

APPENDIX 9.2
ASSESSMENT METHODOLOGIES IN RELATION TO ECOLOGY

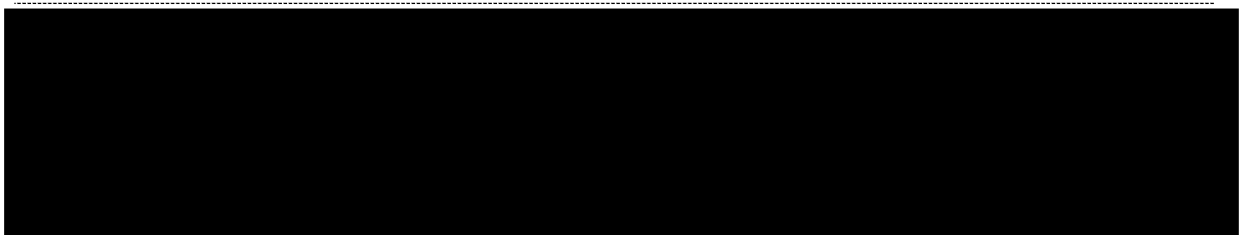
FORD AIRFIELD, WEST SUSSEX

ENVIRONMENTAL STATEMENT

**TECHNICAL APPENDIX 9.2 – ASSESSMENT
METHODOLOGIES IN RELATION TO ECOLOGY**

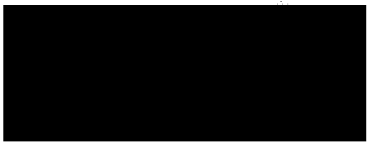
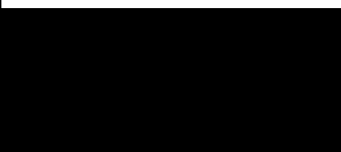
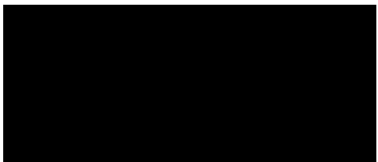
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ECOSA Quality Assurance Record

This report has been produced in accordance with the CIEEM Guidelines for Ecological Report Writing 2017 (CIEEM, 2017). The survey work has been undertaken in line with references within CIEEM's Source of Survey Guidance (CIEEM, 2017).

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FORD AIRFIELD, WEST SUSSEX

ENVIRONMENTAL STATEMENT

TECHNICAL APPENDIX 9.2 – ASSESSMENT METHODOLOGIES

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1.0 SURVEY METHODS

1.1 Introduction

This section details the methods employed as part of the Ecological Assessment undertaken for the site to date. Any significant limitations to the survey methods are also considered.

1.2 Desk Study

1.2.1 Biological Records Centre

Sussex Biodiversity Record Centre (SxBRC) was consulted on 21st May 2018 for the following data:

- Records of non-statutory designated sites (Local Wildlife Sites (LWSs), Sites of Importance for Nature Conservation (SINCs), Site of Nature Conservation Interest (SNCIs) etc.) within two kilometres of the site boundary;
- Records of legally protected and notable species (flora and fauna) within two kilometres of the site boundary, including Species of Principal Importance for the Conservation of diversity in England notified under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 and as listed in the England Biodiversity List; and
- Records of bats within four kilometres of the site boundary. Bat species are highly mobile and therefore the search radius is increased for this species group.

1.2.2 Multi-Agency Geographic Information for the Countryside

The Multi-Agency Geographic Information for the Countryside (MAGIC) database (DEFRA, 2017) was reviewed on 31st July 2018 to establish the location of statutory designated sites located within the vicinity of the site. This included a search for all internationally and nationally designated sites such as Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Wetlands of International Importance (Ramsar sites), Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs) within two kilometres of the site. Where appropriate, the desk study search area has been extended to take account of any appropriate statutory designated sites which need consideration in terms of potential in-direct effects and which support particularly mobile species, particularly those specifically mentioned in local planning policy. The Impact Risk Zones (IRZ) were also obtained from MAGIC, which are used to help guide and assess planning applications for likely effects on SSSIs.

Sites within two kilometres of the site boundary where European Protected Species Mitigation (EPSM) licences have been granted were reviewed. This information allows a greater understanding of the potential for European Protected Species to be present in the local area.

1.2.3 Other Sources of Information

Online mapping resources, at an appropriate scale, were used to identify the presence of habitats such as woodland blocks, ponds, watercourses and hedgerows, in the vicinity of the site. These habitats may offer resources and connectivity between the site and suitable habitat in the local area, which may be exploited by local species populations.

The presence of ponds or other waterbodies within a 500 metre radius of the site in particular are noted in relation to great crested newt. The 500 metre radius is a standardised search radius to assist in the assessment of the suitability of a site and its surrounding habitat to support this species, based on current Natural England guidance (English Nature, 2001).

The local planning portal was consulted for information regarding habitats and species associated with other development sites in the local area.

Baseline information within the Artemis Phase 1 Habitat Survey report (Technical Appendix 9.5) has been referenced where relevant within this report (Artemis, 2016).

1.2.4 Desk Study Limitations

The species data held by the SxBRC are collated from the biological recording community in Sussex. However, there are many areas of Sussex where the records held are limited, either spatially or taxonomically.

Badger *Meles meles* records are not included in the SxBRC consultation as local badger groups have requested that badger records remain confidential due to their vulnerability to persecution.

SxBRC do not provide records of otter within their consultation data, providing the following explanation: *“Otters Lutra lutra became extinct in Sussex and many other parts of the UK in the late 1960s. This was a result of deteriorating water quality due to industrial and agricultural pollution, along with hunting and habitat degradation. Recent improvements to the state of watercourses and a reduction in persecution have led to the slow return of the otter to the South East. Sussex has over 4,500km of rivers and tributaries. There are no recent breeding otter records and very few resident otters in Sussex. Over the last 20 years however, signs of otter activity have been found in most of the Sussex river catchments.”*

Online mapping resources provide an indication of habitat features present in the wider area, but do not provide a detailed assessment of habitat types.

The MAGIC database is updated on a periodic basis and therefore may not represent the most up to date information.

1.3 Walkover Survey

1.3.1 Survey Methods

A walkover of the site was undertaken to ratify the findings of the Phase 1 habitat survey undertaken by Artemis in 2015 (Technical Appendix 9.5). The status of habitats on site was also monitored on an ad hoc basis during other surveys undertaken at the site between 2017 and 2019.

1.3.2 Survey Details

The walkover survey was carried out by Georgina Timmis, Senior Ecologist of ECOSA on 22nd May 2017. The weather conditions were sunny with approximately 0-25% cloud cover, an ambient temperature of 18°C and a light breeze.

During the survey, the surveyor was equipped with 10x40 binoculars and a digital camera.

1.3.3 Survey Limitations

There were no significant limitations to the walkover survey.

1.4 Bat Survey

1.4.1 Survey Methods

Ground Level Tree Assessment

The ground level tree assessment was undertaken in line with current best practice guidelines (Collins, 2016). An assessment was made of the suitability of the trees on the site and immediately on the site boundary (**Map 1**) to support roosting bats based on the presence of Potential Roost Features such as holes, cracks, splits, loose bark and ivy cladding. The assessment of the potential for trees on the site to support roosting bats is based on a four-point scale as detailed in **Table 1**¹.

Table 1: Criteria used to assess suitability of roosting for bats

Suitability	Description of roosting habitats
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more

¹ Table adapted from (Collins, 2016)

	regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
Moderate	A structure of tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically/structure that does not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential.
Negligible	Negligible habitat features on site likely to be used by roosting bats.

Bat Emergence/Re-entry Survey

The bat emergence/re-entry survey was undertaken in line with current best practice guidelines (Collins, 2016). In accordance with the guidelines for buildings assessed as having low suitability to support roosting bats (**Table 1**) a single dusk emergence survey was undertaken in order to ascertain the presence/likely absence of roosting bats from within the air hanger and semi-sunken building.

The dusk emergence surveys commenced approximately 15 minutes before sunset until approximately two hours after sunset. The dawn re-entry surveys commenced approximately two hours before sunrise until just after sunrise.

The surveys were carried out by a team experienced ECOSA surveyors, positioned at previously identified vantage points around the structures (**Map 2**). These vantage point locations allowed a sufficient coverage of the roosting features identified on the buildings to be impacted by the proposals.

During the surveys surveyors recorded the time, species, location and direction of flight for each bat encountered, with particular attention paid to establishing bat access/egress locations to any roosts within the buildings.

The ecological function of roosts was determined using criteria set out in the Bat Conservation Trust guidelines (Collins, 2016).

Bat Transect Survey

Bat transect surveys were undertaken in line with current best practice guidelines (Collins, 2016). Given that the site has been assessed as having moderate suitability for supporting foraging and commuting bats a single survey visit was undertaken on an

approximately monthly basis between May and October 2017 to allow an assessment of the status and importance of foraging/commuting bats at the site to be made.

Two pairs of surveyors walked two pre-determined transect route across the site on each occasion (see **Map 3**), walking the same transect route on each survey with start and end points varied on each survey visit in order to vary the coverage of the site. The transect route ensured that the surveyors visited key areas of foraging and commuting habitat within the site, such as mature hedgerows and treelines as well as less suitable habitats. The dusk transects surveys commenced at sunset and lasted for at least two hours depending on the level of bat activity recorded whilst the dawn transect survey commenced two hours before sunrise and lasted until sunrise. A single dusk and dawn transect survey was undertaken in the same 24 hour period.

The transect survey was punctuated by regular point counts, during which the surveyors stopped walking for a period of five minutes to record bat activity at that point. Point count locations were situated at key habitat features on site. The point count locations were the same on each survey.

Bat Automated Detector Survey

In addition to the transect surveys automated detector surveys were undertaken in line with current best practice guidelines (Collins, 2016).

Six Wildlife Acoustics Song Meter 2 (SM2+) detectors with SMX-U1 microphones were deployed at the site for five consecutive nights each month between June and October 2017 (Paragraph 1.4.3).

The automated detectors were secured in suitable habitat with the microphone positioned to face towards the nearest open space. The devices were programmed to record between 30 minutes before sunset, until 30 minutes after sunrise the following morning on each night they were deployed.

Automated detectors can be calibrated in a number of different settings which can result in the potential variations in the way that bat calls are recorded. **Table 2** details the standard settings used by ECOSA during automated detector surveys undertaken. The detectors were programmed to count each two second call as a single bat pass.

Table 2: Standard automated detector settings

Option	Basic Setup
Settings - Audio	
Sample rate	192000Khz
Channels	Mono L (left)
Compression	WAV

Gain Left	+0.00
Gain Right	+0.00
Settings - Audio Advanced	
Dig High Pass Filter (HPF) Left	Fs/12
Dig High Pass Filter (HPF) Right	Off
Digital Low Pass Filter (LPF) Left	Off
Digital Low Pass Filter (LPF) Right	Off
Trig Lvl Left	12SNR
Trig Lvl Right	Off
Trg Win Left	2.0s
Trg Win Right	2.0s
Trg Max Length	2s
Bits (Div Ratio)	16
Nap Trg Lvl	Off

The detectors were deployed at the same location during each survey period in order to allow a determination of the levels of activity at the site in each survey period. The locations at which the automated detectors were deployed are provided in **Map 4**.

At the end of each automated survey period, the remote bat detectors were retrieved from the site, data was downloaded and then analysed using Kaleidoscope Pro®. This program is designed to analyse large volumes of bat call data using an automated classifier.

In order to analyse the data efficiently the raw .wav files recorded on the automated detector are subsequently converted to zero crossing (.zc) files which are subject to automated classification by Wildlife Acoustics Kaleidoscope Pro. During the conversion process the data is filtered to remove noise files in line with Wildlife Acoustics recommended setting as provided in **Table 3**.

Table 3: Noise file filtering settings

Option	Basic Setup
Signal of Interest – Frequency	8 – 120 kHz
Signal of Interest – Call Length	2 - 500ms
Signal of Interest – Minimum Number of Calls	2
Advanced Signal Enhancement	On

All filtered noise files are kept and subsequently assessed for bat calls in order to ensure that no bat calls have been incorrectly classified as noise. The “Advanced Signal Enhancement” setting discards files which Kaleidoscope assessed as being

insufficient quality. Any discarded files are subsequently not stored by Kaleidoscope and therefore, not subject to analysis by an ecologist.

The species calls were subsequently checked manually by a suitably qualified ecologist using the Kaleidoscope software, to verify their identities. Sonobat® (v2.9.7) was used to confirm the species identity for ambiguous bat calls. Where suitable recordings were obtained, bats were identified to species level. For some groups, notably long-eared bat species² and *Myotis*³ bat species, specific identification was not always possible.

The data was then exported to Microsoft Excel for detailed analysis (i.e. counts of bat registrations) of various parameters.

In summary, the automated detector data was used to assess the following:

- Species present within the site;
- Species recorded during each survey month; and
- Frequency of individual species activity on site

In order to standardise the number of bat calls recorded the data was then used to calculate an “Activity Index” for various different parameters to be assessed. This involved dividing the number of registrations by the number of nights which detectors were deployed. This data is then represented as number of registrations per night.

1.4.2 Survey Details

Ground Level Tree Assessment

The ground level tree assessment was carried out by Brian Hicks, Senior Field Surveyor (Natural England Bat Licence 2015-14880-CLS-CLS) of ECOSA on 7th August and 10th August 2018. **Table 4** provides details of each ground level tree assessment survey.

² There are two species of long-eared bat, the brown long-eared bat *Plecotus auritus* and the grey long-eared bat *Plecotus austriacus*. These species can only be separated by examination of physical characteristics and Phylogenetic Analysis Identification of bat droppings. Unless confirmation of identification has been made by visual identification the two species shall be referred to in this report as long-eared bat. The brown long-eared bat is the commonest of the two species typically being found roosting within large roof voids although small voids and trees are also utilised. The grey long-eared bat is rare and confined to southern England and like the brown long-eared typically roosts in roof voids.

³ There are seven species of *Myotis* bats in Britain. *Myotis* bats are very difficult to identify specifically, this can generally only be done by examination of physical features and Phylogenetic Analysis Identification of bat droppings. Many of these bats are common and will utilise buildings for roosting often occupying small and inaccessible voids. For the purpose of this report all species shall be referred to as *Myotis* bats unless a specific identification has been possible.

Table 4: Ground Level Tree Assessment details

Survey Date	Weather Conditions
7 th August 2018	General conditions: Dry and sunny Start temp: 21°C End temp: 23°C Cloud Cover: 0% Wind Speed: a light to moderate breeze
10 th August 2018	General conditions: Rain Start temp: 16°C End temp: 14°C Cloud Cover: 100% Wind Speed: a light to strong breeze

Bat Emergence/Re-entry Survey

The bat emergence survey was undertaken in August 2018. **Table 5** provides details of each emergence/re-entry survey.

Table 5: Bat emergence survey details

Survey Date	Survey Type	Duration	Weather Conditions	Sunset/ Sunrise Time
28 th August 2018	Dusk	19:40 – 22:00	General conditions: Dry Start temp: 16°C End temp: 14°C Cloud Cover: 40-20% Wind Speed: a light breeze	19:57

During the bat emergence surveys the surveyors were equipped with Pettersson D240x time expansion bat detectors. The Pettersson detectors were connected to Edirol R-05 recorders for the full duration of the survey. Recordings made with the detectors were later analysed using Sonobat® (v2.9.7) to confirm the identity of any species encountered.

The bat emergence survey was coordinated by Georgina Timmis, Senior Ecologist of ECOSA (Natural England Bat Licence 2016-26971-CLS-CLS) assisted by suitably qualified and experienced ECOSA surveyors Ralph Dunbar (Natural England Bat Licence 2017-28338-CLS-CLS), Richard Allam and Lauren Peach.

Bat Transect Survey

The bat transect surveys were undertaken between May and October 2017 with a total of six dusk bat transect surveys and a single dusk pre-dawn survey. **Table 6** provides details of each survey.

Table 6: Bat transect survey details

Survey Date	Survey Type	Duration	Weather Conditions	Sunset/ Sunrise Time
30 th May 2017	Dusk	21:00 – 23:30	General conditions: Calm, clear Start temp: 16°C End temp: 14°C Cloud Cover: 20-90% Wind Speed: A light wind	21:04
28 th June 2017	Dusk	21:19 – 23:45	General conditions: Overcast Start temp: 16°C End temp: 14°C Cloud Cover: 100 - 80% Wind Speed: A light wind	21:19
3 rd August 2017	Dusk	20:44 – 23:00	General conditions: Dry, overcast Start temp: 17°C End temp: 16°C Cloud Cover: 100% Wind Speed: A fresh breeze	20:44
4 th September 2017	Dusk	19:40 – 21:50	General conditions: Dry, overcast Start temp: 19°C End temp: 17°C Cloud Cover: 100% Wind Speed: A gentle breeze	19:40
5 th September 2017	Dawn	04:23 – 06:50	General conditions: Dry, overcast Start temp: 17°C End temp: 17°C Cloud Cover: 100% Wind Speed: a light breeze	06:23
26 th September 2017	Dusk	18:54 – 20:55	General conditions: Dry, calm Start temp: 17°C End temp: 15°C Cloud Cover: 85-95% Wind Speed: No wind	18:54
24 th October 2017	Dusk	17:51 – 20:08	General conditions: Overcast Start temp: 14°C End temp: 13°C Cloud Cover: 100-90% Wind Speed: a light breeze	17:51

The bat transect surveys were coordinated and led by Georgina Timmis, Senior Ecologist of ECOSA (Natural England Bat Licence No. 2016-26971-CLS-CLS), assisted by suitably qualified and experienced ECOSA surveyors.

The detector programming and data analysis was conducted by suitably qualified ECOSA staff.

Bat Automated Detector Survey

The automated detector surveys were undertaken between June and October 2017 with a total of 30 nights recording undertaken. **Table 7** provides details of each recording period.

Table 7: Automated detector survey details

Survey Period	Date	Weather Conditions ⁴				Sunset	Sunrise
		Temperature (°C)		Wind (km/h)	Precipitation (mm)		
		High	Low				
June 2017	1 st	19	9	14	0.00	21:07	04:54
	2 nd	21	10	16	0.51	21:08	04:54
	3 rd	19	12	37	0.00	21:09	04:53
	4 th	18	8	32	0.00	21:10	04:52
	5 th	18	12	35	3.05	21:11	04:52
June/July 2017	28 th	18	14	14	0.51	21:19	04:52
	29 th	18	12	21	0.00	21:19	04:53
	30 th	21	14	19	0.00	21:19	04:53
	1 st	23	14	27	0.00	21:19	04:54
	2 nd	22	16	32	0.25	21:18	04:55
July 2017	25 th	22	12	23	0.00	20:57	05:20
	26 th	19	12	37	3.05	20:56	05:21
	27 th	19	12	39	0.00	20:55	05:22
	28 th	19	15	45	2.03	20:53	05:24
	29 th	19	16	39	5.08	20:52	05:25
August 2017	24 th	20	9	27	0.00	20:59	06:05
	25 th	21	9	14	0.00	20:57	06:06
	26 th	22	13	21	0.00	20:56	06:08
	27 th	24	13	19	0.00	20:55	06:09
	28 th	22	12	13	0.00	20:53	06:11
September/ October 2017	28 th	19	15	29	0.00	18:46	06:59
	29 th	19	13	26	5.08	18:44	07:00
	30 th	17	9	35	0.25	18:41	07:02
	1 st	18	14	37	1.02	18:39	07:04

⁴ Weather data is sourced from online weather data **Invalid source specified.**

Survey Period	Date	Weather Conditions ⁴				Sunset	Sunrise
		Temperature (°C)		Wind (km/h)	Precipitation (mm)		
		High	Low				
	2 nd	18	11	37	0.51	18:37	07:05
October 2017	27 th	14	3	16	0.00	17:45	07:46
	28 th	15	1	24	0.00	17:43	07:48
	29 th	15	6	24	0.00	16:41	07:50
	30 th	12	2	21	0.00	16:39	07:51
	31 st	13	2	21	0.00	16:38	07:53

The automated detectors were deployed by a suitably experienced ECOSA ecologist. The detector programming and data analysis was conducted by Georgina Timmis, Senior Ecologist of ECOSA.

1.4.3 Survey Limitations

Some bat species, e.g. long-eared bats *Plecotus* species, generally emerge from their roosts in total darkness and do not produce strong echolocations, and therefore these bats can be difficult to observe and record during bat surveys, leading to under-recording.

It was not possible to complete a single transect survey and/or deploy automated detectors each month between April and October as recommended within the Bat Conservation Trust guidelines. However, given that a total of seven transect survey visits and seven deployments were undertaken coupled with automated detectors surveys between early June and October, covering the peak months of the season, it is considered that a robust assessment of the usage of the site by foraging and commuting bats can be made.

The quality of both hand-held and automated bat detector recordings is based, to a large extent, on the proximity of a bat to the detector's microphone. Obstructions such as vegetation or environmental variables such as rainfall and wind noise from vegetation will all influence the quality of sound reaching the microphone and thus some bat echolocation recordings are of insufficient quality for specific identification.

⁵ There are two species of long-eared bat, the brown long-eared bat *Plecotus auritus* and the grey long-eared bat *Plecotus austriacus*. These species can only be separated by examination of physical characteristics and Phylogenetic Analysis Identification of bat droppings. Unless confirmation of identification has been made by visual identification the two species shall be referred to in this report as long-eared bat. The brown long-eared bat is the commonest of the two species typically being found roosting within large roof voids although small voids and trees are also utilised. The grey long-eared bat is rare and confined to southern England and like the brown long-eared typically roosts in roof voids.

Bats routinely alter their echolocations in relation to behaviour and their environment. It is not always possible to make a robust identification of every bat recording.

The use of bat detectors is likely to result in the under-recording of a percentage of bats present, such as those flying at height (Collins & Jones, 2009), which would be out of the recording range for the detectors.

During sound analysis, for some groups, notably long-eared bat species⁶ and *Myotis*⁷ bat species, identification to species level is not always possible.

The number of registrations recorded is not a measure of the number of bats present on site; the number of registrations provides a quantitative assessment of the level of bat activity at a particular location (i.e. the greater the number of registrations, the greater the level of bat activity). The data cannot differentiate between, for example, a single bat passing the detector 10 times or 10 bats passing the detector on a single occasion.

1.5 Badger Survey

1.5.1 Survey Methods

The survey involved a detailed investigation of the site, its immediate boundaries, to identify evidence of badger residence, foraging or territorial activity. This evidence can take the form of latrines, setts, paths between setts or leading to feeding areas, scratching posts at the base of tree trunks, hair traces, snuffle holes formed during foraging, and footprints (Reynolds & Harris, 2005).

Where badger paths were identified these were back tracked in order to establish whether they led to any sett entrances.

Where setts are identified, the location of entrances and direction in which they are travelling are plotted and an assessment of the made of the level of activity of each entrance.

The ecological function of setts was determined using criteria set out in the In Practice article 'Classification of Badger *Meles Meles* – Setts in the UK: A Review and Guidance

6 There are two species of long-eared bat, the brown long-eared bat *Plecotus auritus* and the grey long-eared bat *Plecotus austriacus*. These species can only be separated by examination of physical characteristics and Phylogenetic Analysis Identification of bat droppings. Unless confirmation of identification has been made by visual identification the two species shall be referred to in this report as long-eared bat. The brown long-eared bat is the commonest of the two species typically being found roosting within large roof voids although small voids and trees are also utilised. The grey long-eared bat is rare and confined to southern England and like the brown long-eared typically roosts in roof voids.

7 There are seven species of *Myotis* bats in Britain. *Myotis* bats are very difficult to identify specifically, this can generally only be done by examination of physical features and Phylogenetic Analysis Identification of bat droppings. Many of these bats are common and will utilise buildings for roosting often occupying small and inaccessible voids. For the purpose of this report all species shall be referred to as *Myotis* bats unless a specific identification has been possible.

for Surveyors' (Andrews, 2013), based on (Kruuk, 1978), (Thornton, 1988) and (Cresswell, et al., 1990).

1.5.2 Survey Details

The badger survey was carried out by Brian Hicks and Ed Venables, Senior Field Ecologists of ECOSA on 27th November 2017. The weather conditions were dry with approximately 50% cloud cover, an ambient temperature of 15°C and a light breeze.

1.5.3 Survey Limitations

There were no significant limitations to the badger survey.

1.6 Hazel Dormouse Survey

1.6.1 Survey Methods

The hazel dormouse *Muscardinus avellanarius* survey was undertaken in line with current best practice guidelines (Bright, et al., 2006).

The hazel dormouse survey involved the erection of 100 dormouse tubes within suitable dormouse habitat throughout the site at regular intervals. The locations of these tubes are marked on **Map 5**. The nest tubes were subsequently checked for evidence of dormouse on a monthly basis between June and September 2017.

In accordance with survey guidance, a value is assigned to each month, which is weighted depending on the likelihood of finding evidence of dormouse in a given month. These scores are based on the erection of 50 dormouse nest tubes. The values for each month that the tubes are in place are then added together. In accordance with survey guidance, absence of dormouse should not be assumed for a search effort of less than 20 points⁸. **Table 8** shows points assigned for each month during the survey undertaken.

Table 8: Hazel dormouse survey scores

Month	Score
June	2
July	2
August	5
September	7
Total	<u>16</u>

⁸ Each month, between April and November, inclusive is assigned an index of probability score, based on optimum survey timings.

Current guidance states that where the number of tubes at a site are doubled (i.e. 100) the index of probability score can be doubled for each month (Natural England, 2015). Therefore, working on this basis the score achieved is 32.

1.6.2 Survey Details

The dormouse tubes were erected on 26th May 2017 with monthly visits undertaken between June to September 2017. **Table 9** provides details of each hazel dormouse survey.

Table 9: Hazel dormouse survey details

Survey Date	Weather Conditions
21 st June 2017	Warm and sunny, 19°C, 25% cloud cover with a light wind
25 th July 2017	Sunny and dry, 18°C, 5% cloud cover with a light wind
22 nd August 2017	Cloudy and cool, 18.5°C, 100% cloud cover with a light wind
28 th September 2017	Sunny and dry, 15°C, 60% cloud cover with a light wind

The hazel dormouse surveys were co-ordinated and led Georgina Timmis, Senior Ecologist of ECOSA assisted by suitably qualified ECOSA surveyors.

The survey was undertaken using 100 dormouse tubes comprising corrugated plastic tubes of standard dimensions (Bright, et al., 2006) with plywood insert secured in the relevant habitat with heavy duty garden wire.

1.6.3 Survey Limitations

There were no significant limitations to the dormouse survey.

1.7 Bird Survey

1.7.1 Survey Methods

Breeding Bird Survey

Breeding bird transects surveys were undertaken using a modified version the British Trust for Ornithology (BTO) Breeding Bird Survey (Baillie, et al., 2012). Three visits were undertaken from May to June 2017.

The bird surveyor walked a pre-determined transect route across the site, on each occasion walking the same transect route (**Map 6**). The transect route ensured that the surveyor visited key areas of habitat for breeding birds such as woodland, wetland and large expanses of grassland / arable land, as well as less suitable habitats. The transect was punctuated by pauses to scan and listen for territorial birds. The transect survey was always undertaken during the morning and began within one hour of sunrise. The

route across the site was varied so that time-location bias was minimised. Surveys were undertaken in suitable weather conditions i.e. without strong winds or heavy rainfall.

The survey was aimed at recording the presence of Schedule 1⁹ and / or British Trust for Ornithology red¹⁰ or amber listed Birds of Conservation Concern (Eaton, et al., 2015) and assessing the number of active territories of notable species within the site. Green listed species were recorded but no attempt was made to identify their territories. Territorial activity was mainly defined by the presence of singing birds, however other evidence such as courtship and display, agitated behaviour, nest building, distraction display, recently fledged young, occupied nests and / or birds carrying food was also used.

On completion of the surveys evidence of territorial birds and confirmed breeding evidence was transferred onto a single map. Clusters of registrations on this map coincide with the activity of territory holding birds, although with some species this varies with biology. The maps were then analysed to determine the number of pairs of each notable breeding species present, a process open to subjectivity in interpretation, and requiring professional judgement.

The detectability of bird species and associated territorial activity is affected by a variety of factors including, but not limited to; species detectability, species abundance, temporal variations in activity, species phenology, habitat structure, survey effort and observer ability. During the breeding bird survey methods to reduce these potential impacts included; using experienced ornithologists and undertaking a robust number of surveys spread over the main breeding season. As a result, a comprehensive assessment of the breeding bird assemblage at the site was completed.

Wintering Bird Survey

A walked transect survey (**Map 7**) was undertaken the site to determine the usage of the site by wintering birds. The survey largely consisted of the surveyor/s scanning the site using telescope and binoculars to identify the bird species utilising the site. Largely, the open areas such as fields were not traversed as this generates disturbance that may deter birds and therefore compromise the results of the survey. However, hedgerows and woodlands were walked to record the birds present.

The wintering bird survey methodology was based on that carried out as part of the Solent Waders and Brent Strategy (King, 2010). The surveys aimed to determine the

⁹ Birds listed on Schedule 1 of the Wildlife and Countryside Act (1981 as amended) are afforded additional protection making it an offence to: Intentionally or recklessly disturb any bird while it is nest building, or is at a nest containing eggs or young; or; Intentionally or recklessly disturb the dependent young of any such bird.

¹⁰ The UK's birds are split in to three categories of conservation importance - red, amber and green. Red is the highest conservation priority, with species needing urgent action. Amber is the next most critical group, followed by green.

presence of notable or protected wintering bird species with particular reference to those associated with the Arun Valley SPA.

The detectability of bird species and associated territorial activity is affected by a variety of factors including, but not limited to; species detectability, species abundance, temporal variations in activity, species phenology, habitat structure, survey effort and observer ability. During the wintering bird survey methods to reduce these potential impacts included; using experienced ornithologists and undertaking a robust number of surveys spread over the winter season. As a result, a comprehensive assessment of the wintering bird assemblage at the site was completed.

1.7.2 Survey Details

Breeding Bird Survey

A total of three survey visits were undertaken between May and June 2017. **Table 10** provides details of each breeding bird survey.

Table 10: Breeding bird survey details

Survey Date	Weather Conditions
23 rd May 2017	Sunny, 13-16°C, no cloud cover and a light breeze
6 th June 2017	Overcast and showers, 10°C, 100% cloud cover and a strong breeze
12 th June 2017	Sunny, 21°C, 25% cloud cover and a light breeze

The breeding bird survey was carried out by experienced ornithologists Simon Boswell and Simon Colenutt, Principal Ecologists of ECOSA.

During the breeding bird survey the surveyors were equipped with binoculars.

Wintering Bird Survey

A total of six survey visits were undertaken between December 2018 and February 2019. **Table 11** provides details of each wintering bird survey.

Table 11: Wintering bird survey details

Survey Date	Weather Conditions
21 st December 2018	50% cloud cover, 12°C, a moderate breeze
8 th January 2019	0-25% cloud cover, 10°C, a light breeze
15 th January 2019	75-100% cloud cover, 6°C, a light breeze
29 th January 2019	100% cloud cover, 4°C, no wind

Survey Date	Weather Conditions
5 th February 2019	100% cloud cover, 8°C, a light breeze
19 th February 2019	25-50% cloud cover, 8°C, a light breeze

The wintering bird survey was carried out by experienced ornithologist Graeme Down, Senior Ecologist of ECOSA.

During the wintering bird survey the surveyor was equipped with binoculars.

1.7.3 Survey Limitations

There were no significant limitations to the breeding or wintering bird surveys.

1.8 Reptile Survey

1.8.1 Survey Methods

The reptile survey was undertaken in accordance with current best practice guidelines (Froglife, 2015).

The reptile survey consisted of the laying bitumen felt mats approximately 500millimetres x 500millimetres in areas of suitable habitat on the site. Typically, this included areas of suitable habitat with good exposure to the sun. The mats were distributed in all areas considered to offer suitable reptile habitat. The locations of these mats are marked on (**Map 8**).

The use of such refugia is an effective way of surveying for all species of reptile and current survey guidance states that seven inspections are sufficient to confirm presence/likely absence. Survey visits were undertaken in marginal weather conditions such as cold but sunny weather or hazy and somewhat overcast conditions, as this will maximise the thermal value of the refugia for basking reptiles.

During each visit surveyors also undertook a visual inspection survey of other suitable refugia in the site and other suitable basking locations. During the survey a note was also made of any suitable hibernation features present within the site.

1.8.2 Survey Details

A total of 200 reptile refugia were distributed on 31st May 2017 with six inspection visits undertaken between 15th June 2017 and 24th August 2017. **Table 12** provides details of each reptile survey.

Table 12: Reptile survey details

Survey Date	Air Temperature (°C)	Weather Conditions
15 th June 2017	17°C	Warm and sunny, 20% cloud cover with a light wind
29 th June 2017	14°C	Cloudy, 100% cloud cover with a light wind
12 th July 2017	16°C	Overcast , 90% cloud cover with a light wind
27 th July 2017	18°C	Overcast, 100% cloud cover with a light wind
10 th August 2017	15°C	Sunny, 60% cloud cover with a light wind
24 th August 2017	17°C	Cloudy, 75% cloud cover with a light wind

The reptile survey was coordinated by Georgina Timmis, Senior Ecologist of ECOSA assisted by suitably experienced ECOSA surveyors.

1.8.3 Survey Limitations

Only six surveys were undertaken at the site as opposed to seven as recommended in current best practice guidelines for a reptile presence/absence survey. However, given the low number of encounters during the rest of the surveys and that the presence of common lizard has been established, this limitation is considered unlikely to have a significant effect on the survey findings.

1.9 Great Crested Newt Survey

1.9.1 Survey Methods

Habitat Suitability Index (HSI) Assessment

Those ponds and waterbodies located within a 500 metre radius of the site (**Map 9**), where access permitted, were subject to a Habitat Suitability Index (HSI) assessment (Oldham, et al., 2000). HSI is a numerical index between 0 and 1, derived from an assessment of ten habitat variables known to influence the presence of great crested newt *Triturus cristatus* such as geographical location, water body size and permanence, presence of predatory fish and wildfowl, availability of suitable terrestrial habitat and proximity to other ponds. Each factor is scored based on its level of suitability for great crested newt. An HSI of 1 is optimal habitat (high probability of occurrence), while an HSI of 0 is very poor habitat (minimal probability of occurrence). The HSI is calculated on a single pond basis, but takes into account surrounding terrestrial habitat and local pond density. If a pond has a very low HSI score (<0.5) there would typically be a minimal chance of great crested newt presence.

This qualitative score can then be used, with caution, to indicate whether further detailed investigations are necessary or whether a particular waterbody can be 'scoped

out' as unsuitable for great crested newts. However, professional judgement should be used rather than simply relying on the HSI to eliminate ponds from further assessment. Further detailed investigations would involve targeted surveys carried out between mid-March and mid-June to determine presence/absence of great crested newt and if present then an assessment of population status.

Environmental DNA (eDNA) Survey

The great crested newt environmental DNA (eDNA) sampling was undertaken following current best practice guidelines (Biggs, et al., 2014).

Given the presence of a number of waterbodies within 500 metres of the site boundary an eDNA analysis was undertaken to establish the presence / likely absence of great crested newt from within the ponds which were accessible (**Map 9**).

The field sampling entailed the collection of 20 samples of 30 millilitres of water from pre-selected sub-sampling sites around the margin of each waterbody. Sub-sampling sites are chosen to include areas where great crested newt are likely to be present such as areas of vegetation where they may be egg laying and areas of open water where they may be displaying. The 20 samples are then mixed into a single sterile bag from which six samples of water of 15ml are taken each of which is preserved in 35ml of ethanol. The samples are then refrigerated until analysis at the lab. The samples were sent to Crestwood Environmental eDNA testing service for analysis which were analysed in line with current guidance (Biggs, et al., 2014). The samples were taken within the required season (mid-April to June) when great crested newt eDNA is likely to be present within the pond and therefore, the analysis result indicates the presence or likely absence of the species from a given waterbody.

1.9.2 Survey Details

Habitat Suitability Index (HSI) Assessment

The great crested newt HSI assessment was carried out by Georgina Timmis, Senior Ecologist of ECOSA (Natural England Great Crested Newt Licence No. 2016-21864-CLS-CLS) on 22nd May 2017 and Lucy Grable, Ecologist of ECOSA on 28th June 2017. The weather conditions are provided in **Table 13**.

Table 13: Habitat Suitability Index assessment details

Survey Date	Weather Conditions
22 nd May 2017	Sunny, 13-16°C, no cloud cover and a light breeze
28 th June 2017	Overcast and showers, 16-17°C, 100% cloud cover and no wind.

Access was sought to undertake an HSI assessment on all waterbodies within a 500 metre radius during 2017, although in some cases access was not granted (Paragraph 1.9.3). The details of the great crested newt HSI assessment are provided in **Table 14**.

Table 14: Details of all waterbodies on site and within a 500 metre radius of the site boundary

Pond No.	Approximate Distance and Direction from Site Boundary	Waterbody Description	HSI Undertaken	eDNA Undertaken
1	20 metres to the south	Medium sized pond adjacent to Horsemere Green Lane	Yes	No
2	365 metres to the south-east	Small ornamental pond	No	No
3	365 metres to the south-east	Small ornamental pond	No	No
4	5 metres to the south	A large rectangular waterbody within the grounds of Her Majesty's Prison Ford. Likely to be an artificial reservoir based on aerial imagery.	No	No
5	190 metres to the east	Small pond adjacent to an agricultural field and the River Arun	No	No
6	380 metres to the east	Large pond adjacent to an agricultural field and the River Arun	Yes	Yes
7	380 metres to the east	Small pond adjacent to an agricultural field and the River Arun	Yes	Yes
8	125 metres to the north	Small pond in road verge	Yes	Yes
9	400 metres to the north	Medium sized pond within woodland	Yes	Yes
10	480 metres to the west	Small garden pond	No	No

Environmental DNA (eDNA) Survey

The eDNA sampling was carried out by Lucy Grable, Ecologist of ECOSA on 28th June 2017. The weather conditions were overcast and showers with approximately 100% cloud cover, an ambient temperature of 16-17°C and no wind. The details of the great crested newt eDNA assessment are provided in **Table 14**.

1.9.3 Survey Limitations

Not all parts of the ponds sampled for eDNA analysis could be accessed due to steep banks and dense bankside vegetation.

2.0 EVALUATION METHODS

2.1 Introduction

This section details the criteria used to inform the evaluation of each ecological feature present within the site's Zone of Influence. Industry guidelines for evaluation were followed (CIEEM, 2016).

2.2 Designated Sites

The evaluation of designated sites is based on criteria set out by a number of relevant organisations, which is enforced through relevant legislation¹¹. **Table 15** sets out the conservation value of designated sites and the associated criteria.

Table 15: Conservation values of designated sites and associated criteria

Conservation Value	Designation	Criteria
County	Local Nature Reserves (LNR)	Designated for their local wildlife value and for education, scientific and recreational purposes. Criteria for designation are set out by the Sussex Local Authorities and are based on Natural England guidance (Natural England, 2010).
County	Local Wildlife Sites (LWS)	Sites that represent local character and distinctiveness. Sites are identified by the local authority. Criteria for designation are set out by the Sussex Local Authorities (Cole, 2018) and are based on DEFRA guidance (DEFRA, 2006).
National	Site of Special Scientific Interest (SSSI)	Designated as areas of biological or geological interest of national importance. Criteria for designation are set out by the JNCC (JNCC, 2017).
	National Nature Reserve (NNR)	Also usually designated as SSSIs. They receive legal protection through the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 (as amended).
European	Special Protection Area (SPA)	Designated for supporting internationally important populations of birds listed in the annexes of the Birds Directive. Criteria for designation are set out by the JNCC (JNCC, 2017)
	Special Area of Conservation (SAC)	Support internationally important habitats or internationally important assemblages or populations of species. Criteria for designation are set out by the JNCC (McLeod, et al., 2005).
International	Ramsar site	Designated as wetlands of international importance. Criteria for designation are set out by Ramsar (Ramsar, 1971).

2.3 Vegetation

Evaluation of habitats has been undertaken with reference to selection criteria for designated sites at various geographic scales as detailed in **Table 16**.

¹¹ See Paragraphs 1.2.1 to 1.2.3 of the Technical Appendix 9.1 for details.

Table 16: Criteria for geographic scale of importance for habitats

Importance	Criteria
Negligible	Habitat is not notable, nor does it support any rare species. It is low quality and/or is very limited in extent.
Site	Habitat is not notable, nor does it support any rare species. However, the habitat is of good quality.
Local	Habitat is notable or includes rare plant species but is not of sufficient size or quality to qualify for Local Wildlife Site status in accordance with 'Sussex Local Wildlife Site Selection Criteria' (Cole, 2018)
County	Habitat would qualify for Local Wildlife Site status in accordance with 'Sussex Local Wildlife Site Selection Criteria' (Cole, 2018)
National	Habitat would qualify for SSSI status in line with criteria set out in 'Guidelines for the Selection of Biological SSSIs' (Latham, et al., 2018) (Jefferson, et al., 2014)
European	Habitat would qualify for SAC status in line with criteria set out in 'The Habitats Directive: Selection of Special Areas of Conservation in the UK' (JNCC, 2018)
International	Habitat would qualify for Ramsar status in line with criteria set out in 'The Ramsar Sites Criteria' (Ramsar, 1971).

Evaluation of the site for plants and habitats is based on ECOSA's best professional judgement considering the following factors:

- **Species rarity/vulnerability** – Relative rarity of and threat to plant species in England is based on extinction risk categories and criteria defined in 'A Vascular Plant Red List for England' (Stroh, et al., 2014). **Table 17** shows the relative extinction risk of species in different categories. Species in higher risk categories are considered to be of greater ecological value.

Table 17: Categories of extinction risk for UK plant species

Category	Definition	Relative Value
Regionally Extinct (RE)	Extinct in England but still present elsewhere in Great Britain	Greatest ↓ Least
Critically endangered (CR)	Extremely high risk of extinction in the wild	
Endangered (EN)	High risk of extinction in the wild	
Vulnerable (VU)	High risk of endangerment in the wild	
Near Threatened (NT)	Likely to become endangered in the near future	
Least Concern (LC)	Assessed as not threatened following consideration of Criteria A, B, C & D	
Other Categories		
Data Deficient (DD)	Taxa believed to have very restricted and quite possibly threatened populations, but insufficient data for analysis	
Waiting List (WL)	Full assessment not possible due to inadequate data, taxonomic uncertainties or uncertainties over native or archaeophyte status	

- **Habitat and plant species distribution** - The SxBRC consultation, species-specific information within a range of resources including local BAPs, lists of Habitats/Species of Principal Importance (previously Priority Habitats/Species under UKBAP) is used to determine the distribution of plant species and habitat types at various geographic scales.
- **Habitat quality** – In general, habitats with a greater diversity of species are considered to be of greater ecological value. Factors such as geology, hydrology, connectivity and management can affect the quality and diversity of a habitat.
- **Habitat size** – The extent of a habitat will affect its geographic scale of importance. A 'significant' area of a notable habitat is one capable of providing a substantive contribution to the conservation of that habitat type, sustains viable species populations associated with that habitat type and/or provides a genetic resource for species associated with that habitat type.

2.4 Mammals

2.4.1 Bats

Evaluation of habitats has been undertaken with reference to evaluation criteria set out in 'Valuing Bats in Ecological Impact Assessment' (Wray, et al., 2010), detailed in **Table 18**. In line with this guidance, each criteria is given a score, which is used to determine the geographic scale of importance for each bat species at the site **Table 19**.

Table 18: Scores for evaluation of bat foraging and commuting habitat

Criteria	Categories	Score
Species	Common	2
	Rarer	5
	Rarest	20
Number of bats	Individual bats (<100 registrations)	5
	Small number of bats (100 – 10,000 registrations)	10
	Large number of bats (>10,000 registrations)	20
Roosts nearby	None	1
	Small number	3
	Moderate number/Not known	4
	Large number of roosts, or close to a SSSI for the species	5
	Close to or within a SAC for the species	20
Habitat Quality - Commuting	Absence of (other) linear features	1
	Unvegetated fences and large field sizes	2
	Walls, gappy or flailed hedgerows, isolated well-grown hedgerows, and moderate field sizes	3
	Well-grown and well-connected hedgerows, small field sizes	4
	Complex network of mature well-established hedgerows, small fields and rivers/streams	5
Habitat Quality - Foraging	Industrial or other site without established vegetation	1
	Suburban areas or intensive arable land	2
	Isolated woodland patches, less intensive arable and/or small towns and villages	3
	Larger or connected woodland blocks, mixed agriculture and small villages/hamlets	4
	Mosaic of pasture, woodlands and wetland areas	5

Table 19: Scoring system for valuing commuting and foraging bats

Score	Geographic Scale
1-10	Site
11-20	Local
21-30	County
31-40	Regional
41-50	National
>50	International

This calculation provides a broad indication of the value of the site for each bat species present. ECOSA may use their professional judgement to adjust the geographic scale at which the site is valued based on factors not accounted for within the scoring system. Where this occurs the adjustment will be fully justified.

The site may of value at different geographic scales for different bat species. The value assigned to the site overall is the greatest value assigned to any one bat species.

Evaluation of the site for bats is based on ECOSA's best professional judgement considering the following factors:

- **Species rarity** - Relative rarity of bat species in England is based on guidance set out in InPractice Article 'Valuing Bats in Ecological Impact Assessment' (Wray, et al., 2010), which is based on estimates in (Richardson, 2000), (Harris, et al., 1995) and (Harris & Yalden, 2008). **Table 20** shows the relative rarity of different species of bat. Rarer species are considered to be of greater ecological value.

Table 20: Relative rarity of UK bat species

Rarity within England	Species
Common (Population over 100,000)	Common pipistrelle <i>Pipistrellus pipistrellus</i> Soprano pipistrelle <i>Pipistrellus pygmaeus</i> Brown long-eared bat <i>Plecotus auritus</i>
Rarer (Population 10,000 – 100,000)	Lesser horseshoe <i>Rhinolophus hipposideros</i> Whiskered bat <i>Myotis mystacinus</i> Brandt's bat <i>Myotis brandtii</i> Daubenton's bat <i>Myotis daubentonii</i> Natterer's bat <i>Myotis nattereri</i> Leisler's bat <i>Nyctalus leisleri</i> Noctule <i>Nyctalus noctula</i> Nathusius' pipistrelle <i>Pipistrellus nathusii</i> Serotine <i>Eptesicus serotinus</i>
Rarest (Population under 10,000)	Greater horseshoe <i>Rhinolophus ferrumequinum</i> Bechstein's bat <i>Myotis bechsteinii</i> Alcathoe bat <i>Myotis alcathoe</i> Greater mouse-eared bat <i>Myotis myotis</i> Barbastelle <i>Barbastella barbastellus</i> Grey long-eared bat <i>Plecotus austriacus</i>

- **Species distribution** – The SxBRC consultation, online resources available from the Sussex Bat Group and Article 17 reporting (JNCC, 2013) is used to determine the distribution of bat species at various geographic scales.
- **Presence of roosts and their ecological function (i.e. breeding or non-breeding roosts)** –Roost types have been defined in accordance with Bat Conservation Trust guidelines (Collins, 2016). Definitions and their relative status are set out in **Table 21**.

Table 21: Bat roost type definitions and relative status

Roost Type	Definition	Relative Status
Maternity Roost	Where female bats give birth and raise their young to independence.	Greatest Least
Hibernation Roost	Where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.	
Swarming Site	Where large numbers of males and females gather during late summer to autumn. Appear to be important mating sites.	
Satellite Roost	An alternative roost found in close proximity to the main nursery colony used by a few individual breeding females to small groups of breeding females throughout the breeding season.	
Day Roost	A place where individual bats, or small groups of males, rest or shelter in the day but are rarely found by night in the summer.	
Mating Sites	Where mating takes place from late summer and can continue through winter.	
Transitional/Occasional Roost	Used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.	
Night Roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony.	
Feeding Roost	A place where individual bats or a few individuals rest or feed during the night but are rarely present by day.	

- **Habitat quality** – The assessment of habitat quality is based on information within a number of publications including the Bat Conservation Trust guidelines (Collins, 2016) and 'Valuing Bats in Ecological Impact Assessment' (Wray, et al., 2010). Online mapping resources are referenced in order to assess the habitat quality and connectivity in the wider area.

2.4.2 **Badger**

Evaluation of badger has been undertaken based on criteria detailed in **Table 22**. Geographic scales beyond county are not included as badger are common and widespread across the country. The reason for their consideration as part of the ecological impact assessment is as a result of their vulnerability to persecution and associated legal protection¹².

¹² See Paragraph 1.6 of the Technical Appendix 9.1 for details.

Table 22: Criteria for geographic scale of importance for badger

Importance	Criteria
Negligible	Supports habitat that is only likely to be used by badger occasionally/opportunistically, if at all.
Site	Supports habitat that is likely to provide a resource for badger, but this resource is not considered to be significant to the local badger population.
Local	Supports habitat that is likely to provide a significant resource for badger in the local area but would not qualify for Local Wildlife Site status in accordance with 'Sussex Local Wildlife Site Selection Criteria' (Cole, 2018)
County	Supports a large or significant population of badger e.g. the most extensive and long-recorded badger sett over a large area in accordance with 'Sussex Local Wildlife Site Selection Criteria' (Cole, 2018)

Evaluation of the site for badger is based on ECOSA's best professional judgement considering the following factors:

- **Presence of setts and their ecological function (e.g. main sett or outlier sett)**
 - Sett types have been defined in accordance with 'The history, distribution, status and habitat requirements of the badger in Britain.' (Cresswell, et al., 1990). Definitions and their relative status are set out in **Table 23**.

Table 23: Badger sett type definitions and relative status

Sett Type	Definition	Relative Status
Main Setts	The continuously used, breeding and over-wintering sett for a social group of badgers. Only one main sett will exist in each social group's territory and will be relatively centrally located within the group's range.	Greatest  Least
Annexe Setts	An annexe of the main sett, linked by well-used surface paths to the main sett (but not connected underground). Not continuously used.	
Subsidiary Setts	Distant from main sett. Several entrances, but with no well-used paths connecting to main sett, and only used seasonally.	
Outlier Setts	Distant from the main sett. Small, with one or two entrances only. Used for short periods sporadically, with no obvious, well-used paths connecting to others.	

- **Habitat quality** - The assessment of habitat quality is based on information within a number of publications including 'The history, distribution, status and habitat requirements of the badger in Britain.' (Cresswell, et al., 1990). Online mapping resources are reference to assess the habitat quality and connectivity in the wider area.

2.4.3 Other Mammals - European Hedgehog, Brown Hare, Harvest Mouse

Evaluation of other mammals including European hedgehog *Erinaceus europaeus*, brown hare *Lepus europaeus*, harvest mouse *Micromys minutus* has been undertaken with reference to selection criteria for designated sites at various geographic scales as detailed in **Table 24**. Geographic scales beyond local are not included as this species, in isolation, is not included as features for consideration in the selection of designated sites. There is also insufficient information available regarding the distribution of these species to make an accurate assessment to based on county distribution.

Table 24: Criteria for geographic scale of importance for other mammals

Importance	Criteria
Negligible	Supports habitat that is of such limited extent it does not form even a significant proportion of the on-site habitat resource for the species.
Site	Supports habitat that is likely to provide a resource for the species, but this resource is not considered to be significant to the local population.
Local	Supports habitat that is likely to provide a significant resource for the species in the local area.

Evaluation of the site for other relevant species which may be present on site is based on ECOSA's best professional judgement considering the following factors:

- **Species distribution** – The SxBRC consultation, 'Mammal Watch South East' (Mammal Watch South East, 2015) and 'The State of Britain's Hedgehogs 2018' (Wilson & Wembridge, 2018) are used to determine the distribution of European hedgehog at the local and national scale.
- **Habitat quality** - The assessment of habitat quality is species-specific and is gained from a range of sources. Online mapping resources are referenced to assess the habitat quality and connectivity in the wider area.

2.5 Birds

Evaluation of habitats for wintering and breeding birds has been undertaken with reference to selection criteria for designated sites at various geographic scales as detailed in **Table 25**.

Table 25: Criteria for geographic scale of importance for birds

Importance	Criteria
Site	Supports habitat that is likely to provide a resource for birds, but this resource is not considered to be significant to the local bird population.
Local	Supports habitat that is likely to provide a significant resource for birds in the local area but would not qualify for Local Wildlife Site status in accordance with 'Sussex Local Wildlife Site Selection Criteria' (Cole, 2018)

County	Supports a bird population or assemblage that would qualify for Local Wildlife Site status in accordance with ' <i>Sussex Local Wildlife Site Selection Criteria</i> ' (Cole, 2018)
National	Supports a bird population or assemblage that would qualify for SSSI status in line with criteria set out in ' <i>Guidelines for the Selection of Biological SSSIs</i> ' (Drewitt, et al., 2015)
European	Supports a bird population or assemblage that would qualify for SPA status in line with criteria set out in ' <i>Selection guidelines for Special Protection Areas</i> ' (Stroud, et al., 2001)
International	Supports a bird population or assemblage that would qualify for Ramsar status in line with criteria set out in ' <i>The Ramsar Sites Criteria</i> ' (Ramsar, 1971).

Evaluation of the site for breeding birds is based on ECOSA's best professional judgement considering the following factors:

- **Species rarity/vulnerability** - Relative rarity of and threat to bird species in England is based on extinction risk categories and criteria defined in the Birds of Conservation Concern (BoCC) Red List (Eaton, et al., 2015). **Table 26** shows the relative extinction risk of species in different categories. Species in higher risk categories are considered to be of greater ecological value.

Table 26: Categories of extinction risk and their criteria for UK bird species

Category	Definition	Relative Value
Red List	Red List criteria include species which are: ▪ globally threatened; have been subject to historical population decline in UK during 1800–1995; ▪ are in severe (at least 50%) decline in UK breeding population over last 25 years, or longer-term period, or; ▪ subject to severe (at least 50%) contraction of UK breeding range over last 25 years, or longer-term period.	Greatest  Least
Amber List	Amber list criteria include species which are: ▪ in unfavourable conservation status in Europe; ▪ subject to historical population decline during 1800–1995, but recovering; ▪ subject to moderate (25-49%) decline in UK breeding population or contraction of UK breeding range over last 25 years, or the longer-term period; ▪ subject to moderate (25-49%) decline in UK non-breeding population over last 25 years, or the longer-term period; ▪ rare breeders (1–300 breeding pairs in UK); ▪ rare non-breeders (less than 900 individuals), or; ▪ internationally important species with at least 20% of European breeding or non-breeding population in the UK.	
Green List	Species that occur regularly in the UK but do not qualify under any or the above criteria.	

Relative rarity of bird species in Sussex is based on information provided in the Sussex Notable Bird List (Sussex Ornithological Society, 2016).

- **Species distribution** - The SxBRC consultation, Birds of Sussex (James, 1996), Sussex Notable Bird List (Sussex Ornithological Society, 2016) and the British Trust for Ornithology Bird Atlas (Balmer, et al., 2018) is used to determine the distribution of bird species at various geographic scales.
- **The quality and function of on-site habitats (e.g. nesting or feeding sites)** – This information is species-specific and is gained from a wide range of sources.

2.6 Reptiles

Evaluation of reptiles has been undertaken with reference to selection criteria for designated sites at various geographic scales as detailed in **Table 27**. Geographic scales beyond local are not included no UK reptile species are included in Annex II of the Habitats Directive and therefore no reptile population or assemblage is considered to be of importance beyond the national level.

Table 27: Criteria for geographic scale of importance for birds

Importance	Criteria
Site	Supports habitat that is likely to provide a resource for reptiles, but this resource is not considered to be significant to the local reptile population.
Local	Supports habitat that is likely to provide a significant resource for reptiles in the local area but would not qualify for Local Wildlife Site status in accordance with ' <i>Sussex Local Wildlife Site Selection Criteria</i> ' (Cole, 2018)
County	Supports a reptile population or assemblage that would qualify for Local Wildlife Site status in accordance with ' <i>Sussex Local Wildlife Site Selection Criteria</i> ' (Cole, 2018)
National	Supports a reptile population or assemblage that would qualify for SSSI status in line with criteria set out in ' <i>Guidelines for the Selection of Biological SSSIs</i> ' (JNCC, n.d.)

Evaluation of the site for reptiles is based on ECOSA's best professional judgement considering the following factors:

- **Species rarity** - Relative rarity of reptile species in England is based on guidance set out in the Reptile Habitat Management Handbook (Edgar, et al., 2010). **Table 28** shows the relative rarity for different species of reptile. Rarer species are considered to be of greater ecological value.

Table 28: Relative rarity of UK bat species

Rarity within England	Species
Common	Slow-worm <i>Anguis fragilis</i> Grass snake <i>Natrix natrix</i> Common lizard <i>Zootoca vivipara</i> Adder <i>Vipera berus</i>
Rare	Sand lizard <i>Lacerta agilis</i> Smooth snake <i>Coronella austriaca</i>

- **Species distribution** - The SxBRC consultation, the National Amphibian and Reptile Recording Scheme (NARRS) Report 2007-2012 (Wilkinson & Arnell, 2013) and Article 17 reporting (JNCC, 2013) is used to determine the distribution of reptile species at various geographic scales.
- **Population size class of populations present** - Population size class is estimated using guidance in Froglife's 'Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10' (Froglife, 1999). **Table 29** shows the Froglife guidance for assessing the population size of reptile species known to be present at the site, based on a refugia density of 10 per hectare which is less than the density used at the site.

Table 29: Criteria for population size assessment based upon a refugia density of 10 per hectare

Species	Low Population	Good Population	Exceptional Population
Slow-worm	<5	5-20	>20
Common lizard	<5	5-20	>20
Grass snake	<5	5-10	>10
Adder	<5	5-10	>10

- **Habitat quality and connectivity** - The assessment of habitat quality is based on information within a number of publications including Reptile Habitat Management Handbook (Edgar, et al., 2010). Online mapping resources are referenced to assess the habitat quality and connectivity in the wider area.

2.7 Amphibians

Evaluation of amphibians has been undertaken with reference to selection criteria for designated sites at various geographic scales as detailed in **Table 30**.

Table 30: Criteria for geographic scale of importance for amphibians

Importance	Criteria
Site	Supports habitat that is likely to provide a resource for amphibians, but this resource is not considered to be significant to the local population.
Local	Supports habitat that is likely to provide a significant resource for amphibians in the local area but would not qualify for Local Wildlife Site status in accordance with ' <i>Sussex Local Wildlife Site Selection Criteria</i> ' (Cole, 2018)
County	Supports an amphibian population or assemblage that would qualify for Local Wildlife Site status in accordance with ' <i>Sussex Local Wildlife Site Selection Criteria</i> ' (Cole, 2018)
National	Supports amphibian population or assemblage that would qualify for SSSI status in line with criteria set out in ' <i>Guidelines for the Selection of Biological SSSIs</i> ' (JNCC, n.d.)
European	Supports a rare amphibian population (great crested newt) that would qualify for SAC status in line with criteria set out in ' <i>The Habitats Directive: Selection of Special Areas of Conservation in the UK</i> ' (JNCC, 2018)

Evaluation of the site for amphibians is based on ECOSA's best professional judgement considering the following factors:

- **Distribution** - The SxBRC consultation, National Amphibian and Reptile Recording Scheme (NARRS) Report 2007-2012 (Wilkinson & Arnell, 2013) and Article 17 reporting (JNCC, 2013) is used to determine the distribution of amphibians at various geographic scales.
- **Population size class of populations present** - It is difficult to establish the true size of a population of amphibians, due to variations in sampling efficiency and the complex population dynamics involved. Hence, population estimation methods can only give an indication of whether the population is small, medium or large in terms of the number of newts present in the breeding pond.

In accordance with Natural England's 'Great Crested Newt Mitigation Guidelines' (English Nature, 2001), survey results should be expressed as peak adult counts per pond per night gained through field survey methods, and a total site count, if appropriate.

Populations can then be classed as:

- 'small' for maximum counts up to 10;
 - 'medium' for maximum counts between 11 and 100; or
 - 'large' for maximum counts over 100.
- **Ecological function of habitats present (i.e. breeding or resting place)** – Great crested newt surveys of waterbodies will determine the presence of breeding

ponds for amphibian species. As these ponds provide a key ecological function they are accorded a higher ecological value than terrestrial habitat which may provide shelter for great crested newt in their terrestrial phase.

- **Habitat quality and connectivity** - The assessment of habitat quality is based on information within a number of publications including the Great Crested Newt Mitigation Guidelines (English Nature, 2001), the Great Crested Newt Conservation Handbook (Langton, et al., 2001) and the Herpetofauna Worker's Manual (Gent & Gibson, 2003). Online mapping resources are referenced to assess the habitat quality and connectivity in the wider area. Habitats which may provide connectivity between breeding ponds are accorded a higher ecological value.

2.8 Invertebrates

Evaluation of invertebrates has been undertaken with reference to selection criteria for designated sites at various geographic scales as detailed in **Table 30**.

Table 31: Criteria for geographic scale of importance for amphibians

Importance	Criteria
Site	Supports habitat that is likely to provide a resource for amphibians, but this resource is not considered to be significant to the local population.
Local	Supports habitat that is likely to provide a significant resource for invertebrates in the local area but would not qualify for Local Wildlife Site status in accordance with 'Sussex Local Wildlife Site Selection Criteria' (Cole, 2018)
County	Supports an invertebrate population or assemblage that would qualify for Local Wildlife Site status in accordance with 'Sussex Local Wildlife Site Selection Criteria' (Cole, 2018)
National	Supports invertebrate population or assemblage that would qualify for SSSI status in line with criteria set out in 'Guidelines for the Selection of Biological SSIs' (JNCC, n.d.)
European	Supports a rare invertebrate population that would qualify for SAC status in line with criteria set out in 'The Habitats Directive: Selection of Special Areas of Conservation in the UK' (JNCC, 2018)

Evaluation of the site for invertebrates is based on ECOSA's best professional judgement considering the following factors:

- **Distribution** - The SxBRC consultation, the Sussex Rare Species Inventory and Article 17 reporting (JNCC, 2013) is used to determine the distribution of invertebrate species at various geographic scales.
- **Ecological function of habitats present** – The potential ecological function of a habitat is considered, for example, those that support larval food plants of a particular species, particularly for species that are restricted to a narrow variety of plant species.

- **Habitat quality and connectivity** - The assessment of habitat quality is based on information within a number of publications depending on the invertebrate species being considered. Online mapping resources are referenced to assess the habitat quality and connectivity in the wider area.

2.9 Limitations to Evaluation Methodology

For some species there is insufficient baseline information to understand a species distribution or rarity at a specific geographic scale. Evaluation is based on best judgement using the information available.

The assessment of habitat quality is, by nature, subjective but is based on published evidence where available.

Habitat connectivity is based, in part, on consultation of online mapping resources, which may not be up to date.

The size of species populations are an estimate as it is impossible to know exactly how many individuals are on site using standard survey methods.

Further survey was not undertaken for brown hare, European hedgehog or harvest mouse and therefore population size was not a factor considered as part of the evaluation for these species.

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Map 1 Ground Level Tree Assessment



FORD AIRFIELD, WEST SUSSEX

ENVIRONMENTAL STATEMENT

TECHNICAL APPENDIX 9.2 –
ASSESSMENT METHODOLOGIES

Map 1 - Ground Level Tree Assessment

Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

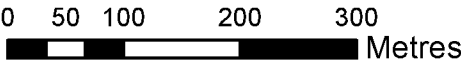
KEY

-  Site Boundary
-  Trees/tree groups subject to Ground Level Tree Assessment (2018)

N.B. Tree numbers reproduced from Barrell Tree Consultancy 'Tree Constraints Plan' Reference No. 181189-BT1. A ground level tree assessment was undertaken on 7th August and 10th August 2018 at the following tree nos:

G1, G13, G15, G17, G36, G37, G38, G41, G44, G46, G47, G48, G50, G51, G52, G53, G54, G55, G56, G57, G58, G75, H2, H42, H45, H49, H59, H73, H74, H76, T12, T14, T16, T18, T19, T43, T60, T61, T62, T63, T64, T65, T66, T67, T68, T69, T70, T71 and T72.

Scale at A3: 1:6,500



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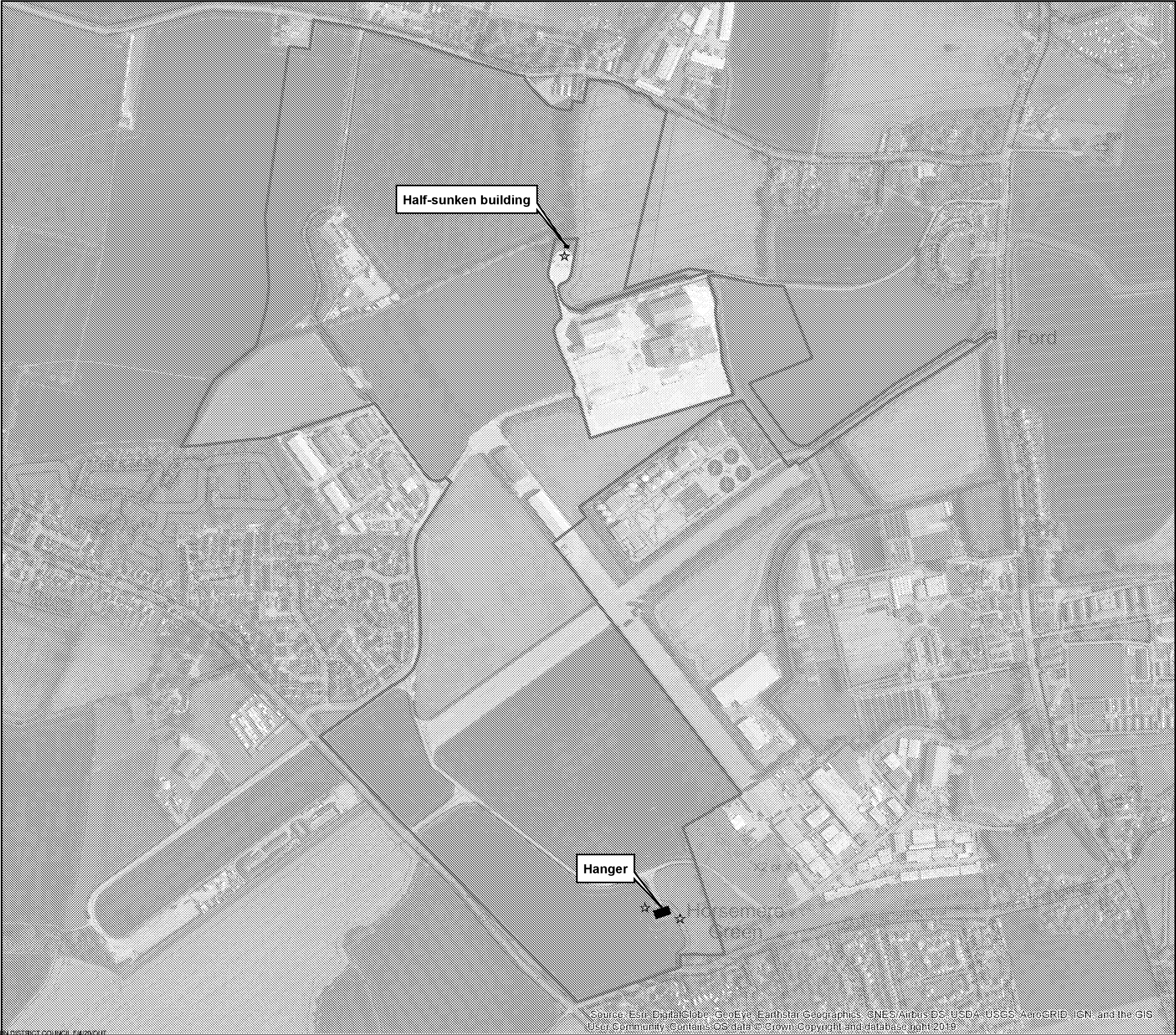
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Map 2 Bat Emergence/Re-entry Survey



FORD AIRFIELD, WEST SUSSEX

ENVIRONMENTAL STATEMENT

**TECHNICAL APPENDIX 9.2 –
ASSESSMENT METHODOLOGIES**

Map 2 - Bat Emergence/Re-entry Survey

Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

KEY

-  Site Boundary
-  Buildings subject to bat emergence survey
-  Location of bat surveyors

N.B. A single bat dusk emergence survey was undertaken on 28th August 2018.

Scale at A3: 1:6,500

0 50 100 200 300 Metres



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Map 3 Bat Transect Survey



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**TECHNICAL APPENDIX 9.2 –
ASSESSMENT METHODOLOGIES**

Map 3 - Bat Transect Survey

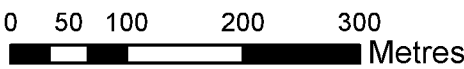
Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

KEY

-  Site Boundary
-  Northern Transect
-  Southern Transect
-  Five Minute Point Count

N.B. A single survey visit was undertaken on a monthly basis between May and October 2017. At the time of writing the red line site boundary had been altered since the bat transect surveys were carried out; therefore, part of the transect route appears outside of the red line site boundary.

Scale at A3: 1:6,500



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Map 4 Bat Automated Detector Survey



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ASSESSMENT METHODOLOGIES**

Map 4 - Bat Automated Detector Survey

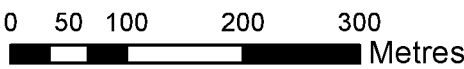
Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

KEY

-  Site Boundary
-  Location of Automated Detectors

N.B. A total of six automated detectors were deployed on two occasions in June 2017 and on one occasion between the months of July and October 2017. Automated detectors were set up at the same six locations during each deployment. At the time of writing the red line site boundary had been altered since the surveys were carried out; therefore, some automated detector locations appear outside of the red line site boundary.

Scale at A3: 1:6,500



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Map 5 Hazel Dormouse Survey



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TECHNICAL APPENDIX 9.2 –
ASSESSMENT METHODOLOGIES

Map 5 - Hazel Dormouse Survey

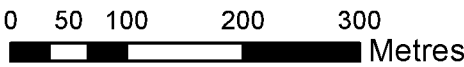
Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

KEY

-  Site Boundary
-  Location of Hazel Dormouse Tubes 2017 (x100)

N.B. Dormouse tubes were erected on the 26th May 2017. A total of four hazel dormouse surveys were undertaken between the months of June and September 2017. At the time of writing the red line site boundary had been altered since the surveys were carried out; therefore, some dormouse tube locations appear outside of the red line site boundary.

Scale at A3: 1:6,500



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Map 6 Breeding Bird Survey



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**TECHNICAL APPENDIX 9.2 –
ASSESSMENT METHODOLOGIES**

Map 6 - Breeding Bird Survey

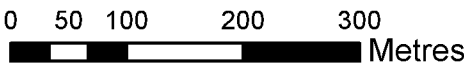
Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

KEY

-  Site Boundary
-  Breeding Bird Transect Route

N.B. Breeding bird survey visits were undertaken during May and June 2017. At the time of writing the red line site boundary had been altered since the surveys were carried out; therefore, part of the transect route appears outside of the red line site boundary.

Scale at A3: 1:6,500



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Map 7 Wintering Birds



FORD AIRFIELD, WEST SUSSEX

ENVIRONMENTAL STATEMENT

**TECHNICAL APPENDIX 9.2 –
ASSESSMENT METHODOLOGIES**

Map 7 - Wintering Bird Survey

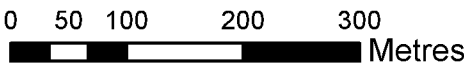
Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

KEY

-  Site Boundary
-  Wintering Bird Transect Route

N.B. Wintering bird survey visits were undertaken from December 2018 to February 2019 inclusive.

Scale at A3: 1:6,500



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Map 8 Reptile Survey



FORD AIRFIELD, WEST SUSSEX

ENVIRONMENTAL STATEMENT

**TECHNICAL APPENDIX 9.2 –
ASSESSMENT METHODOLOGIES**

Map 8 - Reptile Survey

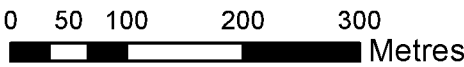
Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

KEY

-  Site Boundary
-  Location of Reptile Refugia 2017 (x200)

N.B. Reptile refugia were distributed on the 31st May 2017 and the 1st June 2017. A total of six reptile surveys were undertaken between the months of June and August 2017. At the time of writing the red line site boundary had been altered since the surveys were carried out; therefore, some reptile refugia locations appear outside of the red line site boundary.

Scale at A3: 1:6,500



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Map 9 Great Crested Newt Survey



FORD AIRFIELD, WEST SUSSEX

ENVIRONMENTAL STATEMENT

TECHNICAL APPENDIX 9.2 –
ASSESSMENT METHODOLOGIES

Map 9 - Great Crested Newt Survey

Client:	Wates Development / Redrow Homes
Date:	October 2019
Status:	Final Rev. 1

KEY

- Site Boundary
- Great Crested Newt Buffer: 500m

Great Crested Newt Survey 2017

Survey Method

- Pond subject to HSI and eDNA survey (Ponds 6, 7, 8 and 9)
- Pond subject to HSI only (Pond 1 only)
- Pond not surveyed - not accessible (Ponds 2, 3, 4, 5 and 10)

N.B. At the time of the HSI assessment four of the ten ponds shown were considered suitable for great crested newts; eDNA surveys were carried out on the 28th June 2017 at Ponds 6, 7, 8 and 9 only.

Scale at A3: 1:10,000

0 100 200 400 Metres

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