have specific habitat requirements, and the quarry is deemed to be of County significance for its breeding bird assemblage.

4.3.28 The undisturbed habitats within the Eastern Quarry are outside of the Study area andsimilar habitat are not present within the Study area. The banks of the stream within Ebbsfleet Marshes LWS may have the potential to support nesting kingfisher, but no nesting habitat is present within the Study area.

4.3.29 Records for another Schedule 1 bird species, firecrest (*Regulus ignicapillus*) were identified from the desk study. Firecrest is associated with coniferous forest but can be found in mixed and broadleaved forests where coniferous species are present, particularly when holly and ivy are present. There is no coniferous woodland within or adjacent to the Scheme and few coniferous trees within areas of broadleaved woodland making the presence of Firecrest within the Study area less likely. However, since broadleaved woodland within the Study Area contains reasonable amounts of holly and ivy, Firecrest cannot be completely discounted from nesting within these areas (see TN1, TN2, TN3, TN6, TN7 on Figure 2; Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0006).

4.3.30 Habitats such as woodland, scrub, trees and buildings within the Study area are likely to support common and widespread species, including species of conservation concern such as dunnock (*Prunella modularis*) and song thrush (*Turdus philomelos*). Species such as

these are likely to be present throughout the Study area and could nest within the Scheme where these habitats are present.

4.3.31 Bats

4.3.32 Within the 1km search zone for bats, the desk study returned records of eleven species of bat comprising serotine (*Eptesicus serotinus*), Brandt's (*Myotis brandtii*), Daubenton's Bat (*Myotis daubentonii*), whiskered bat (*Myotis mystacinus*), Natterer's bat (*Myotis nattereri*), Leislers (*Nyctalus leisleri*), noctule (*Nyctalus noctula*), Nathusius' pipistrelle (*Pipistrellus nathusii*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*) and brown long-eared bat (*Plecotus auritus*).

4.3.33 No records of bat roosts were provided by KMBRC from within the Study area. Twelve records of bat roosts were provided by KMBRC located outside the Study area but within 1km, including two roosts in Darenth Wood SSSI, one supporting 21 *Myotis* bats with another being a hibernation roost where Daubenton's bat, Natterer's bat, Brandt's / whiskered bat, brown long-eared bat and common and soprano pipistrelle have all been recorded. In addition, a pipistrelle maternity roost supporting at least 76 bats was identified from the Swanscombe residential area to the north of the Study area.

4.3.34 Roosts were also identified to the south-west of the Ebbsfleet Junction and at the far eastern end of the Study area. Smaller roosts (typically of a single bat) were identified at Darenth Country Park on the eastern edge of Bean, in Gravesend and at two locations in Northfleet.

4.3.35 No bat roosts have so far been identified within Eastern Quarry during the annual bat monitoring surveys which have been undertaken since 2006 (Middlemarch 2014a).

4.3.36 Features were identified that could support a bat roost within and adjacent to the Scheme. These were located within the buildings and trees within and adjacent to the Bean Interchange as identified below and illustrated on Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0010.

4.3.37 Habitats within the Scheme and surrounding Study area (scrub, woodland and grassland) were identified as offering suitable foraging and commuting habitat for the local bat population.

Preliminary Bat Roost Assessment – Buildings / Structures / Bat boxes

4.3.38 Eleven properties at Ightham Cottages, one stable block and three outbuildings were identified within the Scheme and subject to preliminary bat roost assessment. Six of the cottages, the stable block and out buildings were assessed for their suitability to support roosting bats as per the BCT Good Practise Guidelines (Collins, 2016). Five cottages could not be surveyed due to access restrictions. Table 4-3, outlines the results of the preliminary bat roost assessment of these buildings.

Table 4-3 Preliminary bat roost assessment – buildings and structures

Structure	Surveys undertaken	Description	Roosting potential
Cottage 1	Internal and external inspection	Terraced house. Pitched, ridged, tiled roof with front timber soffit box and fascia boards to the rear. Timber loft space with roofing felt	Negligible
Cottage 2	No access for survey		
Cottage 3	External inspection only	Terraced house. Pitched, ridged tiled roof, fascia boards and lead flashing around chimney.	Low
Cottage 4	No access for survey		
Cottage 5	Internal and external inspection	Semi-detached house. Pitched, tiled roof. Party wall to No4. Timber fascia boards along eaves of extension and edge of gable.	Low
Cottage 6	No access for survey		
Cottage 7	No access for survey		
Cottage 8	Internal and external inspection	Terraced house. Pitched roof, tiled with Velux windows. Timber fascia boards and soffit box with concrete flashing around chimney.	Negligible
Cottage 9	No access for survey		
Cottage 10	External inspection only	Mid-terrace cottage. Extension at rear, pitched, tiled roof with UPVC conservatory to rear. Concrete chimney, capped with tiled vent, wooden fascia boards.	Low
Cottage 11	Internal and external inspection	End terrace. Pitched, tiled roof, UPVC fascia board. Tiled porch extension over front bay window / door.	Negligible
Stables	Internal and external inspection	Wooden stables with roofing felt or corrugated sheeting (non-metal), single skin.	Low
Outbuildings	Internal and external inspection	Wooden outbuildings with roofing felt or corrugated sheeting (non-metal), single skin.	Negligible

4.3.39 Two wooden bat boxes were present on semi-mature trees 1.5m above ground level within the horse sanctuary paddock. The inspection found no evidence of use by bats.

Preliminary Bat Roost Assessment – Trees

4.3.40 A total of 11 trees were identified within or adjacent to the Scheme which had features suitable to support roosting bats. The locations of the trees, BT1 to BT11, can be found on Figure 6 (Drawing: HA543917-HHJV-HGN-ZZZZ-SK-EN-0010). The detailed tree roost assessments for these are shown in Appendix F.

4.3.41 All 11 trees were surveyed from the ground level with two of the trees, BT1 and BT2, assessed further using a ladder and fibrescope. Four trees were assessed as having features with 'Moderate' roosting potential (BT4, BT5, BT6 and BT11); five as having 'Low' roosting potential (BT3, BT7, BT8, BT9 and BT10) and two as having 'negligible' potential (BT1 and BT2) following the Bat Conservation Trust (BCT) good practice guidelines (Collins, 2016).

4.3.42 Three of the trees (BT1, BT2 and BT3) were located within the Scheme. BT3 was classified as having 'Low' roosting potential. Under the BCT good practice guidelines recommendations, no further surveys are required of the tree (Collins, 2016). BT1 and BT2 were found to be unsuitable for roosting bats.

4.3.43 One tree, BT11 is located outside, but directly adjacent to the Scheme. Given the proximity of this tree to the scheme, any disturbance impacts on bats may need to be considered once the detailed scheme designs are known.

4.3.44 The other seven trees (BT4 to BT10) are located outside of the Scheme footprint and are unlikely to be affected by the Scheme.

4.3.45 A full assessment of the trees and woodland at the eastern end of the horse paddock (TN7, Figure 2) was not undertaken as this was outside the Scheme, there is potential for these trees to support features suitable for roosting bats.

Bat Activity Transect

4.3.46 A bat activity transect was carried out within the Scheme at the Bean Interchange, close to Ightham Cottages and the adjacent horse sanctuary.

4.3.47 Two bat species were recorded during the bat activity transect in June 2017 including common pipistrelle and soprano pipistrelle with low levels of activity recorded. The majority of the activity was recorded to the south-east of the horse paddock along the woodland edge and over the balancing pond adjacent to the horse paddock (Pond 14 on Figure 4, Drawing Number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0007). Foraging activity was also recorded in the woodland to the north-east of Ightham Cottages on Bean Lane. Flight direction was recorded as part of the survey, no obvious flight lines were noted as most of activity recorded related to foraging.

4.3.48 A slightly greater diversity of bat species was recorded on the second transect survey in September 2017, but activity levels remained generally low, with common pipistrelle being the most active. Other species recorded included noctule and soprano pipistrelle with a few calls unidentified to species level (*Nyctalus* and *Myotis* spp.).

4.3.49 The results of the bat activity transects are presented in Appendix G. The location of the transects and each Point Count are shown on Figure 6 (Drawing: HA543917-HHJV-HGN-ZZZZ-SK-EN-0010).

4.3.50 The bat species, the number of calls and the time that the calls were recorded during the survey have been provided in Appendix G. Note, that the number of bat calls recorded is not representative of the number of individual bats present, but the overall level of bat activity.

Dawn Re-entry Survey

4.3.51 A dawn re-entry survey was carried out on the front of the four properties considered to be of low potential for roosting bats.

4.3.52 No bats were recorded entering the buildings. A small number of common species (common and soprano pipistrelles) were heard foraging in the woodland to the north-east of the cottages and the occasional bat was heard commuting along Bean Lane. In addition to the pipistrelle bats two *Myotis* calls were recorded. All activity ceased approximately 50 minutes before dawn, indicating that bats were roosting away from the area. On the basis of the current survey results it would appear that Ightham Cottages do not support a large or significant roost. However, further survey would be required in areas where access was not granted to rule out the presence of small or transitionary roosts.

4.3.53 Further details of the dawn re-entry survey are given in Appendix H.

4.3.54 Hazel dormice

4.3.55 There are records of hazel dormouse on both the north and south sides of the A2 with good connectivity to habitats within the Scheme.

4.3.56 North of the A2, KMBRC provided one record of hazel dormouse from 2011 to the south of the Bluewater Retail Park in the strip of woodland north of the A296. A dormouse monitoring report provided by Bluewater Retail Park (Wildthing Wildlife Consultants, 2012) gave evidence that hazel dormouse had been recorded within the same area in 2010, 2011 and 2014.

4.3.57 Historical records from 2001 and 2002 show dormouse as being present within the Darenth Wood SSSI.

4.3.58 The latest dormouse monitoring report for the Eastern Quarry (Middlemarch, 2016d) revealed that hazel dormouse were present within the Eastern Quarry site, within the south of the site, which borders the Study area.

4.3.59 Historical records of hazel dormouse to the south of the A2 included a nest in 2001 located in The Thrift ancient woodland (immediately south of the A2 Bean Interchange; Wildthing Wildlife Consultants, 2012) and three records (2001 & 2004) from the Beacon Wood

Country Park immediately south of Bean. No recent records (i.e. within the past 10 years) of dormouse to the south of the A2 were identified during the desk study.

4.3.60 Dormouse tube surveys carried out in 2014 found the presence of dormice in three locations (Figure 5, Drawing: HA543917-HHJV-HGN-ZZZZ-SK-EN-0009):

- two within landscape planting to the north of the A2; and
- one from the northern edge of the woodland within the Bean Interchange (TN7, Figure 2).

4.3.61 Access restrictions in 2014 meant that not all suitable areas were surveyed. Further surveys in 2017 focused on habitat within, or with direct connectivity to habitats within the Scheme that had not previously been surveyed including:

- the Thrift ancient woodland; and
- the road verge between the westbound A2 carriageway and Bean Lane.

4.3.62 Hazel dormouse were subsequently found to be present within both these habitats.

4.3.63 Survey results detailing dormouse evidence and other small mammals are given in full in Appendix I.

4.3.64 The survey results combined with the desk study data indicate that dormice are widespread in the areas surrounding the A2, Bean Interchange and Ebbsfleet Junctions. Notably this includes the relatively young landscape planting surrounding the road network.

4.3.65 Otter

4.3.66 No records of otter were provided from KMBRC.

4.3.67 One watercourse; the Ebbsfleet was identified during the extended Phase 1 habitat survey towards the eastern end of the Study area. The Ebbsfleet is culverted under the A2 and High Speed 1 for over 700m. The watercourse has the potential to support foraging and commuting otters although habitat for them is limited south of the A2 where the source of the Ebbsfleet is a series of field drains through agricultural land.

4.3.68 No signs of otter were identified through incidental observation during the extended Phase 1 habitat survey though a full survey was not undertaken. There is no holt potential within the section of watercourse adjacent to the A2.

4.3.69 Water vole

4.3.70 No water vole records were provided from KMBRC from within the last 10 years.

4.3.71 Water vole surveys were undertaken in the Ebbsfleet Development Area on behalf of Land Securities in 2004 and then annually between 2006 and 2014, and will continue annually as agreed in the Ebbsfleet Joint Monitoring Strategy (Middlemarch, 2014b). The area surveyed by Land Securities includes those parts of the Ebbsfleet Marshes LWS which are located within the A2 Bean and Ebbsfleet Study area. Numerous and regular field signs of

water vole activity have been recorded in these areas, and based upon the total number of field signs, the population of water voles associated with the entire Ebbsfleet stream corridor is considered to be approximately 17 individuals.

4.3.72 One watercourse; the Ebbsfleet was identified during the extended Phase 1 habitat survey towards the eastern end of the Scheme. The Ebbsfleet is culverted under the A2 and the section of the watercourse immediately adjacent to the A2 is engineered and not considered suitable to support water vole.

4.3.73 No signs of water vole were identified through incidental observation during the extended Phase 1 habitat survey though a full survey was not undertaken.

4.3.74 Badger

4.3.75 Badgers are protected under the Protection of Badgers Act (1992). Badger were recorded within the Study Area. As this report is accessible by members of the public, reference to sensitive information, including specific locations in relation to badger setts, have been removed from this report.

4.3.76 Other species of conservation concern

4.3.77 KMBRC provided records of hedgehog (*Erinaceus europaeus*) from within1km of the Study area, mainly from locations in the surrounding towns and villages. It is possible that this species of principal importance under the NERC Act 2006 ((HMSO, 2006), is present within the Scheme extent.

4.4 Health and Safety notes

Asbestos

4.4.1 Fly-tipped sheets of corrugated asbestos were recorded during the field surveys at three locations (TN20, Figure 2, Drawing HA543917-HHJV-HGN-ZZZZ-SK-EN-0006).

Needles

4.4.2 Used hypodermic needles were recorded during the reptile surveys in the area of land which is used as a car park within the Bean Triangle adjacent to Bean Road (OS Grid reference: TQ 58547 72968.

5 Conclusions

5.1.1 No sites of international importance occurred within the 2km (or 30km for sites designated for bats) search area for the Scheme. One SSSI designated for nature conservation, Darenth Wood, was present within the 2km desk study search area, adjacent to the Scheme. Two non-statutory sites designated for nature conservation were present within the 2km desk study search area.

5.1.2 The Study area supported common and widespread habitats. These included habitats of principle importance, namely lowland mixed deciduous woodland, some of which is also ancient woodland; lowland meadow; lowland calcareous grassland; rivers; ponds and hedgerows.

5.1.3 The Study area had the following potential or actual presence of protected species or species of principle importance.

- Man Orchid, a species of principal importance was recorded within the Scheme. Other orchid species were also recorded.
- The non-native invasive plant species Japanese knotweed was recorded within the Scheme. Japanese Rose and Giant Rhubarb were also found in the Study area.
- Twelve invertebrates listed as species of principal importance. Habitats of potential value to invertebrates include the species-rich grassland and mature coppice woodland.
- One pond (Pond 24a) provided a positive result for great crested newts. This pond is located more than 1km from the Scheme and any great crested newts associated with this pond are unlikely to use habitats within the Scheme. No great crested newts were found within 250m of the Scheme.
- Suitable habitat for reptiles is present across the Study area and incidental sightings of slow-worm and common lizard have been recorded within the Scheme. Further surveys to assess the reptile population in these habitats (undertaken late August and September 2017) identified low to good populations of slow-worm, common lizard and grass snake.
- There is nesting habitat for common and widespread birds within the woodland, scrub tree and buildings. Firecrest, which is listed on Schedule 1 of the Wildlife and Countryside Act 1981 have been recorded locally and could nest in broadleaved woodland within the Study area where holly and ivy are present.
- Hazel dormouse have been recorded from surveys at five locations across the Study area, including vegetation within the Scheme boundary. The survey results combined with the desk study data indicate that dormice are widespread in the areas surrounding the A2, Bean Interchange and Ebbsfleet Junctions.
- No bats were recorded roosting within Ightham Cottages. Bat activity surveys identified low activity of mainly common and soprano pipistrelle, with occasional noctule, *Nyctalus* and *Myotis* species. There is one tree within the Scheme with low potential to support roosting bats.
- No evidence of otter or water vole has been recorded from the Scheme and the section of the Ebbsfleet adjacent to the A2 considered to be of low value to these species.
- Badger were recorded within the Survey area.

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Appendix A

Legislation and Policy

Legislation/Policy	Ecological constraint	Rationale
Conservation of Habitats and Species Regulations 2010 (as amended)	European Designated sites (SACs, SPAs and Ramsar Sites)	Part 2 Section 21 An assessment is required where a plan or project may give rise to significant effects upon 'European Sites' including SACs, SPAs, and Ramsar sites. The process of assessing the implications of development on European Sites is known as Habitats Regulations Assessment (HRA).
	Nature conservation policy in planning contexts	Part 2 Section 39 Ensures nature conservation management is included in national planning policy
Conservation of Habitats and Species Regulations 2010 (as amended)	European protected species of animals: Schedule 2 (Includes great crested newt, hazel dormouse, otter, brown long-eared bat, Barbastelle, common pipistrelle, Daubenton's bat, Leisler's bat, lesser horseshoe bat, Natter's bat, noctule, serotine, soprano pipistrelle, Whiskered bat)	Part 3 Section 40-43 For any species listed on Schedule 2 it is an offence to: - Deliberately capture, kill or injure any wild animal of a European Protected Species - Deliberately disturb wild animals of any such species - (Disturbance includes anything which is likely to impair their ability to breed, reproduce, rear or nurture their young, hibernate, migrate, or significantly affect the local distribution or abundance of the species) - Deliberately take or destroy the eggs of such an animal - Damage or destroy a breeding site or resting place of such an animal - Possess, control, transport, sell, exchange, offer for sale or exchange, any live or dead animal or part of an animal, which is included on Schedule 4 and has been taken from the wild, or anything derived from such an animal or any part of such an animal *certain species are only subject to certain parts of the legislation, see Schedule 2 for more detail
	European protected species of plants: Schedule 5	Part 3 Section 44-45 For any species listed on Schedule 5 it is an offence to: - Deliberately to pick, collect, cut, uproot or destroy a wild plant - To be in possession of, or to control, to transport, to sell or exchange, or to offer for sale or exchange, any live or dead plant or part of a plant which has been taken in the wild, and is of a European protected species and anything derived from such a plant or any part of such a plant - Regardless of the stage of the biological cycle of the plant in question

Legislation/Policy	Ecological constraint	Rationale
	Habitats and Species of Principle Importance for Conservation	Part 4 Section 48 Places responsibility on the secretary of state and appropriate nature conservation bodies to monitor the conservation status of habitats and species of principle importance. See NERC Act 2006 Part 3 Section 41.
Wildlife and Countryside Act 1981 (as amended)	Nationally Designated Sites (Sites of Special Scientific Interest)	Part II Section 28E It is a legal requirement to apply for 'assent' from Natural England for any works which could potentially damage the flora, fauna or features for which a SSSI is designated.
Wildlife and Countryside Act 1981 (as amended)	Schedule 1 birds Schedule ZA1 birds Nesting birds	Part I Section 1 It is an offence to intentionally: - kill, injure or take any wild bird - take, damage or destroy the nest of a wild bird included in Schedule ZA1 - take, damage or destroy the nest of any wild bird while that nest is in use or being built - take or destroy an egg of any wild bird - It is an offence to possess or be in control of - any live or dead wild bird or any part thereof - an egg of a wild bird or any part of such an egg - It is an offence to - disturb any wild bird listed in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young - disturb the dependent young of any bird listed in Schedule 1
	Schedule 5 Animals (Includes water vole, common lizard, grass snake, slow worm, many invertebrates)	Part I Section 9 It is an offence to intentionally kill, injure or take any wild animal included in Schedule 5 It is an offence to possess or be in control of any live or dead wild animal, or any part of, or anything derived from any animal included in Schedule 5 It is an offence to intentionally or recklessly damage or destroy, disturb an animal while it is occupying, or obstruct access to any structure or place which any wild animal on Schedule 5 uses for shelter or protection
Wildlife and Countryside Act 1981 (as amended)	Schedule 8 Plants (Includes Bluebell, sale only)	Part I Section 13 It is an offence to - intentionally pick, uproot, or destroy any wild plant included in Schedule 8 - not being an authorised person, intentionally uproot any wild plant not included on Schedule 8 It is an offence to

Legislation/Policy	Ecological constraint	Rationale
		- sell, offer or expose for sale, have in possession or transport for the purpose of sale- - publish or cause to be published any advertisement conveying that he buys or sells or intends to buy or sell- - any live or dead wild plant included in Schedule 8, or any part of or anything derived from such a plant
	Schedule 9 Invasive species	Part I Section 14 It is an offence to release or allow to escape into the wild any animal which - is of a kind which is not ordinarily resident in and is not a regular visitor to Great Britain in a wild state - is included in Part I of Schedule 9 It is an offence to plant or cause to grow in the wild any plant which is included in Part II of Schedule 9
Natural Environment and Rural Communities (NERC) Act 2006	Habitats and Species of Principal Importance for the purpose of conserving biodiversity Section 41 list species	Part 3 Section 40 Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity. Part 2 Section 41 The Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity. The Secretary of State must: - take such steps as appear to the Secretary of State to be reasonably practicable to further the conservation of the living organisms and types of habitat included in any list published under this section, or - promote the taking by others of such steps.
Protection of Badgers Act 1992	Badgers	It is an offence under the Protection of Badgers Act (1992) to damage or destroy a badger sett; obstruct any entrance or a badger sett and disturb a badger whilst it is occupying a badger sett.
Convention on Biological Diversity and the Countryside Rights of Way Act 2000	Section 72 list species	Part III Section 74 It is the duty of any Minister of the Crown (within the meaning of the Ministers of the M1Crown Act 1975), any Government department, and the National Assembly for Wales, in carrying out his or its functions, to have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biological diversity in accordance with the Convention. The Secretary of State, as respects England, and the National Assembly for Wales, as respects Wales, shall each publish a list of, or lists which together comprise, the living organisms and types of habitat which in the opinion of the Secretary of State or the Assembly (as the case may be) are

Legislation/Policy	Ecological constraint	Rationale
		of principal importance for the purpose mentioned in subsection (1). Without prejudice to subsection (1), it is the duty of a listing authority to take, or to promote the taking by others of, such steps as appear to the authority to be reasonably practicable to further the conservation of the living organisms and types of habitat included in any list published by the authority under this section. These lists have been superceded by the NERC Act 2006 Part 3 Section 41.
The Wild Mammals (Protection) Act 1996	All wild mammals	Section 1 If, save as permitted by this Act, any person mutilates, kicks, beats, nails or otherwise impales, stabs, burns, stones, crushes, drowns, drags or asphyxiates any wild mammal with intent to inflict unnecessary suffering he shall be guilty of an offence.
The Hedgerows Regulations 1997	Any 'important' hedgerow growing in, or adjacent to, any common land, protected land, or land used for agriculture, forestry or the breeding or keeping of horses, ponies or donkeys, if: (a) it has a continuous length of, or exceeding, 20 metres; or (b) it has a continuous length of less than 20 metres and, at each end, meets (whether by intersection or junction) another hedgerow.	Section 5 Subject to the exceptions specified in regulation 6, the removal of a hedgerow to which these Regulations apply is prohibited unless: (a) the local planning authority have received from an owner of the hedgerow notice in the form set out in Schedule 4, or a form substantially to the same effect, of his proposal to remove the hedgerow ("hedgerow removal notice") together with the plan and evidence mentioned in the form set out in Schedule 4; and (b) (i) the authority have given to the person who gave the hedgerow removal notice written notice stating that the hedgerow may be removed; or (ii) the period specified in paragraph (6) has expired without the authority having given to that person a hedgerow retention notice stating that the work may not be carried out; and (c) the removal is carried out in accordance with the proposal specified in the hedgerow removal notice; and (d) the hedgerow is removed within the period of two years beginning with the date of service of the hedgerow removal notice.
Biodiversity 2020; A strategy for England's wildlife and ecosystem services	Biodiversity Ecosystem services Green infrastructure	Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services (Ref -27), published in 2011, is the most recent biodiversity strategy for England, and has as its mission to halt overall biodiversity loss, support healthy well-functioning ecosystems, and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.
Standing Ancient woodland and veteran trees:	Ancient woodland and veteran trees	Natural England have produced standing advice relating to ancient woodland and veteran trees. This gives guidance on

Legislation/Policy	Ecological constraint	Rationale
protecting them from development		what planning authorities should consider for developments near ancient woodland

Appendix B

Target Notes (TN)

Target Note Number	Description
TN1	The southern edge of the woodland adjacent to the A2 comprised a scrubby woodland edge with semi mature Pedunculate Oak (*Quercus petrea*), Ash (*Fraxinus excelsior*), Sycamore *Acer pseudoplatanus*) and Silver Birch (*Betula pendula*) with an understory of Dogwood (*Cornus sanguinea*), Hazel (*Corrylus avellana*), Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*). Bramble (*Rubus fruticosus agg.)* was the dominant ground flora species. Also present were Bluebell (*Hyacinthoides non-scripta*), Sweet Woodruff (*Gallium odoratum*), Wood Spurge (*Euphorbia amygdaloides*) and Wood Melick (*Melica uniflora*). The northern edge of Darenth Wood adjacent to the A296 consisted of mature coppice woodland with scattered standard Hornbeam (*Carpinus betulus*) pollards, Field Maple (*Acer campestre*) and Hawthorn of even age. The ground flora was diverse with Wood Anemone (*Anemone nemorosa*), Bluebell, Dog's Mercury (*Mercurialis perrenis*), Stinking Iris (*Iris foetidissima*), Butcher's-broom (*Ruscus acutleatus*), Sweet Woodruff and Spurge-laurel (*Daphne laurelola*). Man Orchid (*Orchis anthopophora*) plants were also in the woodland adjacent to the road.
TN2	Mature broadleaved woodland with a canopy of Sessile Oak, Hornbeam, Silver Birch, Ash, Wild Service (*Sorbus torminalis*) and Wild Cherry (*Prunus avium*). The understorey was predominantly Hazel with Wayfaring tree (*Viburnum lantana*), Guelder-rose (*Viburnum opulus*) and English Elm (*Ulmus minor*). Bramble was locally dominant. Ancient woodland species in the ground flora included Butcher's-broom, Wood Melic, Wood Meadow-grass (*Poa nemoralis*), Bluebell, and Wood Anemone (all occasional to frequent).
TN3	Block of ancient woodland likely to be a remnant of the Thrift (TN2).
TN4	Block of ancient woodland likely to be a remnant of the Thrift (TN2).
TN5	Semi-natural ancient woodland comprising mix of broadleaved species.
TN6	Small block of semi-natural woodland dominated by Sycamore and Sessile Oak, with occasional occurrence of Hornbeam. The understorey comprised Hawthorn, Elder (*Sambucus nigra*) and young Sycamore. The woodland was dense and very shaded with little diversity in the ground flora where Ivy (*Hedera helix*) was dominant.
TN7	Semi-natural mature woodland with a canopy with abundant Hornbeam and Sessile Oak. Other species in the canopy included Ash, Wild Cherry and Wild Service. The understorey was predominantly Hazel with Wayfaring-tree, Holly, Wild Privet (*Ligustrum vulgare*) and Holly (*Ilex aquifolium*). The woodland had large patches of bare ground from trampling. Ancient woodland species were recorded and included Butcher's-broom, Spurge Laurel, violets (*Viola sp.*), Bluebell and Wood Anemone.
TN8	Semi-natural woodland continuous with a block of ancient woodland at its southern end. The canopy comprised oak, Silver Birch and Ash.
TN9	Mature semi-natural woodland continuous with The Thrift ancient woodland. The canopy was dominated by Oak with an understorey of Hazel, Hawthorn, Holly and Elder. The ground flora comprised large patches of Bramble, Common Nettle (*Urtica dioica*), Bracken (*Pteridium aquilinum*) and Bluebell.
TN10	Wet woodland with a canopy of Crack-willow (*Salix fragilis*) and Grey Willow (*Salix cinerea*) and a damp ground flora including Watercress (*Nasturtium officinale*) and Giant-rhubarb (*Gunnera tinctoria*).

TN11	Unimproved neutral grassland supporting a colony of Man Orchid.
TN12	Large open area with compacted ground supporting a sparse calcareous sward. Species typical of the grasslands included Black medic (*Medicago lupulina*), Red Fescue (*Festuca rubra*), Grass Vetchling (*Lathyrus nissolia*), Pyramidal Orchid (*Acamptis pyramidalis*), Smooth Tare (*Viccia tetrasperma*), Creeping Cinquefoil (*Potentilla reptans*), a Hawkbit (*Leontodon* sp.) and Wild Carrot with calcareous indicators such as Yellow-wort (*Blackstonia perfoliata*) and Marjoram (*Origanum vulgare*). Bramble, Hazel, and Hawthorn scrub scattered throughout.
TN13	Intensively grazed horse paddock.
TN14	An area of species-poor semi-improved rough grassland bounds the Ebbsfleet Junction on the east side. This area is interspersed with scattered scrub consisting of Hawthorn and Elder. The course grassland was dominated by False Oat-grass (*Arrhenatherum elatius*). Other herbs recorded included Goat's-rue (*Galega officinalis*), Perforated St John's-wort (*Hypericum perforatum*) and Wild Teasel (*Dipsacus fullonum*).
TN15	The Ebbsfleet stream. The river had a slow flow and engineered banks in the section closest to the A2. The stream passes beneath a culvert.
TN16	Open area of sparsely vegetated ground with a chalk/flint substrate supporting ephemeral and short perennial vegetation but in succession towards calcareous grassland. Species typical of this habitat include Teasel, Pyramidal orchid, Self-heal (*Prunella vulgaris*), Yellow-wort, Salad Burnet (*Poterium sanguisoba*), Viper's-bugloss (*Echium vulgare*), Perforate St John's-wort, Scarlet Pimpernel (*Anagallis arvensis*) and Marjoram. Scattered rose and Bramble scrub was present throughout.
TN17	Man Orchid colony. Found at three locations
TN18	Japanese Knotweed (*Fallopia japonica*). Scattered along the road verge of the A296 and adjacent to the Bean Lane/A296 Junction.
TN19	Japanese Rose (*Rosa rugosa*).
TN20	Asbestos corrugated sheets. Fly-tipped at three locations.

Protected Species Notes (PSN)

PSN Number	Description
PSN2	Reptile observation – 5 female and 1 male slow-worm
PSN3	Reptile observation – 1 slow-worm under refuse
PSN4	Reptile observation – female slow-worm
PSN14	Slow-worm and common lizard were observed in the grassland within the species-poor grassland and scrub habitat east of Ebbsfleet Junction.
PSN15	Slow-worm and common lizard were observed in the unimproved neutral grassland within the Eastern Quarry land.

Appendix C

HSI Assessment results

Pond Number	Geographic Location	Area	Permanence	Water quality	Shade	Waterfowl	Fish	Pond count	Terrestrial habitat	Macrophytes	HSI score	Pond suitability
13	1	0.87	0.90	0.67	1	0.67	0.67	0.40	0.67	0.10	0.60	Average
14	1	0.80	0.90	0.67	1	0.67	0.33	0.40	0.33	0.10	0.52	Below average
15	1	0.70	1	0.67	0.8	0.67	0.67	0.10	0.33	0.90	0.59	Below average
16	1	0.10	1	0.33	1	0.67	0.67	0.40	0.33	0.40	0.49	Poor
20	1	1	0.90	0.67	1	0.67	0.67	0.40	1	0.40	0.73	Good
21	1	>2000 m^2	0.90	0.67	1	0.01	0.01	0.40	0.67	0.30	0.29	Poor
22a	1	0.45	0.90	0.33	1	0.67	0.67	0.60	0.67	0.45	0.64	Average
24	1	0.86	0.1	0.67	1	1	1	0.40	0.67	0.80	0.62	Average
24a	1	1	1	0.33	1	0.67	0.67	0.40	0.67	0.30	0.64	Average
26	1	>2000 m^2	0.90	0.67	0.4	0.33	0.33	0.6	1	0.80	0.69	Good

eDNA results

Pond	Great Crested Newts Detection	Great Crested Newts Score[1]	Inhibition[2]	Degradation[3]
14	Negative	0	No	No
15	Negative	0	No	No
20	Negative	0	No	No
22a	Positive	2	N/A	N/A
24	Negative	0	No	No
24a	Positive	1	N/A	N/A
26	Negative	0	No	No

2017 eDNA results

Pond	Great Crested Newts Detection	Great Crested Newt Score[3]	Sample Integrity Check[4]	Inhibition[4]	Degradation Check[5]
13	Negative	0	Pass	No	No
22a	Negative	0	Pass	No	No

[1] Number of positive replicated from a series of twelve
[2] For negative samples, DNA from the target species was not detected, in these cases the DNA extract is further tested for PCR inhibitors. If controls indication inhibition of the sample, the lack of detection of GCN DNA is not conclusive evidence for determining the absence of the species in the sample provided.
[3] The stability of field sampling is assessed through the use of appropriate artificial DNA marker to check for unexpected decay of DNA between sampling and analysis. If controls indication degradation of the sample, the lack of detection of GCN DNA is not conclusive evidence for determining the absence of the species in the sample provided.
[4] Refers to quality of packaging, absence of tube leakage, suitability of sample and absence of any factors that could potentially lead to result errors

Appendix D

Presence / absence survey results Pond 13

Visit	Date	Air Temperature (°C)	Wind Speed	Rain	Cloud Cover	Turbidity[5]	Vegetation Cover[6]	Survey Method Used				Amphibians recorded
1	02/05/17	10.5	Light	None	7/8	2/3	3	Y	Y	Y	N	Frogs and tadpoles
2	04/05/17	10.0	Light	None	6/8	4	4	Y	Y	Y	N	Tadpoles & smooth newts
3	08/05/17	9.5	Light	None	7/8	3/4	4	Y	Y	Y	N	Tadpoles and smooth newts
4	Negative eDNA result confirmed - presence / absence surveys stopped											

[5] Turbidity score (0-5). 0 = completely clear, 5 = very turbid

[6] Vegetation cover (0-5). 0 = no vegetation obscuring water, 5 = water completely obscured by vegetation

Presence / absence survey results Pond 22a

Visit	Date	Air Temperature (°C)	Wind Speed	Rain	Cloud Cover	Turbidity[7]	Vegetation Cover[8]	Survey Method Used				Amphibians recorded
1	02/05/17	10.5	Light	None	7/8	3/4	1	Y	N	N	N	Smooth/Palmate newts
2	04/05/17	10.0	Light	None	6/8	5	2	Y	Y	N	N	Smooth/Palmate newts
3	08/05/17	9.5	Light	None	7/8	4/5	2	Y	Y	N	N	Smooth/Palmate newts
4	31/05/17	20	No wind	Light	7/8	5	2	Y	Y	N	N	Smooth newts

[7] Turbidity score (0-5). 0 = completely clear, 5 = very turbid

[8] Vegetation cover (0-5). 0 = no vegetation obscuring water, 5 = water completely obscured by vegetation

Appendix E – Reptile Survey Results

Date	Start time	End time	Start temp	End temp	Weather	Comments	Area	Slow Worm					Common Lizard					Grass Snake			
								Adult			Sub-Adult	Juv	Adult			Sub-Adult	Juv	Adult			Juv
								M	F	U			M	F	U			M	F	U	
31/08/2017	06:50	08:00	9.4	11.7	Sunny, 0% cloud cover, very light breeze, cold, fresh	Only had time to cover Ebbsfleet junction	E							2							
							F														
							G														
							H														
							I														
							J														
07/09/2017	13:45	16:15	18	19	patches of sun, 90% cloud cover, occasional breeze. Rained for 20 minutes	Rough grass around tins in Area C had been mown	A										1				
							B	1	1			3									
							C		1			1					1				
							D	3	10			9	2	3	2		5				
							E							1	2		10				
							F	1	1												
							G														
							H		2							1					
							I														
							J														
12/09/2017	08:30	11:30	13.9	18	Sunny, 0% cloud cover at start, 25% cloud cover at end. Light breeze	Grass road verge along the south and east edge of Area D had been mown	A										1				
							B														
							C														
							D	2	3			1	3			1	16				
							E						2	3	3		3				
							F														
							G														

Date	Start time	End time	Start temp	End temp	Weather	Comments	Area	Slow Worm					Common Lizard					Grass Snake			
								Adult			Sub-Adult	Juv	Adult			Sub-Adult	Juv	Adult			Juv
								M	F	U			M	F	U			M	F	U	
							H				1										
							I														
							J														
12/09/2017	15:50	16:55	18	18	90% cloud cover, few spots of rain, strong breeze	Only had time to cover Bean junction	A														
							B					2									
							C	1	1			1	1								1
							D	2	5		1		6	5	1		2				
13/09/2017	10:50	14:10	17	19	30 - 60% cloud cover, sunny patches, warm/humid, occasional strong breeze		A														
							B					1									
							C	1	1			2			1		1			1	1
							D	2	6		1	4	3	1	2		8				
							E						5	4	3		6				
							F	1	1												
							G														
							H						1								
							I														
							J														
20/09/2017	09:40	12:10	14	15	overcast, muggy, 90% cloud cover		A														
							B		1			1									
							C	1	2			1		1							1
							D	2	7		2	3	3	5	1		17				
							E							3	1		11				
							F		1												
							G														
							H		3		1	2									

Date	Start time	End time	Start temp	End temp	Weather	Comments	Area	Slow Worm					Common Lizard					Grass Snake			
								Adult			Sub-Adult	Juv	Adult			Sub-Adult	Juv	Adult			Juv
								M	F	U			M	F	U			M	F	U	
							I														
							J														
27/09/2017	12:41	16:05	18	20	Warm and Sunny 50% cloud cover muggy, light breeze		A														
							B					4									
							C		1						1						
							D	6	9			1	2	4	5		22				
							E						1	2	2		24				
							F		2												
							G														
							H		1		1	3			1		2				
							I														
							J														

Appendix F – Bat Tree Assessment Results

Bat Tree Number.		**BT1**	**BT2**	**BT3**	**BT4**	**BT5**	**BT6**
Species and trunk diameter at 1.5 m		Ash	Oak	Sycamore	Sycamore	Sycamore	Sycamore
Features	Trunk cavity / butt rot	✓				✓	
	Branch cavity / hazard beam		✓		✓		
	Pruning wound / rot hole						
	Loose bark						
	Woodpecker hole						
	Double leader						✓
	Other (see notes)						
Depth of feature		Unknown	Unknown	Unknown	Unknown	>5cm	>10cm
Height of feature		5m	4m	Unknown	NE / E facing	2.5m, NW facing	2.5m, SE facing
Roosting potential	High						
	Moderate				✓	✓	✓
	Low		✓	✓			
	Negligible	✓					
Notes		Hole in trunk, unable to see depth of feature from ground level	Split in side of limb, unable to see depth of feature from ground level.	Trunk covered in mature Ivy (*Hedera helix*), close to	Hole in underside of limb.	Rot hole in trunk	Possible cavity where two trunks meet. Trunk covered by Ivy.

			storage container no.89			

Bat Tree Number.		BT7	BT8	BT9	BT10	BT11
Species and trunk diameter at 1.5 m		Sycamore	Sycamore, 1m	Sycamore, 1m	Sycamore	Oak
Features	Trunk cavity / butt rot					
	Branch cavity / hazard beam					
	Pruning wound / rot hole					
	Loose bark					
	Woodpecker hole					✓
	Double leader					
	Other (see notes)					
Depth of feature		Unknown	Unknown	Unknown	Unknown	Unknown
Height of feature		Unknown	Unknown	Unknown	Unknown	6-8 m
Roosting potential	High					
	Moderate					✓
	Low	✓	✓	✓	✓	
	Negligible					
Notes		Trunk covered in mature Ivy – multiple stems – could provide or obscure roosting opportunities	Multiple stems, Ivy covering main trunk. No obvious features seen from ground, but tree of age and stage where features could be present at height.	No obvious features seen from ground, but Ivy obscures main trunk, tree of age and stage where features could be present at height.	Trunk covered by mature Ivy, adjacent to storage container no. 95	Mature 2 stemmed oak with 2 woodpecker holes between 6-8m high. Potential roosting feature - future survey if affected by scheme.

Appendix G – Bat Activity Transect Survey Results

Transect Survey Metadata

Date	Temperature (ºC)	Cloud cover	Wind speed (Beaufort scale 1-12)	Rain	Sunset	Start time	Finish time	Time of first bat	Time of last bat
28/06/17	15	8/8	1	None	21:20	21:00	22:29	21:32	22:24
12/9/2017	13	7/8	4	Light rain from 19:49	19:19	19:00	20:21	19:08	20:17

Bat Activity Transect Survey Results, June – Number of Calls

Survey date	**28/06/17**	
Bat species	Number of Calls	Time(s)
Common pipistrelle	11	21:36:36; 21:37:38; 21:39:29; 21:43:23; 21:45:34; 21:46:15; 21:48:10; 21:48:32; 21:48:56; 22:12:30; 22:24:46.
Soprano pipistrelle	8	21:35:51; 21:36:00; 21:36:36; 21:46:15; 22:07:10; 22:12:15; 22:17:40; 22:22:43.

Bat Activity Transect Survey Results, September – Number of Calls

Survey date	**12/09/17**	
Bat species	Number of Calls	Time(s)
Noctule	1	19:08:02
Nyctalus species	3	20:17:20 20:17:24 20:17:28
Common pipistrelle	21	19:36:21 19:44:42 19:46:41 19:47:03 19:48:50 19:48:53 19:49:02 19:49:05 19:49:36 19:49:55 19:50:05 19:50:14 19:50:27 19:51:05 19:51:31 19:52:28 19:52:52 19:53:08 19:56:29 20:11:31 20:14:16
Soprano pipistrelle	2	19:42:06 19:47:20
Pipistrelle species	1	19:49:53
Myotis species	3	19:49:36 19:50:14 19:50:59

Appendix H – Dawn Re-entry Survey Metadata

Date	Temperature (°C)	Cloud cover	Wind speed (Beaufort scale 1-12)	Rain	Sunset	Start time	Finish time	Time of first bat	Time of last bat
29/06/17	14	8/8	1	None	04:44	02:44	04:44	02:46	03:53

Appendix I – Dormouse Survey Results

Date	Tube Number	Comments (Highlighted rows indicate dormouse evidence)
18-19.08.2014	11	Possible hazel dormouse nest of green and brown leaves and small number of strips of honeysuckle bark, but structure loose and green leaves found across the ground too
	30	Small cache of gnawed Ash keys - removed
	39	Wood mouse and nest - removed
	144	Tube found on the ground - reinstalled
	155	Wooden insert replaced
2-3.10.2014	6	Beginning of wood mouse/yellow-necked mouse nest - removed
	8	Wood mouse/yellow-necked mouse nest - removed
	11	1 juvenile female hazel dormouse 14.5g in nest of woven strips of bark and green and brown leaves
	28	1 male wood mouse 27.5g and Sweet Chestnut feeding remains - removed
	29	Possible hazel dormouse nest of brown and green leaves and strips of bark but very loose
	30	Feeding remains of Sycamore and Ash keys - removed
	39	Probable wood mouse/yellow-necked mouse nest of brown and green leaves - left just in case it is a dormouse nest
	44	Sweet Chestnut feeding remains
	46	1 male wood mouse 28.5g and Sweet Chestnut feeding remains - removed
	50	Feeding remains - gnawed acorns
2-3.10.2014	85	Tube found on the ground - reinstalled
	92	Tube on Ash which had been felled – reinstated on Field Maple
	100	1 wood mouse/yellow-necked mouse - escaped
	101	Possible hazel dormouse nest of brown and green leaves, mostly green, and shredded dry grass but very loose
	102	1 male wood mouse 20g in nest of small number of green and brown leaves and stripped bark
	104	1 wood mouse/yellow-necked mouse - escaped
	112	Small amount of gnawed seeds
	145	Tube found on the ground with wooden inner broken - plastic outer re-installed
3-4.11.2014	2	Wood mouse/yellow-necked mouse nest of brown leaves - removed
	11	Old and decomposing dormouse nest - removed
	16	Feeding remains
	18	Sweet Chestnut feeding remains
	19	Sweet Chestnut feeding remains
	24	Feeding remains and several green Ivy leaves

Date	Tube Number	Comments (Highlighted rows indicate dormouse evidence)
	29	1 male wood mouse 17g in nest of loose brown leaves and bark strips
	47	Feeding remains
	49	1 juvenile female dormouse 24.5g in nest of tightly woven bark strips and green leaves
	64	Hazel dormouse nest of tightly woven bark strips and green leaves
	92	Not found - replacement tube installed
3-4.11.2014	100	Probable wood mouse/yellow-necked mouse nest of brown leaves and small amount of dead grass strips
	101	Probable wood mouse/yellow-necked mouse nest of brown leaves with feeding remains
	118	1 wood mouse/yellow-necked mouse - escaped
	120	Tube found on the ground with wooden inner missing - plastic outer re-installed
	121	Not found
	122	Not found
	123	Not found
	145	Wooden inner missing
	150	Wooden inner missing
4-5.12.2014	2	Wood mouse/yellow-necked mouse nest of brown leaves - removed
	28	Feeding remains
	46	Feeding remains
	48	Feeding remains
	49	Old hazel dormouse nest - removed
	56	Sweet Chestnut feeding remains
	57	Sweet Chestnut feeding remains
	64	Old hazel dormouse nest - removed
	69	Seed store
	117	Probable wood mouse/yellow-necked mouse nest of brown leaves
	118	Few dead Beech leaves
	121	Wooden inner missing
	122	Not found
	123	Not found
	134	Few dead leaves
	138	Tube found on the ground - reinstalled
	145	Wooden inner missing
	150	Wooden inner missing
	157	Sweet Chestnut feeding remains
13.06.17	192	Collection of green Ivy leaves

Date	Tube Number	Comments (Highlighted rows indicate dormouse evidence)
13.06.17	222	Wooden insert on the floor - reinstalled
12.07.17	174	Hazel dormouse nest and one torpid male weight 15g
	219	Wooden insert on the floor - reinstalled
	223	Hazel dormouse nest – tightly woven nest with green leaves and well-defined entrance hole
21.08.17	163	Hazel dormouse nest
	174	Old hazel dormouse nest
	176	Likely hazel dormouse nest – slightly woven with brown leaves and a small chamber (not well defined)
	192	Collection of Ivy leaves – wood mouse
	209	Collection of leaves and bark with no structure
	219	Missing
	223	Old hazel dormouse nest
	230	Yellow neck mouse and nest
12.09.17	102	Missing
	108	Wood mouse nest
	116	Wood mouse and nest
	163	Hazel dormouse nest
	165	Hazel dormouse nest
	169	Cache of acorns and berries
	174	Old hazel dormouse nest
	176	Likely hazel dormouse nest
	204	Wood mouse and nest
	219	Missing
	231	Missing
	235	Insert on ground - replaced
18.10.2017	163	Dormouse and nest
	165	Dormouse and nest
	166	Food cache
	171	Dormouse and nest
	174	Dormouse nest
	175	Dormouse and nest
	176	Wood mouse nest
	188	Dormouse and nest
	204	Wood mouse and nest

Date	Tube Number	Comments (Highlighted rows indicate dormouse evidence)
	222	Wood mouse nest
	219	Missing
07.11.2017	163	Dormouse nest
	164	Dormouse and nest
	165	Dormouse nest
	171	Small collection of leaves
	175	Dormouse nest
	188	Dormouse nest
	204	Wood mouse and nest

Ebbsfleet Marshes,Northfleet

Darenth Wood

The Thrift

The Thrift

The Thrift

Parkhill Wood

Beacon Wood

Darenth Wood

Darenth Wood

Green Street Common

0 0.5 1 Kilometers

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
01	02/08/2017	FINAL	SD	GS	NM

KEY

- SCHEME EXTENT (STAGE 3)
- 1KM BUFFER
- 250M BUFFER
- LOCAL WILDLIFE SITE (LWS)
- 500M BUFFER
- ANCIENT WOODLAND

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Project: A2 BEAN AND EBBSFLEET JUNCTION IMPROVEMENTS

Drawing title: FIGURE 1 SCHEME LOCATION AND DESIGNATED SITES

Status	ISSUED FOR INFORMATION
Revision	01
Scale	1:20,000
Date	02/08/2017
Drawn By	SD
Checked By	GS
Approved By	NM
Project No.	HA543917
Originator	HHJV
Original Size	A3

Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0005

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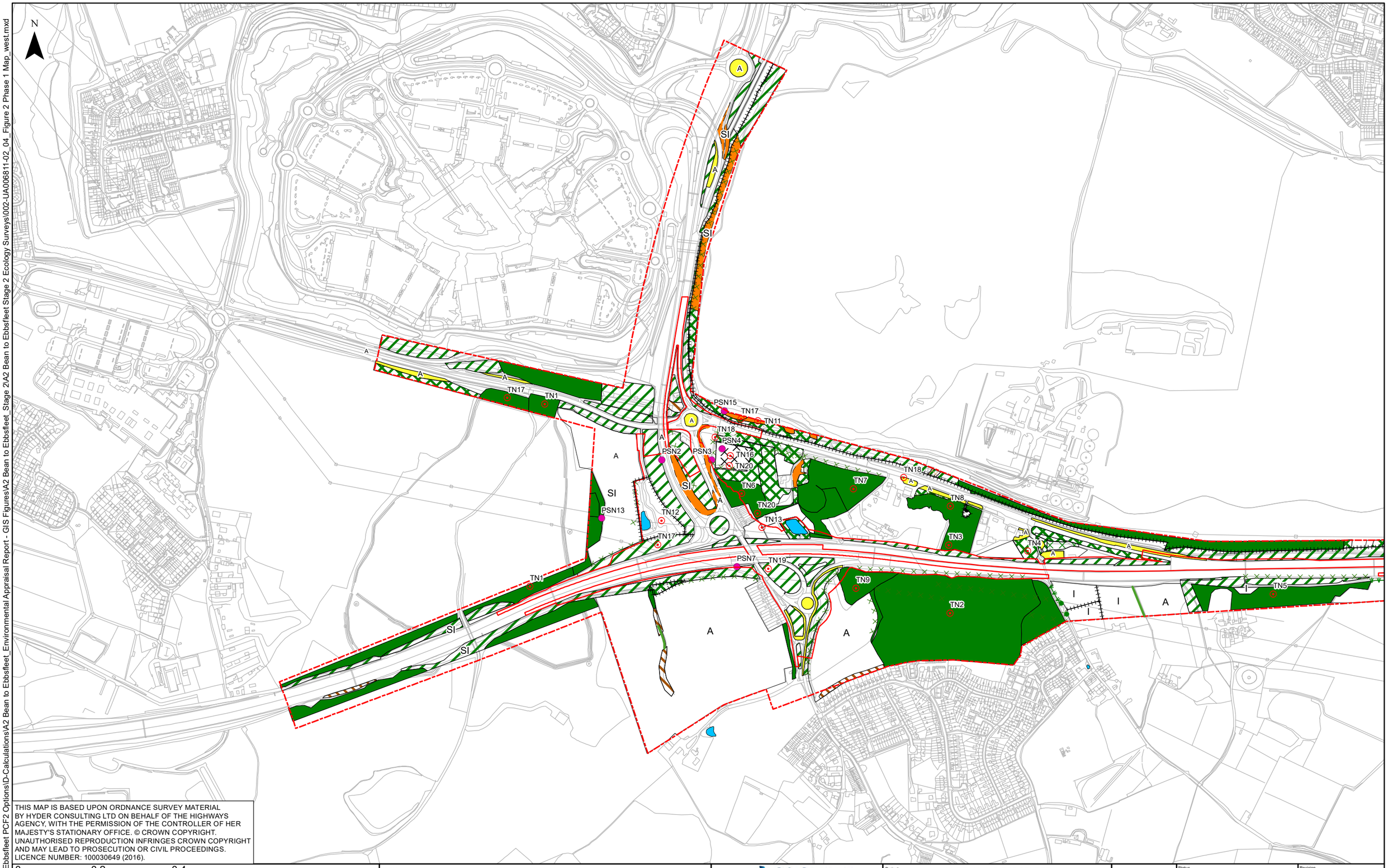

0 0.2 0.4 Kilometers

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
04	29/11/2017	FINAL	NM	GS	NM
01	16/08/2017	FINAL	SD	GS	NM

KEY

- Scheme extent (Stage 1 and 2)
- Scheme extent (Stage 3)
- Broadleaved Parkland/scattered trees
- Scrub - scattered
- Coniferous Parkland/scattered trees
- Protected Species Notes
- Target Note
- Intact hedge - species-poor
- Hedge with trees - native species-rich
- Fence
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Scrub - dense/continuous
- Scrub - scattered
- Neutral grassland - unimproved
- Neutral grassland - semi-improved
- Improved grassland
- Poor semi-improved grassland
- Other tall herb and fern - ruderal
- Standing water
- Cultivated/disturbed land - arable
- Cultivated/disturbed land - amenity grassland
- Cultivated/disturbed land - ephemeral/short perennial
- Introduced shrub
- Bare ground

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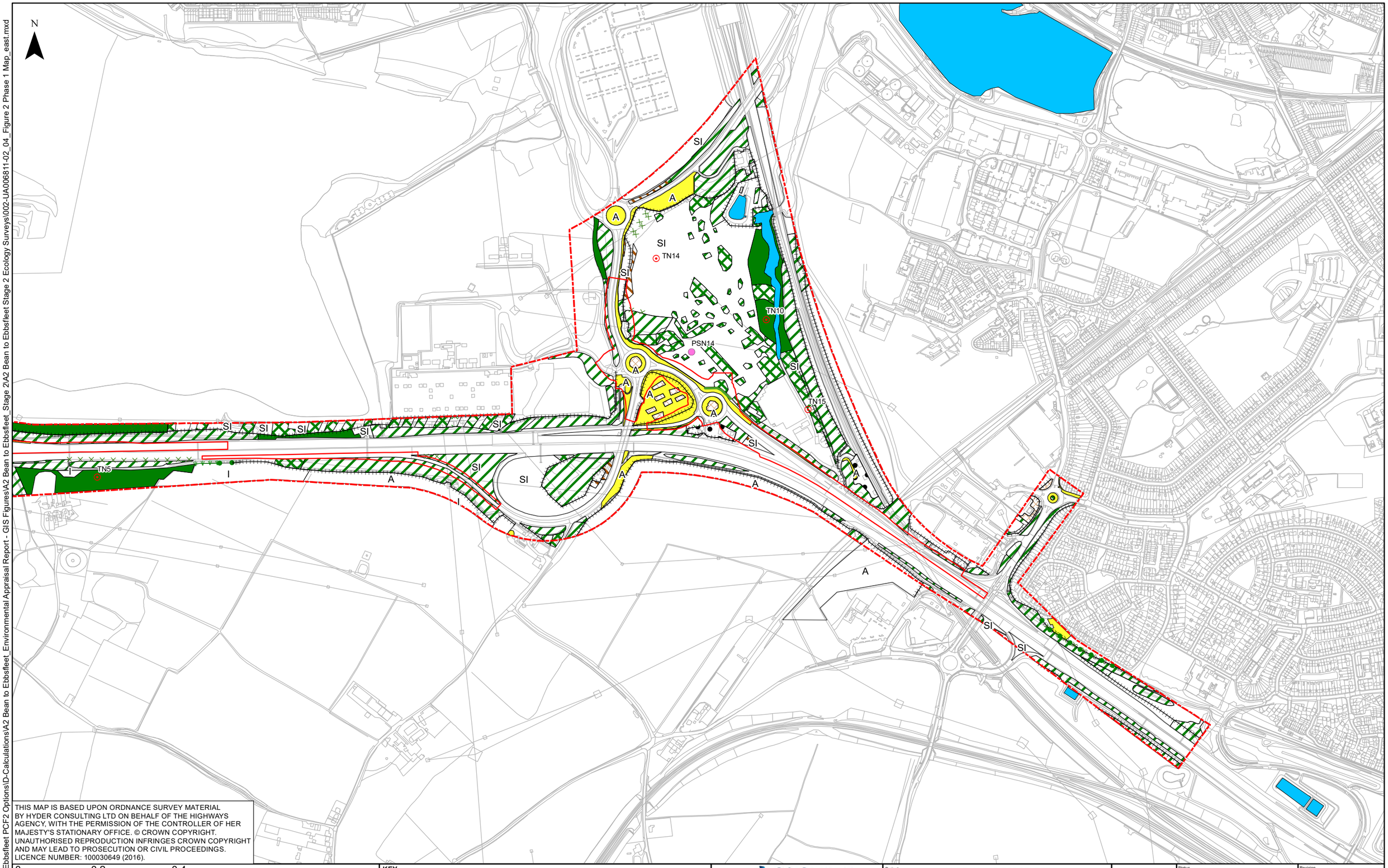
Project: A2 BEAN AND EBBSFLEET JUNCTION IMPROVEMENTS

Drawing title: FIGURE 2 PHASE 1 HABITAT SURVEY MAP SHEET 1 OF 2

Status	ISSUED FOR INFORMATION
Revision	04
Scale	1:8,500
Date	29/11/2017
Drawn By	NM
Checked By	GS
Approved By	NM
Project No.	HA543917
Originator	HHJV
Original Size	A3
Drawing number	HA543917-HHJV-HGN-ZZZZ-SK-EN-0006



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0 0.2 0.4 Kilometers

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
04	29/11/2017	FINAL	NM	GS	NM
01	16/08/2017	FINAL	SD	GS	NM

KEY

- Scheme extent (Stage 1 and 2)
- Scheme extent (Stage 3)
- Broadleaved Parkland/scattered trees
- Scrub - scattered
- Coniferous Parkland/scattered trees
- Protected Species Notes
- Target Note
- Intact hedge - species-poor
- Hedge with trees - native species-
- Fence
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Scrub - dense/continuous
- Scrub - scattered
- Improved grassland
- SI Poor semi-improved grassland
- Other tall herb and fern - ruderal
- Standing water
- A Cultivated/disturbed land - arable
- A Cultivated/disturbed land - amenity grassland
- Introduced shrub
- Bare ground

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Project: A2 BEAN AND EBBSFLEET JUNCTION IMPROVEMENTS

Drawing title: FIGURE 2
PHASE 1 HABITAT SURVEY MAP
SHEET 2 OF 2

Status	ISSUED FOR INFORMATION
Revision	04
Scale	1:8,500
Date	29/11/2017
Drawn By	NM
Checked By	GS
Approved By	NM
Project No.	HA543917
Originator	HHJV
Original Size	A3
Drawing number	HA543917-HHJV-HGN-ZZZZ-SK-EN-0006

N

P1

Eastern Quarry Land

Bluewater Retail Park

P13

P14

P16

P17

P18

P15

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0 0.25 0.5 Kilometers

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
01	02/08/2017	FINAL	SD	GS	NM

KEY

- SCHEME EXTENT (STAGE 3)
- 250M BUFFER
- PONDS
- GCN ABSENT (LAND SURVEYED BY THIRD PARTY).

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Drawing title: FIGURE 3 GCN MAP SHEET 1 OF 2

Status	ISSUED FOR INFORMATION	Revision	01
Scale	1:10,000	Date	02/08/2017
Drawn By	SD		
Checked By	GS		
Approved By	NM		
Project No.	HA543917	Originator	HHJV
Original Size	A3		

Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0007

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N

Eastern Quarry Land

P21

P20

P26

P19

P18

P22

P22a

P23

P24

P24a

P25

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0 0.25 0.5 Kilometers

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
01	02/08/2017	FINAL	SD	GS	NM

KEY

- SCHEME EXTENT (STAGE 3)
- 250M BUFFER
- PONDS
- GCN ABSENT (LAND SURVEYED BY THIRD PARTY).

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Project: A2 BEAN AND EBBSFLEET JUNCTION IMPROVEMENTS

Drawing title: FIGURE 3 GCN MAP SHEET 2 OF 2

Status	ISSUED FOR INFORMATION	Revision	01
Scale	1:10,000	Date	02/08/2017
Drawn By	SD		
Checked By	GS		
Approved By	NM		
Project No.	HA543917	Originator HHJV	Original Size A3

Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0007

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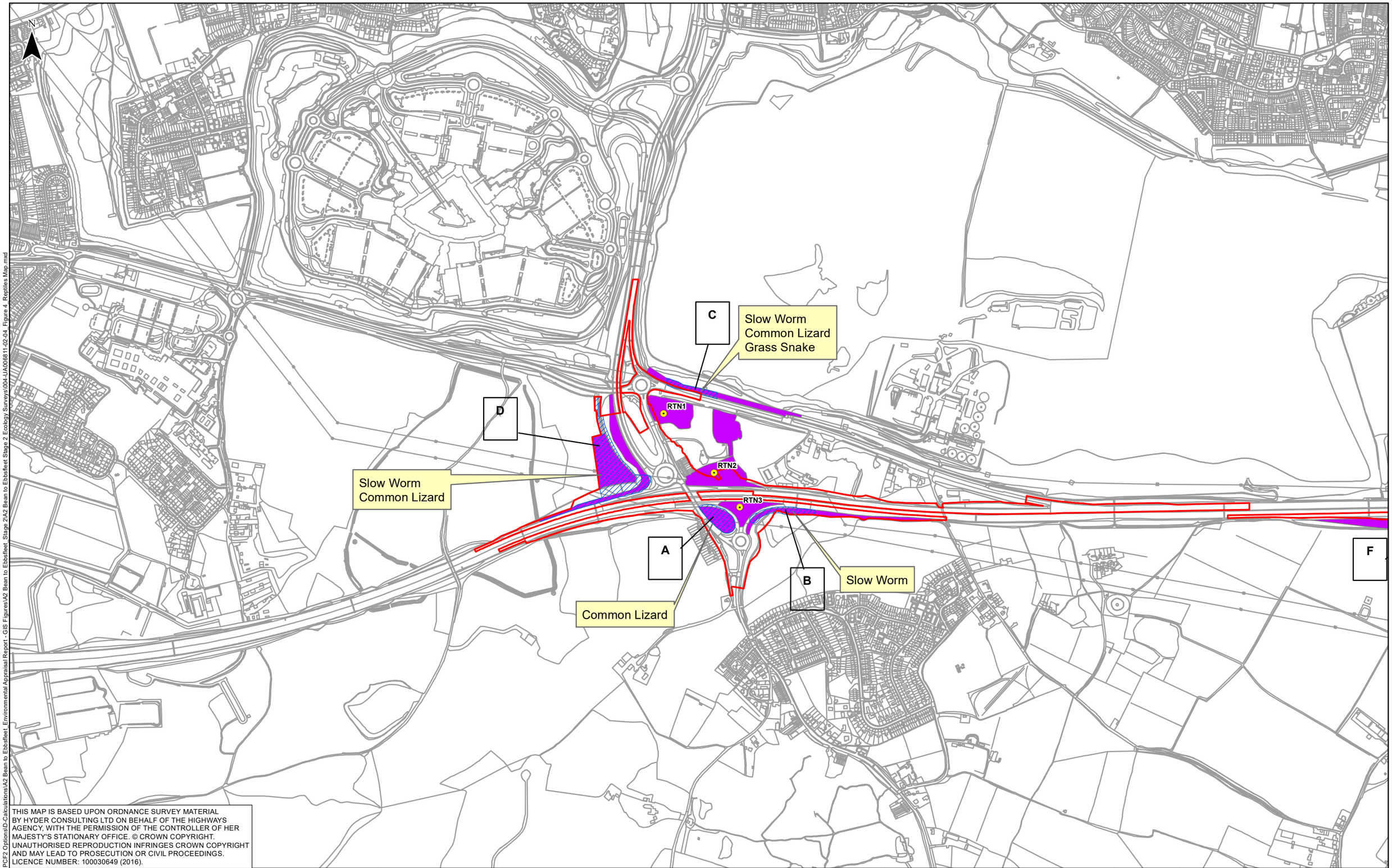

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Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
04	29/11/2017	FINAL	NM	GS	NM
01	02/08/2017	FINAL	SD	GS	NM

KEY

- REPTILE SURVEY TARGET NOTES
- SCHEME EXTENT (STAGE 3)
- REPTILE SURVEY AREA
- SUITABLE REPTILE HABITAT

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Project: A2 BEAN AND EBBSFLEET JUNCTION IMPROVEMENTS

Drawing title: FIGURE 4 REPTILES MAP SHEET 1 OF 2

Status	ISSUED FOR INFORMATION
Revision	04
Scale	1:10,000
Date	29/11/2017
Drawn By	NM
Checked By	GS
Approved By	NM
Project No.	HA543917
Originator	HHJV
Original Size	A3

Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0008

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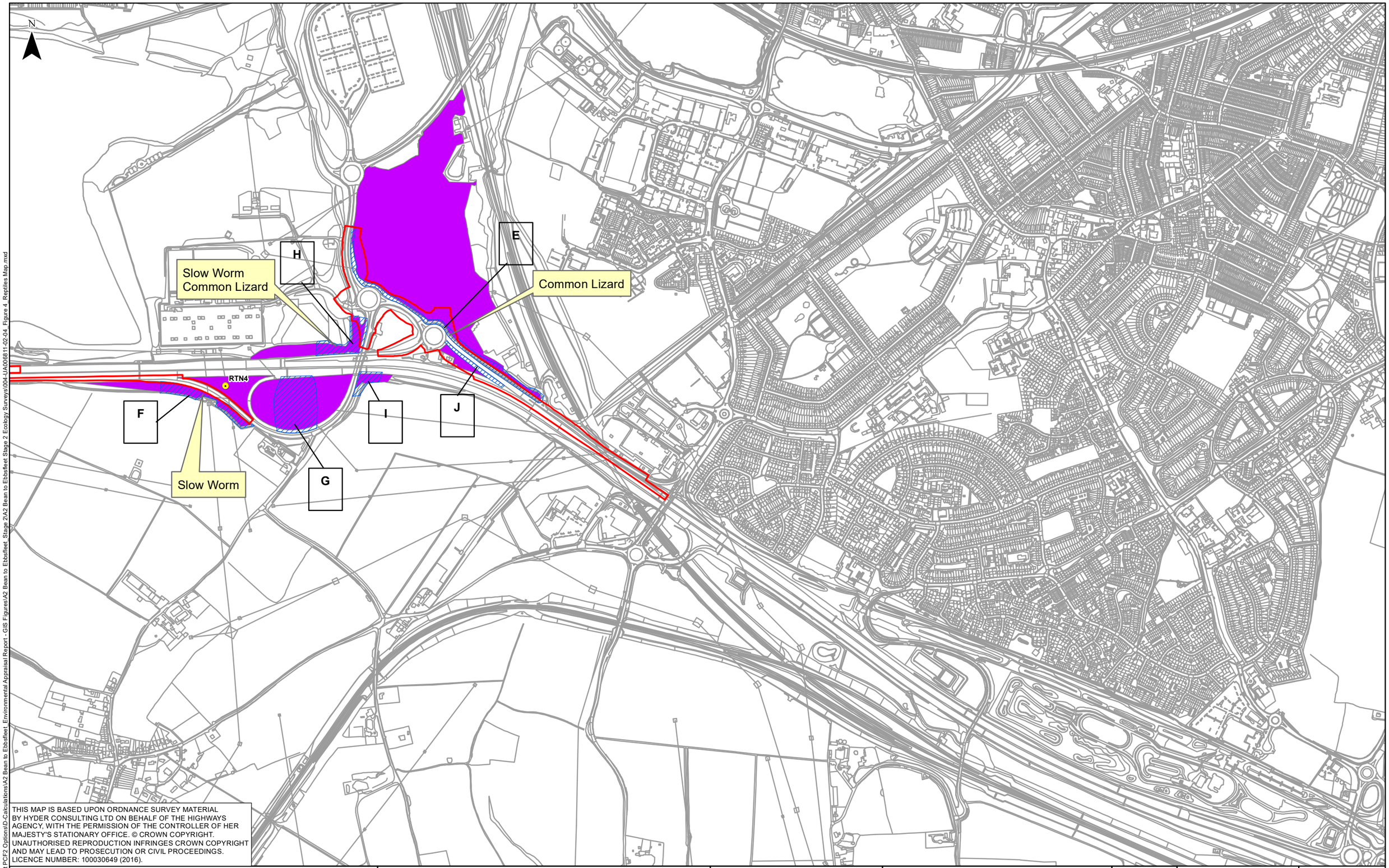

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0 0.25 0.5 Kilometers

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
04	29/11/2017	FINAL	NM	GS	NM
01	02/08/2017	FINAL	SD	GS	NM

KEY

- REPTILE SURVEY TARGET NOTES
- SCHEME EXTENT (STAGE 3)
- REPTILE SURVEY AREA
- SUITABLE REPTILE HABITAT

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Drawing title: FIGURE 4 REPTILES MAP SHEET 2 OF 2

Status	ISSUED FOR INFORMATION
Revision	04
Scale	1:10,000
Date	29/11/2017
Drawn By	NM
Checked By	GS
Approved By	NM
Project No.	HA543917
Originator	HHJV
Original Size	A3

Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0008

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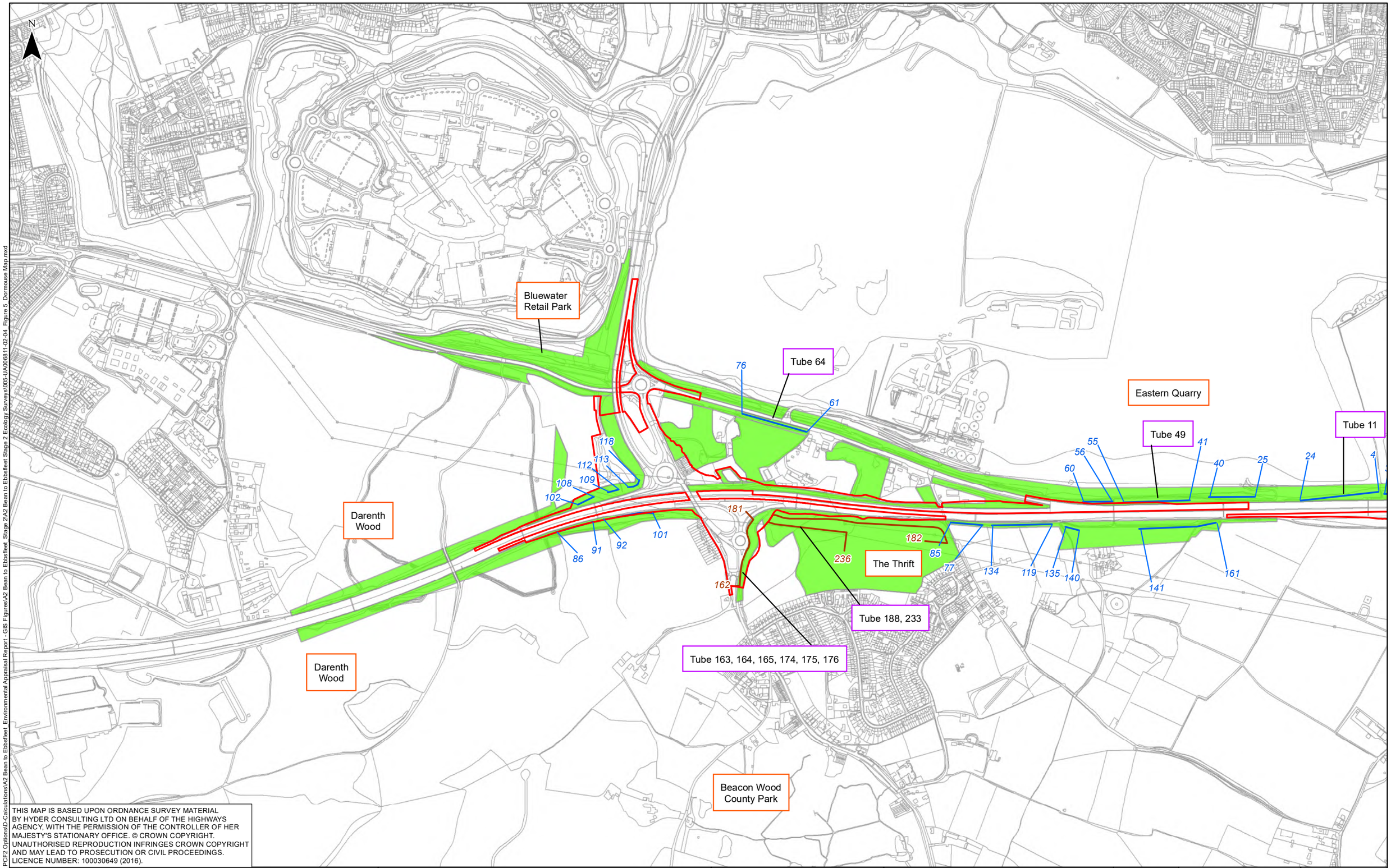

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Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
04	29/11/2017	FINAL	NM	GS	NM
01	02/08/2017	FINAL	SD	GS	NM

KEY

- SCHEME EXTENT (STAGE 3)
- DOREMOUSE TUBE LOCATION 2014
- DOREMOUSE TUBE LOCATION 2017
- POTENTIALLY SUITABLE DORMOUSE HABITAT
- DORMOUSE PRESENCE
- DORMOUSE DESK STUDY RECORDS
- 23 DORMOUSE TUBE NUMBER 2014
- 23 DORMOUSE TUBE NUMBER 2017

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Project: A2 BEAN AND EBBSFLEET JUNCTION IMPROVEMENTS

Drawing title: FIGURE 5 DORMOUSE MAP SHEET 1 OF 2

Status	ISSUED FOR INFORMATION
Revision	04
Scale	1:10,000
Date	29/11/2017
Drawn By	NM
Checked By	GS
Approved By	NM
Project No.	HA543917
Originator	HHJV
Original Size	A3

Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0009

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0 0.25 0.5 Kilometers

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
04	29/11/2017	FINAL	NM	GS	NM
01	02/08/2017	FINAL	SD	GS	NM

KEY

- SCHEME EXTENT (STAGE 3)
- DOREMOUSE TUBE LOCATION 2014
- DOREMOUSE TUBE LOCATION 2017
- POTENTIALLY SUITABLE DORMOUSE HABITAT
- DORMOUSE PRESENCE
- DORMOUSE DESK STUDY RECORDS
- 23 DORMOUSE TUBE NUMBER 2014
- 23 DORMOUSE TUBE NUMBER 2017

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Project: A2 BEAN AND EBBSFLEET JUNCTION IMPROVEMENTS

Drawing title: FIGURE 5 DORMOUSE MAP SHEET 2 OF 2

Status	ISSUED FOR INFORMATION
Revision	04
Scale	1:10,000
Date	29/11/2017
Drawn By	NM
Checked By	GS
Approved By	NM
Project No.	HA543917
Originator	HHJV
Original Size	A3

Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0009

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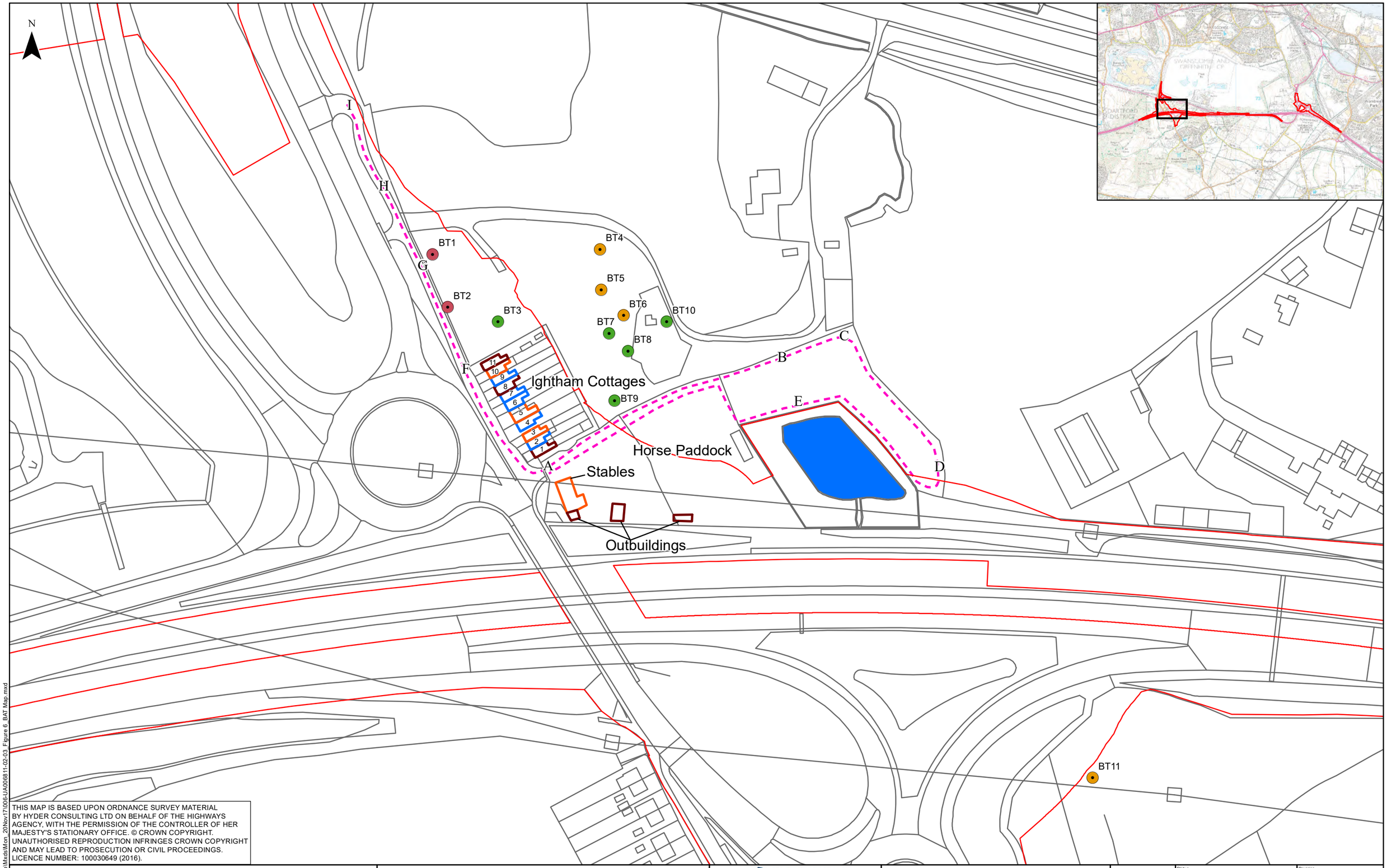

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0 0.035 0.07 Kilometers

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Apprv'd
03	20/11/2017	FINAL DRAFT FOR APPROVAL	NM	GS	NM
01	02/08/2017	FINAL DRAFT FOR APPROVAL	SD	GS	NM

KEY

- SCHEME EXTENT (STAGE 3)
- TREES WITH LOW BAT ROOST POTENTIAL
- TREES WITH MODERATE BAT ROOST POTENTIAL
- NEGLIGIBLE POTENTIAL
- BAT ACTIVITY TRANSECT
- NEGLIGIBLE BAT ROOST POTENTIAL
- LOW BAT ROOST POTENTIAL
- NOT SURVEYED/NO ACCESS
- POND
- A - I LISTENING STOP

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Project: A2 BEAN AND EBBSFLEET JUNCTION IMPROVEMENTS

Drawing title: FIGURE 6 BAT MAP

Status: ISSUED FOR INFORMATION
Revision: 03
Scale: 1:1,500
Date: 20/11/2017
Drawn By: NM
Checked By: GS
Approved By: NM
Project No.: HA543917
Originator: HHJV
Original Size: A3
Drawing number: HA543917-HHJV-HGN-ZZZZ-SK-EN-0010

Path: C:\Users\NS01182\Desktop\Mxds\Mon_20Nov17\006-UA006811-02-03_Figure 6_BAT Map.mxd

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