WORMWOOD SCRUBS

Protected Species Survey Report

November 2017

adult female viviparous lizard at the Scrubs

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Protecting London's **Wildlife** for the future

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1 Executive Summary

London Wildlife Trust (hereafter referred to as 'the Trust') was commissioned by the London Borough of Hammersmith & Fulham (LBHF) to undertake a series of protected species surveys on Wormwood Scrubs, hereafter referred to as 'the Scrubs'. The surveys were commissioned to assess the current importance of the Scrubs for a suite of protected species and protected species groups in light of proposed impacts to the Scrubs through the construction and operation of High Speed Rail 2 ('HS2')..

The survey effort was focussed in two regions:

- a primarily linear area along the northern edge of the Scrubs earmarked for the HS2 Stamford Brook sewer realignment[1] (breeding birds and reptiles), and;
- the wider Scrubs area where habitat enhancement works proposed by LBHF will take place (hedgehog and bats).

Bat, hedgehog, reptile and breeding bird surveys were carried out between May and September 2017 by Mike Waller (breeding birds and reptiles) and Huma Pearce (bats and hedgehogs). The surveys followed accepted professonal standard procedures.

The broad results of the surveys are as follows:

Reptiles

Only viviparous lizard *Zootoca vivipara* was observed, although this species was recorded in healthy numbers across the entire survey transect. Large numbers of very young yearling individuals were observed on the final visit in August, strongly suggesting successful breeding has taken place.

The proposed HS2 works are therefore likely to adversely affect the local population here through habitat destruction/vegetation removal and disturbance from on-site machinery and trench digging. However, this is dependent on the time of year and the scale of the proposed works which is not yet fully known.

All the proposed ecological enhancements are likely to have positive impacts on the general suitability of the onsite habitats for reptiles.

Breeding birds

A total of 15 bird species were observed displaying one or more breeding behaviours, suggesting nesting was taking place within or near the survey area. Of these species, kestrel *Falco tinnunculus* and long-tailed tit *Aegithalos caudatus* juveniles were observed on more than one visit strongly suggesting breeding had been successful on site for these species.

Provided the HS2 works are not carried out during the bird breeding season (March – August), breeding birds are not likely to be directly disturbed by the construction processes. However, the temporary removal of habitat along the base of the embankment may lower the ecological quality of the site in the long-term, thus reducing the suitability of the area for breeding birds.

All the proposed ecological enhancements should significantly improve the suitability of the various habitats present on the Scrubs for birds, particularly the woodland enhancements and development of species-rich grassland which are likely to enhance the availability of food sources throughout the seasons. The Japanese knotweed removal along Lester's

[1] The proposal is described in Supplementary Environmental Statement 3 ("SES") and Additional Provision 4 Environmental Statement Volume 2 Community forum area reports CFA4 Kilburn (Brent) to Old Oak Common at 5.2.1 to 5.2.10 (pp 51-52), 5.2.105 – 5.2.117 (pp 63-65) and in Table 3 Summary of amendments.

Embankment is seen as a positive measure which will result in improved nesting habitat for several species recorded as (probably) nesting there including scarcities such as lesser whitethroat *Sylvia curruca* and linnet *Linaria cannabina*.

Hedgehog

Footprint tunnel and spotlighting surveys did not confirm the presence of hedgehog *Erinaceus europaeus*.[2] Although the site supports suitable foraging and nesting habitats for hedgehogs, it is heavily disturbed (in particular from dog walkers and sports activities) and the surrounding roads and railway line likely pose significant barriers to the movement of hedgehogs (which can roam over 1km over one night).

The proposed habitat enhancements have the potential to improve the site in the long-term, but measures to improve connectivity such as mammal underpasses and the establishment of undisturbed fenced off areas would also be necessary if a hedgehog population is to be established and sustained at the site in the long-term. Appropriate methods and timings of works would need to be included in the future management proposals for the site to prevent adverse impacts to hedgehogs.

Bats

Low numbers of flight records for common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *P. pygmaeus,* and noctule *Nyctalus noctula* were recorded. Bat roosting opportunities were negligible and roost sites are unlikely to occur at the site.

Transitional habitats associated with woodland edge, woodland copses, scrub and long grass/meadow offered feeding opportunities for low numbers of *Pipistrellus* species. Most of these habitat features occur in the northern part of the site, adjacent to the proposed HS2 works.

Any temporary loss of habitat along the northern section, associated with the HS2 development, has the potential to reduce bat activity at the site, at least in the short term. However, given the low numbers of bats recorded, and following the implementation of remedial habitat enhancement works, the overall long-term impact of the proposals on the Wormwood Scrub's bat population is likely to be negligible.

HS2's proposals to establish a permanent wetland habitat in the southern section of the site (ideally to include an expanse of water with appropriate bankside and marginal planting) would have provided a suitable long-term habitat enhancement for bats. As these proposals have been rejected (in favour of the continued amenity use of the site), it is recommended that, where possible, an alternative water body should be included within the proposed habitat enhancement proposals. The following habitat enhancement proposals: traditional native hedgerow planting, the planting of additional woodland, the creation of scrape areas, species rich grassland and heathland habitat as well as the woodland management proposals should benefit bats in the long-term. New planting of tree-lines and hedgerows should be planned to provide vegetative screening from the prevailing wind and artificial lighting.

Bat boxes could be installed to provide roosting habitat, but should be considered secondary to the improvement of foraging habitat.

[2] More correctly defined as West European hedgehog.

2 Introduction

The Trust was commissioned by LBHF to undertake a series of protected species surveys of the Scrubs based on the recommendations outlined in the Extended Phase 1 survey report completed by the Trust for the Borough in September 2016.

The surveys aim to evaluate the current importance of the site (earmarked for the HS2 sewer realignment) for;

- reptiles;
- breeding birds;
- hedgehog and;
- bats

Wormwood Scrubs is situated in inner west London between White City, East Acton and Kensal Green, within the northern part of the borough (postcode W12). There are a range of semi-natural habitats across the site which is extensive and covers an area of just over 66 hectares (not including Little Wormwood Scrubs).

The entire area is designated as common land since the Wormwood Scrubs Act 1879 was passed by Parliament to lay down the conditions by which the area would be owned by the British Army. The Act remains in force to this day so that the area is kept for military training purposes but also '*the perpetual use thereof by the inhabitants of the metropolis for exercise and recreation*'[3]. Its common land status is protected by the 1879 Act, as well as that of the Commons Act 2006, requiring Ministerial consent for the erection of any structure or impediment to access.[4] The Scrubs are also designated Metropolitan Open Land.

A significant extent (42 ha) of the Scrubs is identified as a Site of Borough Importance for Nature Conservation (site H&FBI01 *Wormwood Scrubs Park*). In addition, seven discrete parcels form a designated Local Nature Reserve (LNR), covering all areas of woodland which are primarily located around the edge of the site.

Currently the area is managed by Hammersmith & Fulham Council in collaboration with Groundwork London. The site is championed by the Friends of Wormwood Scrubs who aim to protect it from damage, and continue to fight on-going development plans that infringe upon the Scrubs' natural character, biodiversity and people's tranquil enjoyment of the site.

2.1 HS2 Stamford Brook sewer realignment

A significant strip of land adjacent to the railway lines (which run along the northern edge of the Scrubs) is likely to be temporarily destroyed and surrounding areas heavily disturbed by the Stamford Brook sewer realignment as part of the Kilburn (Brent) to Old Oak Common section of HS2 construction measures. The land under construction usage will run from Chats Paddock south-west along Lester's Embankment and then turn south along the western edge of the open scrub area where it will join Braybrook Street. A satellite compound will also be erected on the Scrubs immediately at the edge of Chats Paddock (see Appendices).[5]

[3] Quote taken from the Wormwood Scrubs Act 1879.
[4] In addition, proposed structures require the consent of the borough council and the Secretary of State for Defence.
[5] Map number: CT-05-009a. Map Name: Construction Phase SES3 and AP4 ES

2.2 Proposed ecological enhancements

Initial ecological mitigation measures were proposed by HS2 in c2013 for the southern part of the Scrubs where a wetland was due to be developed. This proposal was rejected as the measures were deemed unsuitable, conflicting with the amenity use of this part of the Scrubs.

A range of alternative ecological enhancements were proposed by LBHF which covered a much broader scope works across all habitats present on the Scrubs. Those ecological enhancements are as follows:

Traditional native British hedge
To be extended along around the south-western corner of the rough grassland and scrub area in the western Scrubs;

Species enriched grassland
Three rough grassland sections in the southern Scrubs to be enhanced through seeding and appropriate management;

Scrape area creation
Two scrape areas to be created in the south-eastern Scrubs to allow water to collect and thus create ephemeral wetlands;

Improved tree compartment management
All tree compartments (which are LNRs) to be managed to improve their biodiversity value which will include processes such as thinning, native shrub and tree planting, native woodland flora planting, woodland edge improvement, log pile development and glade creation;

Heathland planting
Planting of heathland species in two areas of the north-eastern Scrubs; and

Japanese knotweed removal
Removal of extensive Japanese knotweed along Lester's Embankment along the north-western boundary of the Scrubs.

2.3 Site Details

2.3.1 Topography

The Scrubs lie on the northern side of the Thames Valley above the Lower Flood Plain with a very gently south-sloping aspect. The highest point is approximately 28 metres asl at the northern edge dropping to approximately 15 metres asl at the southern extremity of the site.

The railway embankment, created as part of the earlier Channel Tunnel Rail Link works (for North Pole Depot) in the early 1990s, which marks the northern edge of the site is steep and approximately 15m high.

2.3.2 Hydrology and soils

The entire site sits directly on London clay which underlies much of London originating as marine mud deposited on the sea floor approximately 50 million years ago. During the summer months, the clay dries and contracts causing surface cracks to appear whereas during the

wetter winter months, the area often becomes muddy as the water is slow to drain through the thick clay.

The railway embankment is man-made comprising of '*a mixture of sand and gravel, rubble, spent ballast, clay and coal dust and associated debris from the age of steam*.'[6]

The soils present across the site vary from neutral to slightly acidic and may even be slightly alkaline in places due to historic land use.

2.3.3 Access and usage

The use of the site is very varied due to its large size, openness and relatively level topography. The primary usage of the Scrubs is for leisure and amenity. Most obviously, the large amenity grassland area in the eastern-central part of the site is devoted to playing fields with a number of marked football pitches. Immediately adjacent to this area in the west is an area designated for model aircraft flying. Wilder areas form much of the northern and western boundaries as well as the grassland on the western flank.

The path that runs around the perimeter of the site is popular with joggers and dog walkers. The site is also used for wildlife watching activities and especially bird-watching in the western scrub and rough grassland area (where the survey effort was focussed) which attracts unusual migrant species during spring and summer.

The Scrubs is publically accessible at all times.

[6] All quotes and much information for this subchapter is taken from *The Wildlife of Scrubs Wood* (1984) by The Hammersmith & Fulham Group of London Wildlife Trust.

3 Protected species surveys

3.1 Survey details

The broad survey area covers all land within the earmarked sewer realignment zone in order to establish the importance of this area for the target protected species and protected species groups (see below). Surveys were completed between May and September, focussing on 4 species or species groups.

Table 1 provides details for each survey visit.

Table 1. Details of survey visits

Survey type	Survey date	Weather Conditions	Time surveyed (hours/minutes)
Breeding Bird	19th May	Warm, breezy, sunny spells	1 hour
Breeding Bird	6th June	Warm, sunny	1 hour
Bats (Preliminary Bat Assessment)	7th June	Warm and sunny. 20°C, dry with ~30% cloud cover and a gusty breeze. Visibility was good.	3 hours
Hedgehog habitat survey and placement of footprint tunnels	7th June		2 hours
Hedgehogs (Footprint tunnels)	7th-12th June	The weather conditions were mostly favourable during the survey period with only low levels of rain reported on 7-9th June (~1mm) and minimum temperatures ranging from 11-16°C. Wind speeds reached as much as 20mph, but gusty winds were reported for much of June and, with the exception of detector 2, all other equipment was located in more sheltered areas of the site.	5 nights of survey
Bats (Static detectors)	7th-13th June		6 nights
Hedgehog (Spotlighting)	13thJune	23-15°C, light breeze, no rain and 10% cloud cover	3 hours
Bats (Activity survey)	13th June		
Breeding Bird and Reptile	21st June	Cool, windy, cloudy	2 hours 30 minutes

Survey type	Survey date	Weather Conditions	Time surveyed (hours/minutes)
Breeding Bird and Reptile	3rd July	Mild, still, cloudy	2 hours 30 minutes
Breeding Bird and Reptile	14th July	Warm, still, sunny spells	2 hours 30 minutes
Breeding Bird and Reptile	28th July	Warm, breezy, sunny spells	2 hours 30 minutes
Breeding Bird and Reptile	11th August	Warm, still, sunny spells	2 hours 30 minutes
Reptile	24th August	Warm, breezy, sunny spells	1 hour 30 minutes
Hedgehogs (Spotlighting)	28th September	20-15°C, gusty breeze, no rain and 40% cloud cover.	3 hours
Bat (Activity survey)	28th September		
Hedgehog (Footprint tunnels)	28th September-8th October	Weather conditions were favourable. Overnight, minimum temperatures ranged from 8-15°. Rain was heavy on 28th September (12mm) but ≤2mm for the remainder of the survey period. Wind speeds were variable (9-26km/hr).	10 nights
Bats (Preliminary Bat Assessment – specifically tree inspection)	6th November	14°C, sunny with <10% cloud cover and a light breeze. Visibility was good.	2 hours

3.2 Survey timings

Due to the later-than-expected date of commissioning, the surveys began nearly two months later than expected as materials such as the reptile refugia mats were not available.

The optimal period for reptile surveys is during April and May when gradually warming (though still cool) temperatures, coupled with short days, encourage reptiles to bask for longer periods of time and are thus more visible than later in the summer. However, the first reptile survey could not be conducted until June 21st and so the timing of the reptile survey is deemed as **adequate.**

Similarly, the breeding bird survey period is best conducted during March, April and May when activity is at its highest and breeding behaviour is thus most conspicuous. However, some species will breed throughout the summer and so the timing of the breeding bird survey is deemed as **adequate**.

The hedgehog surveys were carried out in the early and later activity period for the species. In June, adult animals will be active and in late September/October both adults and juveniles (born that year) would be active.

The bat activity transect surveys were carried out in June and September 2017. The June survey fell within the bat breeding season and provided an indication of the number of adult bats using the site, the proximity of maternity colonies within or near to the site (based on the timing of first bat contacts) and the value of the site as bat foraging resource. Bat activity reported during the September survey included activity by both adult and juvenile animals. The timing of the survey was also suitable for evaluating the occurrence of mating roosts (based on the frequency of social calls reported). Furthermore, this survey was carried out whilst the sports pitches were in use and enabled an assessment of the potential impact of artificial lighting on bat use at the site.

3.3 Rationale for selected protected species surveys

Following the Phase 1 Habitat Survey of the Scrubs completed by the Trust in September 2016, rationales for additional protected species surveys were outlined in the final report. Those rationales are included here again (with additional text) to provide background context.

3.3.1 Reptile survey

The northern edge of the scrubs along Lester's Embankment and the adjacent meadow area (western scrub and rough grassland area) has historically been an important area for viviparous lizard. However, the current population size is not fully known. Furthermore, other species such as slow-worm and grass snake may also be present.

All reptile species are fully protected by UK law through the Wildlife & Countryside Act 1981 (as amended) meaning it is illegal to kill, injure or trade in the aforementioned species and are required to be surveyed for as part of the planning process where necessary mitigation may be required.

3.3.2 Breeding birds survey

One of the key aspects of the biological value of the Scrubs is the presence of important breeding bird populations, particularly meadow pipit *Anthus pratensis*, lesser whitethroat *Sylvia curruca*, common whitethroat *S. communis* and song thrush *Turdus philomelos*. A range of other rare and scarce bird species pass through the Scrubs and use the meadow area in particular as a stop-over during the migration periods in spring and autumn.

All nesting birds are protected under UK law through the Wildlife & Countryside Act 1981 (as amended) meaning it is illegal to intentionally take, damage or destroy the nest of any wild bird while it is in use or being built. Nesting birds must be surveyed for as part of the planning process where necessary mitigation may be required.

3.3.3 Hedgehog survey

The GiGL data search [requested for the Phase 1 Habitat report] highlighted a record for hedgehog from 2002. Although this is now an old record, there is a distinct possibility that the Scrubs may support a small population of hedgehogs as the species is nocturnal and rarely encountered unless they are searched for. The habitat is ideally suited to hedgehogs with a mixture of thickets for cover and open grassland areas in which to hunt. Furthermore, the presence of numerous connected garden spaces in adjacent residential areas may provide extra foraging habitat.

Hedgehogs are nationally protected under Schedule 6 of the Wildlife and Countryside Act (1981, as amended) and the Wild Mammals Protection Act (1996). They are also listed as a priority species in the 2007 UK Biodiversity Action Plan (BAP) and London BAP (2008).

3.3.4 Bat survey

Common pipistrelle, soprano pipistrelle and noctule bats have been recorded at Wormwood Scrubs Park (London Bat Group, Oct 2017). No roosts are known to occur at the site. A licensed bat specialist will be required to adequately confirm this and the range of species present.

All bat species in the UK are fully protected under The Conservation (Natural Habitats, &c.) Regulations 2010 (as amended) through their inclusion on Schedule 2. Regulation 41 prohibits: deliberate killing, injuring or taking (capture) of bats; deliberate disturbance of bats in such a way as to: (a) impair their ability to survive, breed, or rear or nurture their young; or (b) affect significantly the local distribution or abundance of bat species; or (c) impair their ability to hibernate or migrate; damage or destruction of a bat breeding site or resting place i.e. roost; and, keeping, transporting, selling, exchanging or offering for sale whether live or dead or of any part thereof.

All bat species in the UK are also protected under the Wildlife & Countryside Act 1981 (as amended) through their inclusion on Schedule 5. Under this Act, it is an offence to: intentionally or recklessly disturb any bat while it is occupying a structure or place which it uses for shelter or protection; intentionally or recklessly obstruct the access to any place of shelter or protection used by bat(s); and, sell, offer or expose for sale, possess or transport a bat(s) for the purpose of sale.

A European Protected Species Mitigation (EPSM) Licence issued by the relevant countryside agency (e.g. Natural England) will need to be applied for to allow derogation from the relevant legislation i.e. for works liable to affect a bat roost or for operations likely to result in a level of disturbance which might impair their ability to undertake those activities mentioned above (e.g. survive, breed, rear young, hibernate, migrate). In certain circumstances, important foraging areas and/or commuting routes can be regarded as being afforded de facto protection, for example, where it can be proven that the continued usage of such areas is crucial to maintaining the integrity and long-term viability of a bat roost.

3.4 Survey methodologies

Table 2. Species survey details

Species survey type	Details
Reptiles	Based on National Amphibian and Reptile Recording Scheme (NARRS) methodology, reptiles were surveyed via two methods; • visual search along the periphery of scrub vegetation and; • deployment and checking of reptile refugia (roofing tiles laid in open but secluded locations away from paths on the ground).[7] A total of 59 reptile refugia were deployed along the entire length of the earmarked sewer realignment zone.
Breeding bird	Based on British Trust for Ornithology Common Bird Census (CBC) method (Marchant, 1983), surveys would be carried out by recording behavioural observations along one or more transects in the affected area. This would establish potential territories by analysing 'clusters' of point records indicative of nesting behaviour. Behaviours deemed to be indicative of breeding are as follows; • carrying nest material or food; • aggressive behaviour; • presence of newly fledged birds; • presence of nests; • singing and; • courtship displaying
Hedgehog	Survey methodology was based on PTES Guidance for detecting hedgehogs using footprint tracking tunnels (2015)[8] and UK BAP Mammals: Interim guidance for survey methodologies, impact assessment and mitigation (The Mammal Society, 2012). Surveys included: • The deployment of five baited footprint tunnels for a period of 5-10 nights in June and late September. The ink used to obtain footprints comprised carbon powder mixed in organic vegetable oil. Tunnels were checked daily and bait (Spike's Hedgehog Food) and paper replaced. Due to high amenity use of the site, the number of suitable sites to deploy hedgehog tunnels was limited. In particular, the sports pitches had to be excluded from the survey area. Tunnels were positioned along linear features at the edge of woodland, scrub vegetation, within undisturbed grassland habitat, and as far as possible, concealed from view. • Two spotlighting surveys were completed at dusk in June and late September/early October and lasted for 3 hours. Animals were searched for using a high power torches, a Flir E60 thermal camera and active listening for animals moving amongst the vegetation. The transect routes walked were the same as those walked during the bat activity transect surveys and are shown in the appendix.

[7] Being ectothermic ('cold blooded'), reptiles seek out warm safe locations meaning they will actively seek out shelter beneath materials which hold their warmth such as corrugated iron, felt roofing tiles etc.

[8] https://ptes.org/wp-content/uploads/2015/06/Guidance-for-detecting-hedgehogs-using-tracking-tunnels.pdf

Species survey type	Details
	Surveys provide a method for confirming presence of species but are unable to confirm absence.
Bats	Based on Collins, J (ed). (2016). *Bat Surveys for professional ecologists; Good Practice Guidelines,* 3rd edition. Bat Conservation Trust, London. • A data search of all known bat records (roost, flight and bat casualty records) with a 2km search radius of the site (TQ2223081737) was requested from London Bat Group. The purpose of the survey was to determine whether there is any historical evidence of a roost within or near to the site and to ascertain the species of bat known to be present within the immediate surrounding area. • A preliminary bat assessment was completed on the 13th June 2017. Habitat types occurring within the site were classified and their value to bats as a roost site, feeding habitat and/or flight line were assessed. The site was revisited on 6th November to better evaluate roost features associated with trees, when they were not in full leaf. Mature trees that support crevice and cavity features, that offer a safe place of shelter from weather and predation, may provide roost sites for bats. Potential tree roost features were identified from a ground level inspections using close focusing binoculars and a high power torch. Suitable openings were inspected for the presence of staining (associated with fur oil deposits when the animal enters and exits the roost) and scratch marks (associated with animals landing at the roost entrance and climbing into the feature). Droppings were also searched for on the vegetation below suitable openings. Bat foraging habitat was assessed as vegetation that typically supports high insect biomass such as edge and mosaic habitats, sheltered habitat features, broadleaved trees and aquatic habitats. Commuting habitat included linear vegetated features such as tree-lines, woodland edge and watercourses. Aerial photographs were used to evaluate connectivity of the site to the surrounding area. Data collected from the static detector surveys and evening bat emergence and activity surveys were also used to evaluate use of the habitat by bats for feeding and commuting. • Four static detectors Song Meter 2 (SM2) detectors and SMX-U1 microphones (Wildlife Acoustics Inc.) were deployed at the site between the 7th and 13th June 2017 to assess bat activity at the site. They were placed within suitable bat foraging and commuting habitat: within the secondary woodland, along tree lines and scrub edges, and within the long grassland/meadow and scrub habitat. The location of the detectors is shown in the Appendix. Detectors were set to record between sunset minus 15 minutes up until sunrise plus 15 minutes to maximise the likelihood of identifying roost sites (from bat calls recorded near to sunset and sunrise) and monitor bat activity throughout the night. Each detector recorded for between six and seven nights, according to battery life. Bat

Species survey type	Details
	calls were analysed using BatSound Software (Petterssen Elektronik) to identify the species recorded. A timeline of bat contacts was produced for each location and bat activity was noted in terms of foraging, commuting and social calls. • Two dusk bat activity transect surveys were completed on the 13th June 2017 and the 28th September 2017. The purpose of the surveys was to determine the species of bat occurring at the site and their use of the habitats for roosting, foraging and commuting. Transect routes walked during the surveys are shown on in the Appendix. Surveys commenced at sunset and lasted no less than 2 hours. Two teams of surveyors undertook the survey to ensure adequate coverage of the site. The transect routes encompassed all habitat types within the site; woodland paths, woodland and scrub edges, boundary treelines, hedgerows and open grassland/meadow and sports pitches. Surveys were undertaken using bat detectors with the capabilities to record all bat call data and GPS: the Anabat Walkabout (Titley Scientific), EM3+ (Wildlife Acoustics Inc.) and Bat Logger M (Petterssen Elektronik). The location of all bat contacts was mapped and the behaviour observed (bats exiting roost site, feeding activity and commuting) was noted.

3.5 Aims of the surveys

The aims were to:

- Determine whether or not the survey area supports the protected species or protected species groups outlined on page 4 (*Introduction*);
- Make incidental recording of other fauna sightings;
- Identify legal ecological requirements that need to be considered; and
- Identify areas of highest ecological sensitivity and importance in relation to the distribution of the protected species.

3.6 Survey limitations

3.6.1 Seasonal species

The timings of the surveys were considered good to determine the presence of the target species. However, due to the later than anticipated start to the surveying, breeding bird surveys were carried out over a less favourable period with most activity recorded during the first two visits, after which activity naturally reduced during the mid to late summer period when most bird species have finished breeding.

3.6.2 Access

The entire site is publically accessible at all times so organising special access was not required.

High levels of public use at the Scrubs, specifically use of the sports pitches and dog walkers restricted the area that could be included in the hedgehog survey. Although tunnels were placed within habitat that bordered the sports pitches, this area was effectively excluded from the footprint tunnel survey. Similarly, although the sports pitches were included in the spotlighting survey in June, only the eastern section could be spotlighted in September because many of the pitches were in use.

3.7 Species rarity

The London Ecology Unit's *Nature Conservation in Hammersmith and Fulham* (Archer & Keech, 1993) was also consulted to assess notable species found on the Scrubs.

Similarly, although an older publication, *The Wildlife of Scrubs Wood* (Hammersmith & Fulham Group of London Wildlife Trust, 1984), was consulted for detailed information on the geology, natural history and wildlife of this former part of the site which was formerly situated adjacent to the survey area.

4 Results

4.1 Reptiles

4.1.1 Habitat assessment

The survey area offers good reptile habitat with a mixture of open sunny areas (required by reptiles for basking) adjacent to or within taller, denser vegetation (for shelter and breeding). The interface between the open scrubby meadow and the densely vegetated embankment is an especially important feature as this provides a natural gradation between the habitat types which provide the aforementioned functions required for reptiles to thrive.

Open meadowland grading into dense bramble thickets - an excellent habitat feature for reptiles

The survey area is deemed to offer excellent habitat for viviparous lizard *Zootoca vivipara* and slow-worm *Anguis fragilis* with a suitable mix of open grassland areas and plenty of denser vegetation required for shelter and breeding.

The survey area is, however, deficient of standing water and so is deemed less suitable for the other common London reptile species, grass snake *Natrix natrix,* which feeds primarily on amphibians which themselves typically require nearby standing water for breeding.

4.1.2 Reptile survey

As previously discussed (section 3.4), reptiles were surveyed using two methodologies to maximise observation potential. Only three species (grass snake, slow-worm and viviparous lizard) could realistically be encountered – the other two native reptile species are rare to very rare and restricted to highly specific habitats not found on the Scrubs.

During the course of the surveys, only viviparous lizard was observed. This species was recorded during the Phase 1 Habitat Survey conducted in September 2016 and is listed as a common species in *The Wildlife of Scrubs Wood* by the Hammersmith & Fulham Group of London Wildlife Trust on land which previously lay adjacent to the survey area.

A very inconspicuous viviparous lizard basking on vegetation.

A total of 43 viviparous lizard observations were made along the entire length of the survey area of which nearly half (20) were made during the final survey on 24th August. During that survey, the majority of the individuals were newly emerged juveniles approximately 5cm in length (see below). In some instances, up to 6 juveniles were observed basking together on top of a single mat. Additionally, a several pregnant females were observed during the July surveys. See Appendices for full records details.

Multiple juvenile viviparous lizards basking together on a felt survey mat. Note their small size in comparison to the grasshopper below.

The mats/areas where lizards were most frequently observed was between mats 1-9, between mats 28-42 and between mats 51-58. Although single observations were made outside of these areas, these three sections hold around 90% of observations and are fairly evenly distributed at the beginning, middle and end of the survey area.

4.1.3 Assessment

The reptile survey confirmed that:

- viviparous lizard is present;
- presence of other reptile species could not be confirmed;
- viviparous lizard is breeding on site;
- viviparous lizard is present in healthy numbers and that;
- viviparous lizard is distributed across the length of the entire survey area but some areas are favoured more than others.

It is possible that other reptile species are present though these were not highlighted in the GiGL datasearch requested for the 2016 Phase 1 Habitat Survey (Sleeman, 2016).

The construction works required for the HS2 sewer realignment are therefore highly likely to significantly disturb, displace and disrupt the breeding of the strong population of viviparous lizards present in this area.

4.2 Breeding birds

4.2.1 Habitat assessment

The survey area supports excellent breeding habitats for a range of bird species. The mixture of inaccessible bramble thickets, tall trees with nesting cavities and abundance of open grassland and berry-bearing shrubs provides ideal nesting and foraging conditions for common and some scarcer bird species. The extensiveness of the area and the natural grading of scrub into open meadowland creates an unusual naturalistic habitat now almost entirely lost from inner London.

Goldfinches feeding on seeding creeping thistle on the Scrubs in September 2016.

The mixture of thickets, scattered mature trees and open scrub provide an extensive mixture of ideal nesting and feeding areas for a large range of bird species.

4.2.2 Breeding birds survey

The first breeding bird survey was conducted on May 19th during what is considered the optimal period of breeding bird surveying. As expected, the highest levels of breeding bird activity was observed then with a total of 11 species displaying breeding behaviour. A total of 16 bird species were observed displaying breeding behaviour over the course of the surveys. Those species were as follows:

- blue tit *Cyanistes caeruleus*
- great tit *Parus major*
- long-tailed tit *Aegithalos caudatus*
- great spotted woodpecker *Dendrocopos major*
- Eurasian wren *Troglodytes troglodytes*
- Eurasian blackcap *Sylvia atricapilla*
- European greenfinch *Chloris chloris*
- common whitethroat *Sylvia communis*
- lesser whitethroat *Sylvia curruca*
- common linnet *Linaria cannabina*
- common kestrel *Falco tinnunculus*
- song thrush *Turdus philomelos*
- common chiff-chaff *Phylloscopus collybita*
- dunnock *Prunella modularis*
- common blackbird *Turdus merula*
- ring-necked parakeet *Psittacula krameri*

Of these species, 2 are red-listed (common linnet and song thrush) meaning the species fits at least one of the following criteria:

- Globally threatened

- Historical population decline in UK during 1800–1995
- Severe (at least 50%) decline in UK breeding population over last 25 years, or longer-term period (the entire period used for assessments since the first BoCC review, starting in 1969).
- Severe (at least 50%) contraction of UK breeding range over last 25 years, or the longer-term period[9]

Red-listed species are thus of high conservation concern. Similarly, common kestrel is Amber-listed (one level below Red-listed) and was one of the few species where young fledged birds were observed on later visits suggesting breeding was successful.

4.2.3 Assessment

The breeding bird survey confirmed that:

- 16 bird species are likely to be breeding on site;
- at least 2 bird species bred successfully on site during the survey period;
- 2 Red-listed species are likely to be breeding on site and;
- at least 2 Amber-listed species are likely to be breeding on site.

Breeding birds were recorded along the entire length of the survey area in the woodland at the western extremity of the survey area, in the thickets along the embankment and in the scrub at the foot of the embankment. This indicates the area is a vitally important area for a range of breeding bird species some of which are very rare in this area of London and in probably at their closest locality to central London such as lesser whitethroat, common whitethroat and common linnet.

The construction works required for the HS2 sewer realignment are therefore highly likely to significantly disturb, displace and disrupt the breeding of the numerous breeding birds present in this area.

4.3 Hedgehog

4.3.1 Habitat assessment

The site supports suitable habitat for hedgehog. Scrub, tall grassland and meadow habitats offer suitable summer nest sites and the scrub and woodland habitat offers potential hibernation sites. The mosaic of linear transitional habitats, which include woodland edge, scrub, meadow and amenity grassland, offer high potential foraging habitat for hedgehogs.

Hedgehogs typically travel between 1-2km per night and occupy a range of between 10-20ha. The area of the scrubs (42ha) is therefore, on size alone, considered able to potentially support a low hedgehog population. However, road and rail infrastructure, which encapsulate the site, and the Grand Union Canal are significant barriers to the free movement of animals and therefore the viability of any population is considered low. Furthermore, disturbances associated with the high amenity use at the site in particular dogs (as well as foxes) reduces the availability of safe daytime refuges and may deter animals from using otherwise suitable habitats

During a daytime walkover survey of the site, no evidence of hedgehogs (nests or scats) were discovered).

[9] https://www.rspb.org.uk/birds-and-wildlife/bird-and-wildlife-guides/bird-guide/status_explained.aspx

Meadow habitat and scrub vegetation offer suitable summer nest sites for hedgehog

Woodland and scrub habitat, of which dead wood, leaf litter and dense vegetation offers suitable cover for potential hedgehog hibernation sites.

Linear transitional habitats comprising woodland edge, scrub, meadow and amenity grassland offer high suitability for foraging hedgehogs.

4.3.2 Footprint tunnels

No evidence of hedgehogs was discovered from the footprint tunnel surveys. Species noted included mice, grey squirrel, red fox, dogs, cats, and slugs. At least one tunnel was disturbed every day/night either by foxes or dogs. High levels of disturbance (and visitation by dogs) were associated with survey days that fell over the weekend. Additional survey nights were completed during the late summer survey in an attempt to correct for errors associated with disturbances by dogs.

A summary of the survey results is provided below.

Table 3: Footprint tunnel Survey 1: June 2017

Tunnel	**Habitat**	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**
		Footprints	Footprints	Footprints	Footprints	Footprints
1	Located within long grassland alongside scrub vegetation and adjacent to the sports pitches	Slug trails	None	Bird	Slug	Bird
2	Located within long grassland alongside scrub vegetation found in the centre of the site and adjacent to the sports pitches	Mice	Mice	Mice Dog	Mice	Mice
3	Located within tall meadow habitat	Fox	Slugs	Dog	Dog	Dog

	associated with the conservation area.	Tunnel moved				
4	Located at the edge of Chats Paddock within scrub and alongside the woodland edge and tall meadow habitat	Slugs Tunnel moved and 1 sheet missing.	Slugs	Dog	Dog	Dog
5	Located at the edge of the woodland next to scrub and tall grass vegetation and within a linear feature between woodland and scrub vegetation.	Fox	None	Dog	None	Cat

Table 4: Footprint tunnel Survey 2: September/October 2017

Tunnel	Habitat	Day 1	Day 2	Day 3	Day 4	Day 5
		Footprints	Footprints	Footprints	Footprints	Footprints
1	Located within long grassland alongside scrub vegetation and adjacent to the sports pitches	None	Cat	None	Slug, bird	None
2	Located along the woodland edge within scrub vegetation and tall grass	Mice, squirrel	None	Mice	Mice, squirrel	Mice
3	Located along the woodland edge, within bramble scrub and tall grassland	Bird, mice	Slug	Dog	Mice	Mice
4	Located alongside hawthorn hedgerow that borders the meadow conservation area	Disturbed, inside panel removed	Removed	Dog	Dog Disturbed, one paper lost	Disturbed, inside panel removed
5	Located within tall meadow habitat, with woodland copses and amenity grassland nearby.	Slugs	Slugs	Slugs	Slugs	Slugs

Tunnel	Habitat	Day 6	Day 7	Day 8	Day 9	Day 10
		Footprints	Footprints	Footprints	Footprints	Footprints
1	Located within long grassland alongside scrub vegetation and adjacent to the sports pitches	Cat	Bird, squirrel	Dog, disturbed	None	Slug
2	Located along the woodland edge within scrub	Mice, Squirrel	Mice, squirrel	Mice	Mice	Mice

	vegetation and tall grass					
3	Located along the woodland edge, within bramble scrub and tall grassland	Dog	Mice, squirrel	Mice	Slug, mice	Squirrel, mice
4	Located alongside hawthorn hedgerow that borders the meadow conservation area	Dog	Dog Disturbed	Dog	Dog Disturbed	Dog
5	Located within tall meadow habitat, with woodland copses and amenity grassland nearby.	Slugs	Slugs	Slugs	Slugs	Slugs

4.3.3 Spotlighting surveys

No hedgehogs were found during the spot lighting surveys. Foxes were noted on all surveys. On the June survey a stag beetle *Lucanus cervus* was recorded over the meadow.

4.3.4 Assessment

Although no evidence of hedgehog was discovered from the surveys, it is not possible to confirm absence. Instead a low population may exist within the site but failed to be detected by the survey methods deployed.

The habitat in the northern part of the site, which will be impacted by the HS2 development, supported the most suitable habitat for hedgehogs in terms of nest/hibernation sites and foraging opportunities. A precautionary approach should be adopted during any site clearance activities to avoid adverse impacts to hedgehogs.

Any vegetation clearance operations should avoid the hibernation period (November to mid-April) and the summer breeding season (June - July). Even outside of these key periods, care should be taken during vegetation clearance works. The cutting of long grass/meadow habitat and/or clearance of leaf piles/shrub vegetation should be undertaken by hand rather than by strimming or the use of machinery.

4.4 Bats

4.4.1 Data search

A total of 88 records were generated by the LBG data search. No bat roosts are known within 2km of the site. Bat flight records were collected from boat surveys along the Grand Union Canal and field surveys within the site and surrounding area. *Pipistrellus* species accounted for 91% of the records.

Common pipistrelle, soprano pipistrelle and noctule bats have been recorded at Wormwood Scrubs Park. These species, together with Leisler's bat *Nyctalus leisleri*, Daubenton's bat *Myotis daubentonii* and a possible serotine *Eptesicus serotinus* were also reported from the surrounding area. A summary of the data-search is shown in Table 5 below.

Table 5: Summary of the London Bat Group data search

Site name	Distance from Wormwood Scrubs	Species recorded (Common name)	Species recorded (Scientific name)
Kensal Green Cemetery	600m north-east	common pipistrelle soprano pipistrelle Leisler's Bat Daubenton's bat	*Pipistrellus pipistrellus* *P. pygmaeus* *Nyctalus leisleri* *Myotis daubentonii*
Regent's Canal/ Grand Union Canal	500m north-east	common pipistrelle unknown pipistrelle	*Pipistrellus pipistrellus* *Pipistrellus species*
Baldwin Gardens, Acton	1240m south-west	Bat	*Vespertilionidae*
North Acton Playing Fields	1260m west	common pipistrelle soprano pipistrelle	*Pipistrellus pipistrellus* *P. pygmaeus*
Carmelite Monastery	825m east	common pipistrelle soprano pipistrelle	*Pipistrellus pipistrellus* *P. pygmaeus*
Kensington Memorial Park	530m east	common pipistrelle	*Pipistrellus pipistrellus*
Little Wormwood Scrubs	65m east	common pipistrelle soprano pipistrelle	*Pipistrellus pipistrellus* *P. pygmaeus*
Ravenscourt Park	2000m south	common pipistrelle soprano pipistrelle noctule	*Pipistrellus pipistrellus* *P. pygmaeus* *Nyctalus noctula*

4.4.2 Preliminary bat habitat assessment

Wormwood Scrubs Park comprises six distinct habitat types: Secondary woodland, tree-lines, scrub, long grassland/meadow, hedgerows and sports pitches. The value of these habitats to bats is presented below. A map showing target notes is provided in the Appendix.

Secondary Woodland

Secondary woodland occurs along the northern and eastern boundary of the site (TN1). This comprises predominantly semi-mature oak, ash, wild cherry and silver birch with a scrub layer of hazel and field maple and dense thickets of hawthorn and blackthorn.

Due to the young age of the trees, this habitat is unlikely to offer roosting sites but instead it provides a flight-line and potential feeding habitat for bats.

TN 1 – Woodland along the northern boundary of the site

An area of semi-mature oak plantation (TN2) with occasional ash and understorey comprising field maple *Acer campestre*, hazel *Corylus avellana*, and brambles *Rubus fruticosus agg*. occurs in the north-eastern part of the site. Again, due to the young age of the trees, bat roosting features were negligible and deadwood was mostly associated with elm die-back.

The paved track that provides pedestrian access through this woodland parcel is covered by the tree canopy, offering a potentially darkened and sheltered bat flight-path and feeding area.

TN2 – Oak plantation in the north-eastern part of the site

TN2 - Woodland path

Woodland copses occur in the western part of the site (TN3). These comprise a diversity of mature and semi-mature trees including oak, horse chestnut, silver birch, ash, aspen, cherry field maple and poplars with a dense understorey of hawthorn and blackthorn. The site as a whole is exposed to the prevailing wind and these copses offer a wind break and a suitably sheltered habitat for foraging bats.

TN3 - Woodland copses in the western part of the site offer edge habitat and a sheltered feeding habitat for bats

Tree-lines

Treelines occur predominantly along the southern boundary of the site (TN4). Key species include wild cherry *Prunus avium*, poplar *Populus sp*., ash *Fraxinus excelsior*, sycamore *Acer pseudoplatanus* and horse chestnut *Aesculus hippocastanum*. Treelines offer screening from lighting associated with the depot (north) and the sports centre (south-east). The broad tree canopies offered suitable foraging opportunities for bats as well as a potential bat flight path.

Scrub

Scrub vegetation comprise mostly brambles, hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa* with some elder *Sambucus nigra* and young ash, hazel, and field maple. This habitat provides a wind-break, particularly where it occurs alongside woodland edge habitat (TN5). Insect biomass is highest where there is a mosaic of woodland, scrub and uncut field margins, specifically along the northern boundary and the north-eastern and north-western corners of the site; and together these habitats offer the most suitable foraging opportunities for bats within the context of the site.

TN4 - Tree-line along the south-eastern boundary of the site offers a flight line and foraging habitat for bats.

TN5 - Wide margin of shrub vegetation comprising mostly hawthorn, blackthorn, brambles and dog-rose forms part of a habitat mosaic which includes a treeline of poplars and an area of infrequently mown grassland with long grasses, ruderals and meadow species

TN5 – Scrub vegetation along the northern boundary

TN5 - Scrub vegetation occurring alongside the woodland offers a suitable foraging habitat for bats that is sheltered from the prevailing wind and not impacted by artificial light sources.

Meadow and uncut field margins

Field margins and meadow habitat (TN6) offer good opportunities for invertebrates and therefore a bat foraging resource. However, the open character of the meadow habitat leaves it exposed to the prevailing wind and reduces its overall value to bats. Bat feeding and commuting activity therefore occur mostly along the northern and westernmost extent of this habitat where it lies alongside woodland edge habitat, and is most sheltered.

TN6 - The meadow habitat in the western part of the site supports a high diversity of insects and enhances bat foraging opportunities. This habitat is however exposed to the prevailing wind and therefore few bat records were noted here.

Sports pitches

The sports pitches (TN7) to the south of Wormwood Scrubs Local Nature Reserve are species poor and intensively managed. This habitat is exposed to the prevailing wind and artificial lighting (when the sports pitches were in use during the evenings) and overall offers limited opportunities for foraging or commuting bats.

Although some bat species such as *Pipistrellus sp* and noctule are known to exploit high insect biomass attracted to artificial lighting, exposure to the prevailing wind restricts bat foraging activity to the treelines and woodland and scrub edges.

TN7 - Open sports pitches offers limited habitat opportunities for bats.

4.4.3 Static detector surveys

Full details of the results of static detector surveys are documented in the Appendix. This includes a map showing the location of the detectors and details of the weather conditions during the survey period (weatheronline.co.uk) as well as tabulated timelines of all bat contacts for each detector per night. A summary of the survey findings is presented in Table 6.

A total of three bat species were recorded: common pipistrelle, soprano pipistrelle and noctule. No bats were recorded during their typical emergence period and it is unlikely that active roost sites occurred close to the survey locations. The most commonly recorded species was common pipistrelle.

The static detector survey revealed that the site offered only low habitat value for bats.

Table 6: Summary of the static detector surveys

Static Detector	Summary of survey findings
Detector 1:	The static detector was located on a tree in the north-western part of the site, within the secondary woodland. Several elm and ash were showing signs of die-back and offered some low roosting opportunities for single or low numbers of bats. The purpose of the survey was to assess the likelihood that trees support an active roost site (based on records close to sunrise and sunset) and the value of the secondary woodland for foraging and commuting bats. Very few records were noted, and only common pipistrelle was recorded. Most bat contacts were single passes and likely represented bat commuting through or over the woodland. Only two short feeding episodes which lasted less than one minute were noted throughout the 6 nights of survey. Overall the woodland habitat offering negligible roosting habitat and limited bat foraging opportunities. The continuum of secondary woodland along the northern boundary does however provide a flight path used by low numbers of pipistrelle bats.
Detector 2:	The static detector was attached to a sign post located within the meadow habitat, close to the woodland edge in the northern part of the site. Common pipistrelle and noctule bat were recorded in low numbers. Most contacts were of single passes and represented bats commuting through the site. Only four common pipistrelle feeding episodes were noted, the longest lasting 6 minutes in duration. Overall the meadow habitat offered limited suitability for bats and the records collected likely reflects use of the woodland edge as a bat commuting route and feeding resource.
Detector 3:	The static detector was placed at the edge of a woodland copse in the western part of the site. This location was sheltered from the prevailing wind and due to the mosaic of woodland, scrub and meadow habitat, it was considered to be a potential bat feeding area within the context of the site. Common pipistrelle bats were recorded feeding at low frequency with feeding episodes lasting up to 5 minutes in duration. A single pass by noctule was reported. Overall the habitat was found to offer only low value to bats as a feeding resource and flight-line.
Detector 4:	The static detector was located along a treeline at the southern boundary of the site. Tree species occurring here included mature horse chestnut, ash, oak and cherry. The treeline was partially lit from light spill associated with the adjacent Linford Christie Sports Centre. Several feeding episodes by common pipistrelle were reported on all nights. These typically lasted 2-3 minutes with some longer periods of foraging activity reported for up to 28 minutes. Low numbers of passes by soprano pipistrelle were also noted, but these were single passes and suggestive of single bats commuting through the site. It is likely that the treeline offers sheltering from the prevailing wind and that *Pipistrellus* species are exploiting insects that are attracted to the adjacent artificial light sources.

4.4.4 Dusk transect surveys

Full details of the results of the dusk transect surveys are documented in the Appendix. This includes information on the weather conditions during the surveys, tabulated timelines of all bat contacts made by each survey team and maps showing the location of observed bat activity.

A total of three bat species were recorded: common pipistrelle, soprano pipistrelle, and noctule.

No bats were recorded during their typical emergence period and it was considered unlikely that a roost site occurs on site.

The most commonly encountered species, **common pipistrelle**, were observed feeding and commuting along the woodland edge, treelines, woodland copses and areas of scrub habitat located close to the boundary to the site.

Few records for **soprano pipistrelle** were noted and most encounters were single call contacts indicative of bats commuting through the site. Soprano pipistrelle bats are frequently associated with water habitats and the absence of wet areas within the site likely make it a poor feeding resource for this species.

Low numbers of **noctule** were noted in the eastern part of the site. Bats were observed flying east/south-eastwards. The low number of contacts reported suggests that the site is used only infrequently by low numbers of noctule bats.

4.4.5 Assessment

Wormwood Scrubs Park offers only a limited habitat resource for bats. The woodland habitat and treelines are of negligible value to roosting bats due to the young age of the trees and/or exposure to high levels of artificial lighting.

The site was found to provide foraging habitat for low numbers of common pipistrelle bats, and provides a flight-line used by low numbers of common pipistrelle, soprano pipistrelle and noctule bats. Mosaic habitats that encompass woodland edge, scrub, and long grassland/meadow and treelines (particularly along the northern boundary) were found to be of most value to bats within the context of the site.

The low number of bat species reported at the site was likely due to impacts associated with exposure to the prevailing wind, artificial lighting, high levels of urbanisation within the surrounding landscape, and an absence of aquatic – especially open water - habitats within the site.

Any temporary loss of habitat along the northern section, associated with the HS2 development, has the potential to reduce bat activity at the site, at least in the short term. However, given the low numbers of bats recorded, and following the implementation of remedial habitat enhancement works, the overall long-term impact of the proposals on the Wormwood Scrub's bat population is likely to be negligible.

5 Evaluation of the ecological enhancement proposals

5.1 Reptiles

Although the reptile survey area did not include primary areas identified for ecological enhancements, some of the enhancements will broadly improve the quality of the habitats for reptiles across the Scrubs. The enhancements likely to have the largest positive impact for reptiles are outlined below.

Traditional native British hedgerow planting
Proposals to plant native hedgerows will create natural barriers for the adjacent grasslands; offering protection from walkers and dogs. This will act to limit disturbance.

Species enriched grassland
The creation of areas of species rich grassland should enhance foraging for reptiles and improve the general structure of the habitat.

Care should be taken during management operations. Cutting of the meadow should be carried out by hand, rather than by strimming or the use of machinery, to minimise disturbance and avoid accidentally hitting individuals as they attempt to escape.

5.2 Breeding birds

Traditional native British hedgerow planting
Proposals to plant native hedgerows will create good habitat for birds by bolstering nesting and foraging opportunities with an increase in berry-bearing shrubs such as hawthorn and elder. This will improve the availability of food for winter thrushes (including redwing *Turdus iliacus* and fieldfare *T..pilaris*) and other birds through autumn and into winter.

Species enriched grassland
The creation of areas of species rich grassland will improve forage opportunities for birds by attracting a wider range of invertebrates and maximising the winter seed resource required by smaller bird species. This will in turn enhance these areas for raptors by improving the area for small mammals preyed upon by species such as kestrel which regularly uses the Scrubs for breeding and breeds nearby.

Management of woodland compartments
Proposals to undergo selective thinning within the woodland to open up sections of the canopy should enhance the value of the woodland habitat for birds in the long term through the establishment of a more diverse ground flora of spring flowers and shrubs which may offer improved forage and nesting opportunities. The retention of dead wood will provide good habitat for dead wood invertebrates which will in turn offer more abundant food sources for species such as great spotted woodpecker.

Scrape areas
The creation of channels that naturally accumulate water on site should enhance bird foraging opportunities in the long-term. However, where possible, the inclusion of a permanent water

body should also be considered since aquatic habitats offer an important feeding and drinking resource for all bird species.

Japanese knotweed removal
The treatment of Japanese knotweed along Lester's Embankment will improve the quality of the nesting habitat here by allowing native shrubs to recolonise from surrounding areas. Species such as bramble are favoured for by birds for their protective thorns and structure whereas Japanese knotweed is poorly structured and thus typically avoided by birds. Large numbers of birds were recorded breeding along Lester's Embankment during the Breeding Birds survey and so this will benefit a wide range of species.

Other recommendations
All works should be carried out outside of the bird breeding season (March – August) to avoid disturbance, especially the woodland enhancements and treatment of Japanese knotweed.

The development of species-rich grassland should include species known to be beneficial to birds such as teasel *Dipsacus fullonum.* Additionally, disturbed ground strips could be created and sown with seed plants such as pale flax *Linum bienne* and native vetch species *Fabaceae sp.* Pale flax is much favoured by linnet which breeds on site and is Red-listed and thus should be viewed as a high priority species for the Scrubs.

5.3 Hedgehog

Traditional British native hedgerow planting
Proposals to plant native hedgerows should increase both foraging and nesting/hibernation habitat for hedgehogs in the long-term.

Species enriched grassland
The creation of areas of species rich grassland should enhance foraging for hedgehogs and offer suitable summer nesting sites in the long-term.
Care should be taken during management operations. Cutting of the meadow should be carried out by hand rather than by strimming or the use of machinery. The timings of management activities should fall outside of the hedgehog hibernation period (November to mid-April) and the summer breeding season (June - July) to minimize impacts. Even outside of these key periods, care should be taken during vegetation clearance activities. Arisings could be left in designated areas to provide suitable nest/hibernation sites.

Management of woodland compartments
Proposals to undergo selective thinning within the woodland to open up sections of the canopy should enhance the value of the woodland habitat for hedgehogs in the long term through the establishment of a more diverse ground flora that may provide nest sites and feeding habitat. The creation of deadwood piles will also offer more opportunities for hibernating animals.

Open water habitat
If a pond/open water habitat is included within the enhancement proposals, this should have a graded bank to provide a suitable ramp to allow hedgehogs to escape out of the water.

Other recommendations
The site has a high amenity value and is impacted by high level of disturbance, particularly from dogs. It is therefore recommended that some areas of scrub and meadow habitat should

be fenced off (with small gaps provided to allow hedgehogs access) to create undisturbed habitat refuges for hedgehogs.

The adjacent road and rail infrastructure pose a significant barrier to the movement of hedgehogs. Measures to improve connectivity with surrounding habitats is considered necessary if the site is to support a viable hedgehog population in the long-term. The creation of mammal underpasses, over-bridges and culverts, that would enable the safe passage of animals, should be considered.

5.4 Bats

Traditional native hedgerow planting
Proposals to introduce native hedgerows should increase both foraging and commuting opportunities for bats in the long term. However, the value of this habitat for bats will be largely dependent on management practices. Where possible, tree species should be included within the hedgerow and management should seek to create high hedges which include mature trees, specifically oaks and ash which have the potential to offer good foraging opportunities as well as potential roost sites in the future. The inclusion of trees will also assist in creating a wind-break.

Scrape areas
The creation of channels that naturally accumulate water on site should enhance bat foraging opportunities in the long-term. However, where possible, the inclusion of a permanent water body should also be considered since aquatic habitats offer an important feeding and drinking resource for all British bat species as well as suitable habitat for other species; birds, amphibians and reptiles.

Any open water habitat should ideally be no less than 0.5ha in extent and the banks and bank margins of a should be planted with species such as reed *Phragmities sp.*, rushes *Juncus sp*. sedges *Carex sp*., reed canary grass *Phalaris arundinacea*, sweet-grasses *Glyceria sp.*, marsh marigold *Caltha palustris*, purple loosestrife *Lythrum salicaria* and watermint *Mentha aquatica*. Planting submerged and floating plants (e.g. water-crowsfoot *Ranunculus sp* and pond weeds *Potamogeton sp*) would also be beneficial, but some areas of open water should also be maintained.

The creation of a permanent water body planted with appropriate marginal and aquatic vegetation will greatly enhance feeding opportunities bats and other species known to occur in the immediate surrounding area, notably Daubenton's bat and Leisler's bat may be encouraged to utilise the site.

Species enriched grassland
The creation of species rich grassland should enhance the value of the site for bats in the long-term. Where possible, a wildflower mix that contains nocturnally pollinated plants that attract moths and other nocturnal insects, such as campions *Silene sp*., pinks *Dianthus sp*., and knapweeds *Centaurea sp*., and low-growing wildflowers such as birds-foot-trefoil *Lotus corniculatus*, selfheal *Prunella vulgaris*, ladies bedstraw *Galium verum* and hawkbits *Leontodon spp* should be considered so as to enhance foraging opportunities for bats.

Chats Paddock
Chats Paddock was found to provide a sheltered feeding areas used by common pipistrelle bats and proposals to retain/restore this habitat feature should ensure continued use of this habitat by bats in the long-term.

Heathland planting

The introduction of heathland species in the north-eastern corner of the site should benefit bats in the long-term but increasing the diversity of flowering species on site and subsequent insect diversity that will provide a bat food resource.

Management of woodland compartments

Proposals to undergo selective thinning and open up section of the canopy should enhance the value of the woodland habitat for bats in the long term. The extent of woodland edge habitat will be increased and the establishment of a more diverse ground flora, retaining standing deadwood and the creation of deadwood piles, should enhance insect diversity and thus the viability of the woodland as a bat feeding resource. Similarly, the graduation of transitional habitat along the woodland edge was found to provide the most suitable feeding habitat for bats and any increase in amount of transitional habitat provided on site should enhance its value to bats in the long-term.

Installation of bat boxes

Given the current low level of bat activity recorded at the site, the provision of artificial bat roost sites is considered a low priority enhancement. Instead it is recommended that resources would be better directed to habitat enhancements that increase the use of the site by bats such as the creation of a wildlife pond and the hedgerows that support mature trees.

If bat boxes are to be included within the enhancement plans, it is recommended that Woodcrete boxes (e.g. Schwegler 2FN, 2F and 2FS boxes) are used in preference to wooden boxes. These should be installed onto mature trees that will not be impacted by the development proposals. Boxes should be positioned three metres or higher above ground in a place where there is a clear flight path for bats entering and leaving the box and away from artificial light sources. The aspect of at least some of the boxes should capture the sun for part of the day and therefore be south (or southeast/southwest) facing (JNCC 2004; BCT 2003).

Bird nest boxes should also be provided and installed on the same tree as the bat boxes to minimise competition of bat boxes by nesting birds (Meddings et al, 2011). Woodcrete nest boxes suitable for hole/cavity nesting birds (e.g. 1B nest box, Avianex and/or 'The Bird House'[10]) are recommended as they include a broad range of designs, are long-lasting compared to wooden boxes and insulate occupants from extremes of temperature and condensation. Bat and bird boxes would need to be surveyed and maintained annually by a suitably qualified ecologist and all data sent to the local records centre.

[10] www.livingbirds.com

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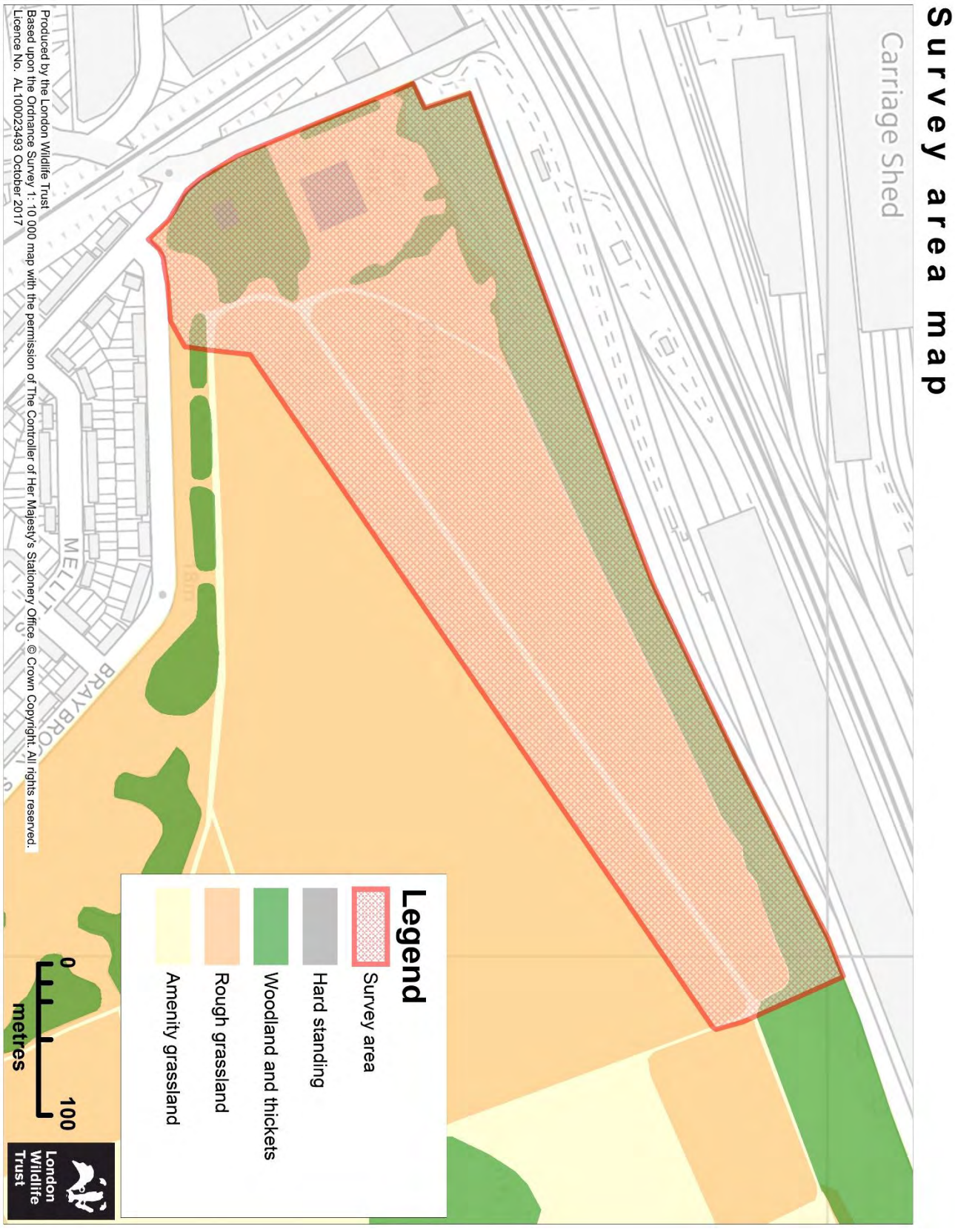
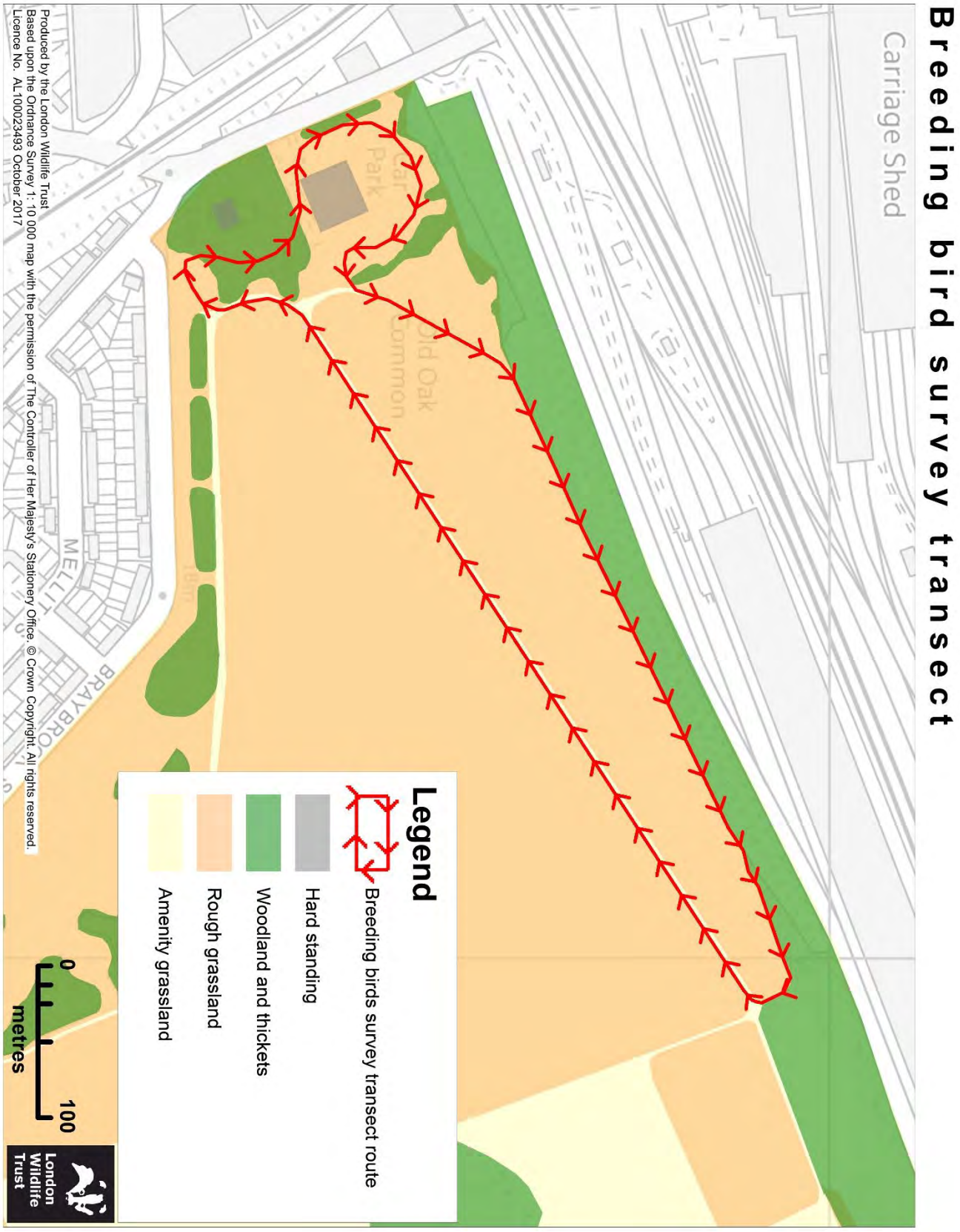
7 Appendices

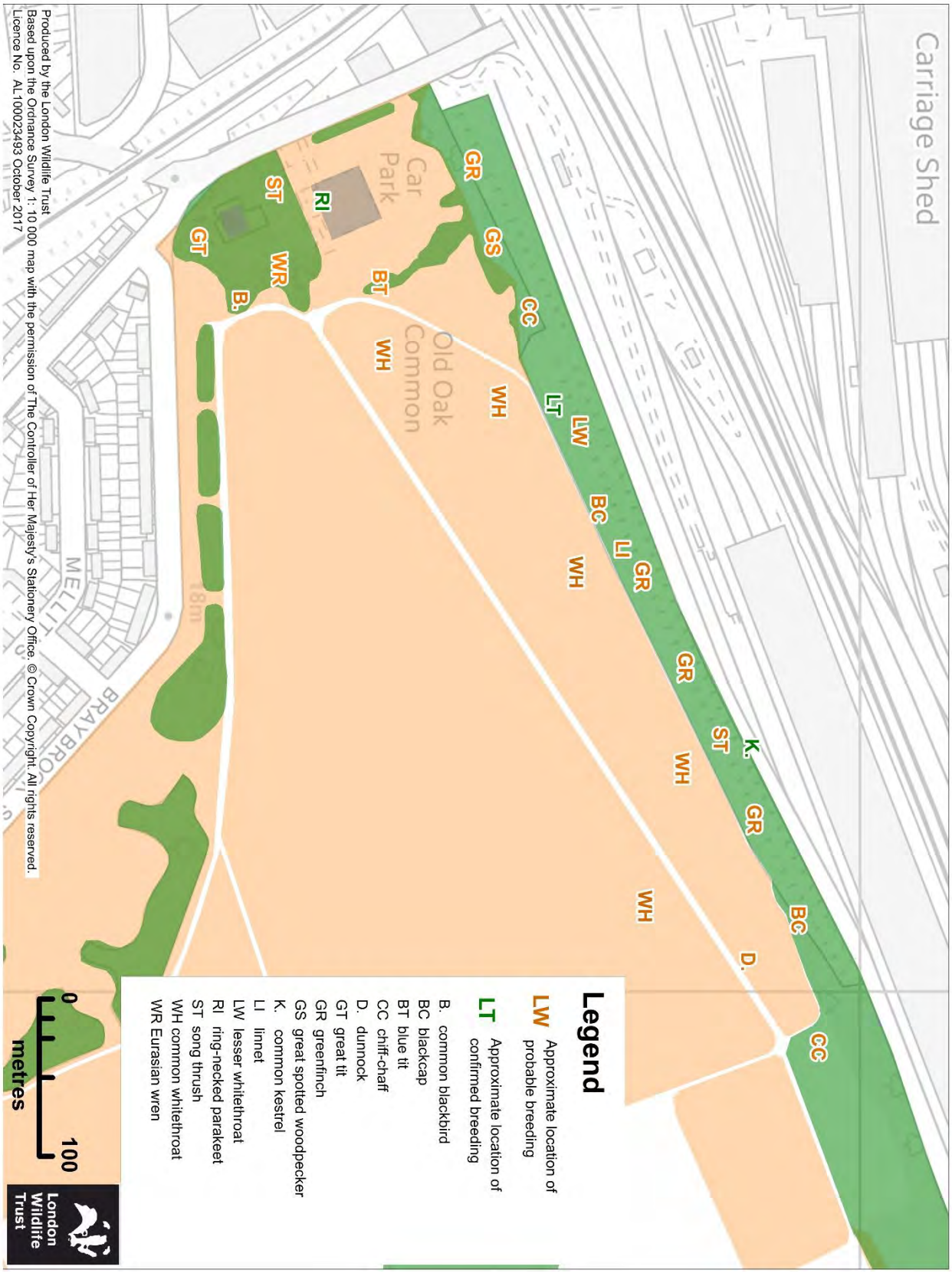
7.1 Breeding bird and reptile survey area map



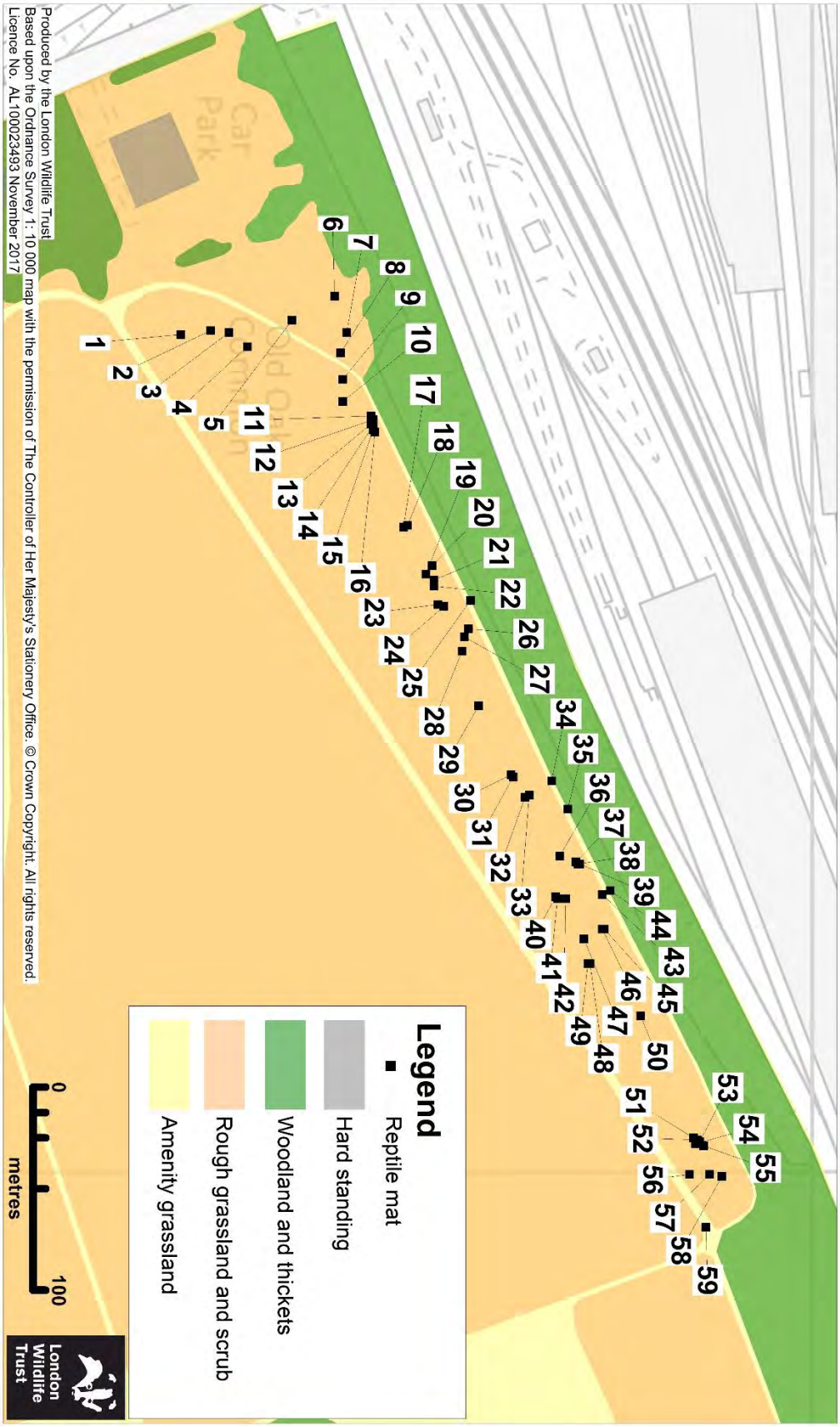
7.2 Breeding birds survey transect map



7.3 Combined breeding birds map



7.4 Reptile survey mat locations



7.5 Reptile survey records

Survey date	Species observed	Number of individuals	Age	Location (mat number or grid ref)	Additional comments
21/06/2017	Zootoca vivipara (viviparous lizard)	1	Adult	2	Basking on the top of mat
21/06/2017	Zootoca vivipara (viviparous lizard)	1	Adult	6	Under the mat
21/06/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	21	Basking on the top of mat
21/06/2017	Zootoca vivipara (viviparous lizard)	2	Adult	53	Under the mat
21/06/2017	Zootoca vivipara (viviparous lizard)	1	Adult	57	A female basking on the top of mat
03/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	1	
03/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	7	Female
03/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	33	Basking on the top of mat
03/07/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	57	Under the mat
14/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	3	
14/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	7	
14/07/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	35	Basking on the top of mat
14/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	36	
14/07/2017	Zootoca vivipara (viviparous lizard)	2	Adult	52	
28/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	1	Basking on the top of mat
28/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	2	Under the mat
28/07/2017	Zootoca vivipara (viviparous lizard)	2	Adult	35	Under the mat
28/07/2017	Zootoca vivipara (viviparous lizard)	1	Adult	42	Basking on the top of mat
11/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	3	Under the mat
11/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	4	Under the mat
11/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	17	Basking on the top of mat
11/08/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	35	Under the mat
11/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	55	Under the mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	1	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	2	Juvenile	9	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	16	Near mat
24/08/2017	Zootoca vivipara (viviparous lizard)	2	Adult	28	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	30	On greater plantain leaf nervy
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	31	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	6	Juvenile	34	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	35	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	38	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	39	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	3	Juvenile	40	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	42	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	53	Under the mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	51	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	3	Juvenile	58	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	2	Adult	55	Under the mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	TQ 2184781891 (47-50)	Under the mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Juvenile	TQ 2193181914 (47-50)	Basking on the top of mat
24/08/2017	Zootoca vivipara (viviparous lizard)	1	Adult	TQ 2172681826 (47-50)	
24/08/2017	Zootoca vivipara (viviparous lizard)	2	Adult	TQ 2172681825 (47-50)	

7.6 Location of footprint tunnels

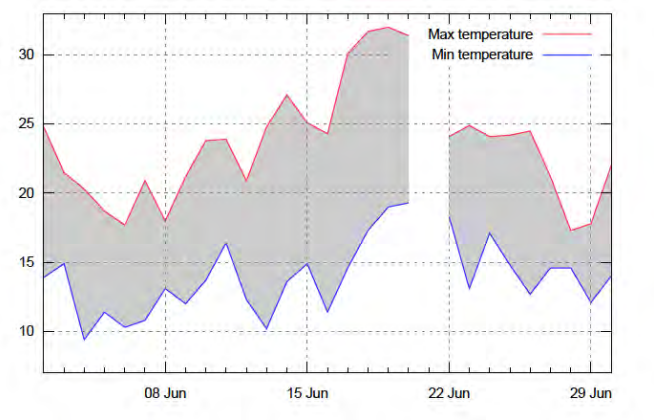
7.7 Preliminary bat assessment showing target notes of habitat features

7.8 Location of static detectors and bat activity transect routes

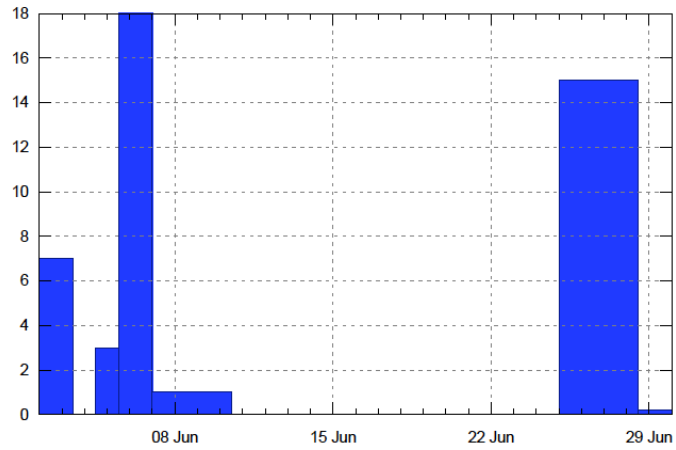
7.9 Static detector survey results

Weather conditions reported during the survey period:

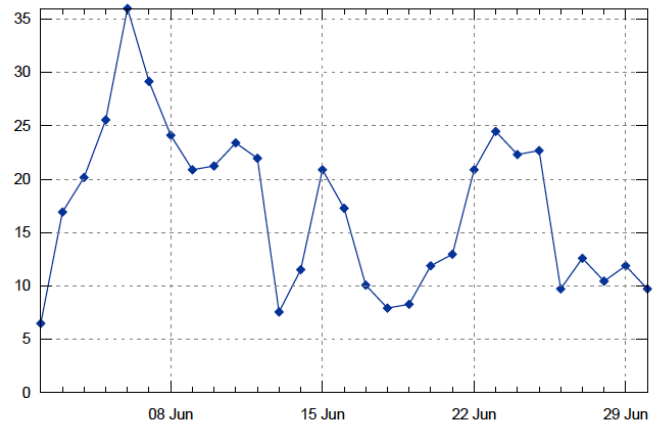
(a) Maximum and minimum temperatures reported in London in June 2017 (Weatheronline.co.uk)



(b) Precipitation reported in London in June 2017 (Weatheronline.co.uk)



(c) Wind speeds reported for London during June 2017 (Weatheronline.co.uk)



Species Code	Common name	Scientific name
Ppip	Common pipistrelle	Pipistrellus pipistrellus
Ppyg	Soprano pipistrelle	Pipistrellus pygmaeus
Nn	Noctule	Nyctalus noctula

Static detector 1: D3643

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
07/06/2017	22:30	Ppip	21:14/ 04:42	76
	22:42	Ppip		
	22:49	Ppip		
08/06/2017	23:31	Ppip	21:15/ 04:41	136
	00:53	Ppip		
	02:20 – 02:21	Ppip		Feeding episode
	02:52	Ppip		
	03:06	Ppip		
09/06/2017	00:07	Ppip	21:16/ 04:41	171
	03:05	Ppip		
10/06/2017	00:18	Ppip	21:17/ 04:41	181
	00:29	Ppip		
11/06/2017	00:24	Ppip	21:17/ 04:40	187
	01:53	Ppip		
	01:58 - 01:59	Ppip		Feeding episode
	02:01	Ppip		
	02:36	Ppip		
	02:45	Ppip		
	03:33	Ppip		
12/06/2017	23:39	Ppip	21:18/ 04:40	141
	00:00	Ppip		
	00:07	Ppip		
	02:41	Ppip		

Static detector 2: D3708

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
07/06/2017	22:24	Ppip	21:14/ 04:42	70
08/06/2017	22:02	Ppip	21:15/ 04:41	47
	22:15	Ppip		
	22:30	Ppip		
	03:41	Ppip		

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
09/06/2017	21:59	Nn	21:16/ 04:41	43
	22:13	Ppip		
	22:19	Ppip		
	22:57	Ppyg		
10/06/2017	22:28	Ppip	21:17/ 04:41	71
	22:31	Ppip		
	00:00	Ppip		
11/06/2017				
12/06/2017	22:08	Ppip	21:18/ 04:40	50
13/06/2017	21:50	Ppip	21:19/ 04:40	91
	22:09	Nn		
	22:13	Ppip		
	22:16 – 22:17	Ppyg		Feeding episode
	22:20 – 22:22	Ppip		Feeding episode
	22:31	Nn		
	22:42 – 22:43	Ppip		Feeding episode
	22:50 – 22:56	Ppip		Feeding episode
	23:13	Ppip		

Static Detector 3: 6215

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
07/06/2017	21:47	Ppip	21:14/ 04:42	33
	23:30	Nn		
08/06/2017	21:48	Ppip	21:15/ 04:41	33
	23:27	Ppip		
	23:30	Ppip		Feeding episode
	23:49 – 23:55	Ppip		Feeding episode
	23:57	Ppip		Feeding episode
	23:59 – 00:01	Ppip		Feeding episode
	00:03 – 00:06	Ppip		Feeding episode
	00:09 – 00:14	Ppip		Feeding episode
	00:22	Ppip		Feeding episode
	00:34 – 00:37	Ppip		
	03:50	Ppip		51
09/06/2017	22:52	Ppip	21:16/ 04:41	96
	23:16	Ppip		
	23:23 – 23:24	Ppip		Feeding episode
	23:38 – 23:39	Ppip		Feeding episode

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
	00:14	Ppip		
	00:50	Ppip		
	01:06	Ppip		
	03:21	Ppip		
	03:23	Ppip		
	03:32	Ppip		
	04:02	Ppip		39
10/06/2017	04:06	Ppip	21:17/ 04:41	
11/06/2017	21:58	Ppip	21:17/ 04:40	41
	22:25	Ppip		
12/06/17	22:20	Ppip	21:18/ 04:40	62
	22:27 – 22:28	Ppip		Feeding episode
	22:34	Ppip		Feeding episode
	22:37	Ppip		Feeding episode
	22:42 – 22:44	Ppip		Feeding episode
	22:47	Ppip		
	23:00	Ppip		Feeding episode
	23:37	Ppip		Feeding episode
	23:40	Ppip		
	00:00	Ppip		
	00:42 – 00:43	Ppip		Feeding episode
	00:47	Ppip		
	01:37 – 01:38	Ppip		Feeding episode
	02:04	Ppip		
	02:14	Ppip		
	03:39	Ppip		61

Static detector 4 – D5360

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
				37
07/06/2017	21:51 – 22:04	Ppip	21:14/ 04:42	Feeding episode
	22:06 – 22:25	Ppip		Feeding episode
	22:31	Ppip		
	23:37	Ppip		
	23:37	Ppip		
	00:06	Ppip		
	00:36 – 00:37	Ppip		Feeding episode
	00:52	Ppip		
	00:55 – 00:56	Ppip		Feeding episode

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
	00:59	Ppip		
	02:26 – 02:27	Ppip		Feeding episode
	03:26	Ppip		
	03:39	Ppip		
	03:42	Ppip		
	03:46	Ppip		
	03:57	Ppip		45
08/06/2017	21:46 – 21:48	Ppip	21:15/ 04:41	31 Feeding episode
	21:51	Ppip		
	21:53	Ppip		
	21:58 – 22:26	Ppip		Feeding episode
	22:31 – 22:32	Ppip		Feeding episode
	22:34 – 22:42	Ppip		Feeding episode
	23:51 – 23:52	Ppip		Feeding episode
	23:55	Ppip		
	23:57	Ppip		
	00:00 – 00:03	Ppip		Feeding episode
	00:07 – 00:08	Ppip		Feeding episode Feeding episode
	00:12 – 00:13	Ppip		Feeding episode
	00:15	Ppip		
	00:17 – 00:20	Ppip		Feeding episode
	00:24	Ppyg		
	00:24 – 00:25	Ppip		Feeding episode
	00:32 – 00:35	Ppip		Feeding episode Feeding episode
	00:37 – 00:38	Ppip		
	00:47	Ppip		
	00:49 – 00:50	Ppip		Feeding episode
	01:11	Ppip		
	01:13	Ppip		
	01:19	Ppip		
	01:23	Ppip		
	01:25	Ppip		
	01:27 – 01:29	Ppip		Feeding episode
	01:32	Ppip		
	01:41	Ppip		
	01:43	Ppip		
	01:46	Ppip		
	02:00	Ppip		
	02:02	Ppip		

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
	02:05	Ppip		
	02:12 – 02:14	Ppip		Feeding episode
	02:17	Ppip		
	02:19 – 02:35	Ppip		Feeding episode
	02:37	Ppip		
	02:39 – 02:43	Ppip		Feeding episode
	02:47 – 02:48	Ppip		Feeding episode
	02:50 – 02:54	Ppip		Feeding episode
	02:59	Ppip		
	03:05	Ppip		
	03:09 – 03:10	Ppip		Feeding episode
	03:14 – 03:15	Ppip		Feeding episode
	03:22	Ppip		
	03:54	Ppip		47
09/06/2017	21:43	Ppip	21:16/ 04:41	27
	21:48	Ppip		
	21:54 – 21:56	Ppip		Feeding episode
	21:59 – 22:01	Ppip		Feeding episode
	22:03 – 22:07	Ppip		Feeding episode
	22:09 – 22:21	Ppip		Feeding episode
	22:23 – 22:29	Ppip		Feeding episode
	22:32 – 22:33	Ppip		Feeding episode
	22:36	Ppip		
	22:38 – 22:39	Ppip		Feeding episode
	22:45 – 22:46	Ppip		Feeding episode
	22:48 – 22:49	Ppip		Feeding episode
	22:53 – 22:54	Ppip		Feeding episode
	23:17	Ppip		
	23:23 – 23:24	Ppip		Feeding episode
	23:34	Ppyg		
	00:01	Ppip		
	00:09 – 00:10	Ppip		Feeding episode
	00:16	Ppip		
	00:22	Ppip		
	01:05	Ppip		
	02:01 – 02:02	Ppip		Feeding episode
	02:05	Ppip		
	02:17	Ppip		
	02:19	Ppip		
	02:21	Ppip		

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
	02:24	Ppip		
	02:26	Ppip		
	02:29	Ppip		
	02:39 – 02:40	Ppip		Feeding episode
	02:46	Ppip		
	03:02	Ppip		
	03:07 – 03:08	Ppip		Feeding episode
	03:25	Ppip		
	03:30	Ppip		
	03:32 – 03:33	Ppip		Feeding episode
	03:38 – 03:40	Ppip		Feeding episode
	04:00 – 04:01	Ppip		40 Feeding episode
10/06/2017	21:55	Ppip	21:17/ 04:41	38
	21:59 – 22:00	Ppip		Feeding episode
	22:02	Ppip		
	22:04 – 22:10	Ppip		Feeding episode
	22:13 – 22:16	Ppip		Feeding episode
	22:20 – 22:32	Ppip		Feeding episode
	22:35 – 22:37	Ppip		Feeding episode
	22:45 - 22:47	Ppip		Feeding episode
	22:59 – 23:02	Ppip		Feeding episode
	23:04	Ppip		
	23:06	Ppip		
	23:10 – 23:11	Ppip		Feeding episode
	23:16	Ppip		
	23:32	Ppip		
	23:35	Ppip		
	23:36	Ppip		
	23:47	Ppip		
	23:49	Ppip		
	00:00	Ppip		
	00:12	Ppip		
	00:18	Ppip		
	00:24	Ppip		
	00:29 – 00:31	Ppip		Feeding episode
	00:38 – 00:39	Ppip		Feeding episode
	00:42 – 00:43	Ppip		Feeding episode
	00:47	Ppip		
	01:04 – 01:05	Ppip		Feeding episode

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
	01:07 – 01:09	Ppip		Feeding episode
	01:15 – 01:18	Ppip		Feeding episode
	01:31	Ppip		
	01:34	Ppip		
	01:51 – 01 :52	Ppip		Feeding episode
	02:00	Ppip		
	02:04	Ppip		
	02:14 – 02:16	Ppip		Feeding episode
	02:22	Ppip		
	02:25	Ppip		
	02:27 – 02:28	Ppip		Feeding episode
	02:30	Ppip		
	02:34	Ppip		
	02:36	Ppip		
	02:44	Ppip		
	02:46	Ppip		
	02:53 – 02:54	Ppip		Feeding episode
	02:56	Ppip		
	02:58	Ppip		
	03:10 – 03:11	Ppip		Feeding episode
	03:24	Ppip		
	03:26	Ppip		
	03:30	Ppip		
	03:41	Ppip		
	03:44	Ppip		
	03:46	Ppip		
	03:48	Ppip		
	03:51 – 03:53	Ppip		Feeding episode
	03:56	Ppip		44
11/06/2017	21:59	Ppip	21:17/ 04:40	42
	22:02 – 22:05	Ppip		Feeding episode
	22:08 – 22:16	Ppip		Feeding episode
	22:19 – 22:23	Ppip		Feeding episode
	22:26 – 22:30	Ppip		Feeding episode
	22:46 – 22:47	Ppip		Feeding episode
	22:51 – 22:52	Ppip		Feeding episode
	23:13	Ppip		
	23:30 – 23:33	Ppip		Feeding episode
	23:35 – 23:36	Ppip		Feeding episode
	23:46	Ppip		

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
	00:01	Ppip		
	00:23 – 00:24	Ppip		Feeding episode
	00:52 – 00:53	Ppip		Feeding episode
	01:26	Ppip		
	01:30 – 01:34	Ppip		Feeding episode
	01:36	Ppip		
	01:39 – 01:41	Ppip		Feeding episode Feeding episode
	01:47	Ppip		
	01:51	Ppip		
	02:03	Ppip		
	02:07 – 02:08	Ppip		Feeding episode
	02:10 – 02:13	Ppip		Feeding episode
	02:15	Ppip		
	02:20	Ppip		
	02:22	Ppip		
	02:24	Ppip		
	02:36	Ppip		
	03:29	Ppip		
	03:33 – 03:34	Ppip		66 Feeding episode
12/06/2017	21:57	Ppip	21:18/ 04:40	39
	21:59	Ppip		
	22:03	Ppip		
	22:15	Ppip		
	22:17	Ppip		
	22:22 – 22:24	Ppip		Feeding episode
	22:28 – 22:31	Ppip		Feeding episode
	22:44	Ppip		
	22:51	Ppip		
	23:00 – 23:03	Ppip		Feeding episode
	23:09 – 23:14	Ppip		Feeding episode
	23:16 – 23:34	Ppip		Feeding episode
	23:36 – 23:37	Ppip		Feeding episode
	23:40 – 23:44	Ppip		Feeding episode
	23:46 – 23:57	Ppip		Feeding episode
	00:03 – 00:05	Ppip		Feeding episode
	00:08	Ppip		
	00:18	Ppip		
	00:21	Ppip		
	00:37	Ppip		

Night	Time	Species	Sunset/sunrise	Minutes after sunset/ before sunrise
	00:39	Ppip		
	01:18 – 01:19	Ppip		Feeding episode
	01:47	Ppip		
	01:51	Ppip		
	01:54:	Ppip		

Dusk transect survey results

Species Code	Common name	Scientific name
Ppip	Common pipistrelle	Pipistrellus pipistrellus
Ppyg	Soprano pipistrelle	Pipistrellus pygmaeus
Nn	Noctule	Nyctalus noctula

SURVEY 1: 13TH JUNE 2017

Sunset: 21:19 Start time: 21:20 End time: 23:55

Weather conditions: 23-15°C, light breeze, no rain and 10% cloud cover

Team 1: Caroline Nash + Field Assistant

Time	Species	Minutes after sunset	Comment
21:47	Ppip	28	Feeding
21:52	Ppip		
22:02	Ppyg	43	
22:07	Ppip		
22:14	Ppip		
22:15	Ppip		
22:21	Ppip		Feeding
22:32	Ppip		
22:40	Ppip		Feeding
23:18	Ppip		Two bats feeding
23:25	Ppip		
23:32	Ppip, Ppyg		

Team 2: Huma Pearce + Field Assistant

Time	Species	Minutes after sunset	Comments
21:53	Ppip	34	
22:16	Ppip		
22:20	Ppyg	61	
22:23-22:25	Ppip		Feeding
22:34-22:35	Nn	75	
22:45	Ppip		
22:53-22:59	Ppip		Feeding
23:16	Ppip		

7.10 Dusk bat activity survey on 13th June 2017

SURVEY 2: 28TH SEPTEMBER 2017

Sunset: 18:45 Start time: 18:45 End time: 21:00

Weather conditions: 20-15°C, gusty breeze, no rain and 40% cloud cover.

Team 1: Caroline Nash + Field Assistant

Time	Species	Minutes after sunset	Comments
19:26	Ppip	41	
19:48 – 19:49	Ppip		Feeding
19:50 – 19:53	Ppip		
20:01	Ppip		

Team 2: Huma Pearce + Field Assistant

Time	Species	Minutes after sunset	Comments
19:19-19:21	Ppip	34	Feeding
19:26	Ppip		
19:32	Ppip		
19:39	Nn	80	
19:42	Ppip		Feeding
19:53	Ppip		

7.11 Bat activity survey on 28th September 2017

8 Capability statement

Company and report information

London Wildlife Trust delivers a variety of contracts across the Greater London area, such as phase 1 habitat surveys, landscape design and habitat creation. We understand the urban as well as the suburban and rural environments as they relate to biodiversity and are well placed to deliver ecological surveys across the Greater London area.

London Wildlife Trust is the only charity dedicated solely to protecting and the capital's wildlife and improving wild spaces, engaging London's diverse communities through access to our nature reserves, campaigning, volunteering and outdoor learning. We therefore have a specific interest in ensuring that all land holders and managers manage their land for the benefit of wildlife and people.

The recommendations set out within this report broadly reflect London Wildlife Trust's core principles and objectives.

The information in this document is, to the best knowledge of the author and London Wildlife Trust correct at time of writing.

The ecological recommendations offered in this document are based on known wildlife conservation good practice and where applicable, the current legislation on protected species but should not be treated as legal advice. The report may also contain additional, non-statutory, recommendations with regards to protected species and/or habitats. These are clearly identified as optional where they are offered.

London Wildlife Trust does not take any responsibility for future decisions about the site that is the subject of this assessment.

Staff capability

All ecologists are members of the Chartered Institute of Ecology & Environmental Management (CIEEM), at the appropriate level, and follow the CIEEM code of professional conduct when undertaking ecological work.

9 Staff details

Name and contact details	Role in team	Relevant experience
Mike Waller BSc Grad CIEEM Tel: 07505 028037 Email: mwaller@wildlondon.org.uk	*Conservation ecologist* Data collection, Analysis and evaluation and report delivery.	Extensive experience of surveying techniques and land management. Excellent identification skills across a broad range of taxa with a specialisation in vascular plants.
Huma Pearce BSc MSc MCIEEM	*Sub-contractor* Data collection, analysis and evaluation and report delivery	Licensed bat ecologist: Class 2 license; Registration No.: 2015_10494_CLS_CLS. Twenty years of experience of mammal ecology, surveys and mitigation work.
Mathew Frith BSc, MCIEEM, CEnv Tel: 020 78034292 Email: mfrith@wildlondon.org.uk	*Project advisor* Quality control.	Nearly 30 years' experience of urban nature conservation policy and practice, including land management issues of parks and inner urban sites. Phase 1 survey experience and site assessment. Green Flag Award judge.