

Cardiff Parkway Developments Ltd
Cardiff Hendre Lakes
2017/2018 Bat Survey Report

Environmental Statement Appendix 7.6

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 252199

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1 Introduction

1.1 Background to the Project

Ove Arup & Partners Ltd. (Arup) has been commissioned by Cardiff Parkway Developments Ltd (CPDL) to undertake baseline ecological surveys to inform the design and environmental assessment of a proposed new train station and expansion of the business park at St. Mellons, Cardiff. The site is centred on National Grid Reference (NGR) ST251808 and the site location is shown on Figure 1. CPDL is proposing to develop a scheme that is an employment led development including a new railway station and park & ride facility.

The site currently consists of predominantly arable and pastoral farming on the western edge of St. Mellons. The site's field boundaries are formed by hedge and tree lines with reens throughout. There is a lake, recreational grassland and woodland to the west of the site. The wider landscape comprises residential and commercial properties, and broad-leaved woodland to the north and west. To the south the land is bisected by the railway line with further neighbouring agricultural land. To the east there is agricultural land.

An extended Phase 1 habitat survey was undertaken in January 2017¹ to establish the habitats present on Site and to assess the potential for legally protected species to be present. As a result of that survey and a desk study of available records, it was considered that there was the potential for bats to be present and therefore detailed species-specific surveys were required.

This report provides information from bat survey work carried out in 2017 and 2018 to inform the development of the project. It identifies potential for trees and buildings within the study area to support bat roosts and establishes the levels of bat activity within the study area, identifying risk species and areas where further surveys and/or mitigation measures may be required. The report also details other species incidentally recorded during the surveys.

1.2 Survey Objectives

The surveys objectives were:

- To assess the potential of trees and buildings within the study area to support bat roosts;
- To record bat activity levels and make observations on bat behaviour, including flight paths within the study area using transect survey methods;
- To record and identify levels of bat activity using static detectors at locations spaced throughout the Site;
- To identify any important foraging areas for bats within the Site;
- To identify the range of species present and their relative abundance in terms of activity levels; and

¹ Arup. (2017) Cardiff Hendre Lakes | 2017 Extended Phase 1 Habitat Survey Report

- To provide a sufficient information to inform the assessment of impacts on bats from the proposed development as part of the Environmental Impact Assessment.

1.3 Study Area

For the purposes of this study, the survey area was based on the Site itself, as shown on Figure 1.

1.4 Legislation

All UK bat species are afforded protection under both European and national law. All bats are listed as European Protected Species (EPS) under the provisions of the Conservation of Habitats and Species Regulations 2017 (as amended) (known as the 'Habitats Regulations').

This legislation also list four British bat species as Annexes II² species in which their conservation requires the designation of Special Areas of Conservation. These species are lesser horseshoe bat (*Rhinolophus hipposideros*), greater horseshoe bat (*Rhinolophus ferrumequinum*), barbastelle (*Barbastella barbastellus*) and Bechstein's bat (*Myotis bechsteinii*).

Additionally, all bat species are afforded protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

Together this legislation makes it an offence to:

- intentionally or recklessly kill, injure or capture a bat;
- intentionally or recklessly disturb a bat such as to affect its ability to survive, breed or rear its young;
- damage, destroy or obstruct access to a breeding site or resting place (e.g. roost) used by a bat, or disturb bats while they are using such a place; and
- possess or control a live or dead bat, or any part of a bat.

Certain species are also listed as Species of Principal Importance for the conservation of biodiversity in Wales, in response to the provisions of the Environment (Wales) Act 2016. The Act includes a duty on all public authorities to have regard for the conservation of biodiversity in the exercise of their functions. This duty applies to government bodies, local authorities and statutory undertakers.

Common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*P. pygmaeus*), greater horseshoe bat, lesser horseshoe bat and barbastelle bat are all listed on the Cardiff Local Biodiversity Action Plan (LBAP).

Actions that are prohibited by legislation can be made lawful on the approval and granting of a licence from Natural Resources Wales (NRW), subject to conditions.

² <http://jncc.defra.gov.uk/page-4063>

2 Survey Methodology

2.1 Desk Study

Biodiversity Information was obtained from the South East Wales Biodiversity Records Centre (SEWBREC)³ on 31st January 2017. The search included information on bats up to 5km from the Site boundary and data was limited to those from the last 10 years.

2.2 Roost Potential Assessments

Trees within the study area were assessed from the ground for their potential to support bat roosts in line with the guidance set out in the Good Practice Guidelines⁴ on the 31st July and 29th August 2018. This assessment was aided by the Arboricultural Survey Report⁵ which provided a plan and record of all trees/groups of trees within the study area.

During the Ground Level Tree Assessment (GLTA), features considered to provide suitable roost sites for bats such as the following were sought (also see Table 1 below for details on roost categorisation):

- Trunk cavity/hollow – Large hole in trunk caused by rot or injury;
- Branch cavity - Large hole in branch caused by rot or injury;
- Trunk split – Large split/fissure in trunk caused by rot or injury;
- Branch spilt – Large split/ fissure in branch caused by rot or injury;
- Branch socket cavity – Where a branch has fallen from the tree and resulted in formation of an access point in to a cavity;
- Woodpecker hole – Hole created by nesting birds suitable for use by roosting bats;
- Lifted bark – Areas of bark which has rotted/lifted to form suitable access point/roost site for bats;
- Hazard beam failure- Where a section of the tree stem/branch has failed causing collapse and leading to longitudinal fractures/splits/ racks along its length; and
- Ivy cover – Dense/mature ivy cover where the woody stems could create small cavities/ crevices.

Following the GLTA, trees with bat roosting features above ‘negligible’ were subsequently climbed and inspected as far as possible to confirm/review their bat roosting potential, as described in Table 1 below.

³ <http://www.sewbrec.org.uk/home.page>

⁴ Collins, J. (2016). Bat Surveys: Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.). The Bat Conservation Trust, London.

⁵ Barton Hyett Associates (July 2018). Arboricultural survey report on behalf of Arup for outline planning application of business park, parkway rail station and park and ride at land to the south of St Mellons business park, St Mellons, Cardiff.

Table 1: Categorisation of the potential for bat roosts within trees and buildings

Suitability	Description Roosting Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.
Low	<p>A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do 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).</p> <p>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.</p>
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protected, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
High	A structure or tree with one or more potential roost sites that are obviously more suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

The GLTA and follow-up tree climbing inspections were carried out by two licensed bat ecologists and certified tree climbers (Chloe Delgery of Arup and Ben Mitchell of Johns Associates) on the 31st July and 29th August 2018.

Buildings were also categorised as having negligible, moderate or high suitability for bats depending on the construction of the building and the presence of potential bat access points ascertained by external inspections if necessary, using close focusing binoculars/monoculars.

During the surveys the following information in Table 2 for the trees and buildings was also recorded using forms on tablet devices along with photographs.

Table 2: Information capture during preliminary roost assessments

Information Recorded for Trees		Information Recorded for Building	
<ul style="list-style-type: none"> • GPS location • Survey date • Species • Height 	<ul style="list-style-type: none"> • Diameter at breast height • Suitable features • Signs of bat use 	<ul style="list-style-type: none"> • GPS location • Survey date • Building type • Age • Height of eaves • Pitch height at gable ends 	<ul style="list-style-type: none"> • Roof aspect • Roof complexity • Roof covering • Suitable features • Signs of bat use

2.3 Walked Activity Transect Surveys

Four transect routes were used to cover the whole of the Site area (shown on Figure 2). The chosen routes were influenced by ease of accessibility and navigation. All routes were walked in daylight to identify hedge and reed crossing points and to identify any hazards present. Each transect survey was undertaken by a pair of surveyors (at least one of the pair had walked the route in daylight). Pairs walking different routes were in communication using mobile phones.

The pairs of surveyors walked their respective routes at a constant speed to ensure the sampling area was the same per unit time.

Within each pair, one surveyor recorded each bat echolocation call using an Elekon Batlogger M (which enabled them to be linked to a specific location (GPS) and time, whilst the other surveyor acted as scribe. The scribe noted down any relevant observations, for example, numbers of bats, flight direction, flight height and behaviour (commuting or foraging). Both surveyors also identified bat species by ear during the transect surveys.

Each month, the transect routes were walked in a different direction. All surveys were carried out at dusk, commencing at sunset and ending two hours after sunset. The bat transect surveys were undertaken by teams of experience ecologists once every month between May and October 2017.

The surveys were conducted by Wildwood Ecology⁶ were led either by Dr Matt Davies MCIEEM or Dr Alex Pollard MCIEEM with a number of assistants. All surveyors were assessed for their competence by Wildwood Ecology prior to undertaking surveys.

The habitats represented along the transects are describes in Table 3 below. Timings and weather conditions for all transect survey visits can be seen in Table 4.

Table 3: Description of transect habitats

Transect Number	Habitats Represented
1	Poor semi-improved grassland, semi-improved neutral grassland, standing water, tall ruderal, dense scrub, semi-natural broadleaved woodland, species poor hedge with trees and arable.
2	Improved grassland, standing water, species-poor hedge with trees, species-rich intact hedge, semi-natural broadleaved woodland, buildings, arable, poor semi-improved grassland, semi-improved natural grassland and dense scrub.
3	Semi-improved neutral grassland, species-poor hedge with trees, species-poor intact hedge, standing water, improved grassland and poor semi-improved grassland.
4	Improved grassland, semi-improved neutral grassland, semi-natural broadleaved woodland, standing water and species-poor hedge with trees.

Table 4: Dates, timings and weather conditions for all transect surveys.

Date	Survey Duration	Sunset	Conditions (Temp [°C], Cloud cover [Oktas], Wind speed [Beaufort], Rain)
24/05/2017	2 hours	21:11	Start – 17, 1/8, F1, nil Finish – 17, 0/8, F1, nil
27/06/2017	2 hours	21:34	Start – 22, 8/8, F0, nil Finish – 18, 8/8, F0, nil
27/07/2017	2 hours	21:08	Start – 16, 1/8, F3/4, nil Finish – 15, 2/8, F3, nil

⁶ <https://wildwoodecology.com/>

Date	Survey Duration	Sunset	Conditions (Temp [°C], Cloud cover [Oktas], Wind speed [Beaufort], Rain)
31/08/2017	2 hours	20:01	Start – 15, 5/8, F2, nil Finish – 12, 4/8, F2, nil
26/09/2017	2 hours	19:01	Start – 18, 8/8, F1/2, nil Finish – 16, 7/8, F3, nil
31/10/2017	2 hours	16:47	Start – 13, 8/8, F2/3, nil Finish – 12, 7/8, F1/2, nil

2.4 Static Bat Activity Monitoring

Static bat detectors were used to record bat activity over a five-night period each month from May to October 2017. The Static Detector Activity Surveys were undertaken in accordance with the BCT Good Practice Survey Guidelines³.

Eight locations were selected within the study area in accordance with the Good Practice Survey Guidelines. These are shown as Locations 1 to 8 on Figure 3 and are described in Table 5.

Table 5: Static bat activity monitoring locations

Monitoring Locations	NGR	Description
Location 1	ST 24997 81247	Alongside species-poor hedge with trees surrounded by arable and poor semi-improved grasslands within the northern area of the site
Location 2	ST 24982 80886	Within a species-rich intact hedgerow intersecting arable and improved grassland fields within the northern area of the site
Location 3	ST 24875 80840	At the edge of an area of scrub along the western bank of Faendre Reen in the western area of the site
Location 4	ST 24740 80975	North of Location 3, at the edge of an area of semi-natural broadleaved woodland along the western bank of Faendre Reen.
Location 5	ST 25114 80834	Within a species-poor hedge with trees surrounded by semi-improved neutral grassland fields which are grazed by cows. Located to the west of Marshfield Site of Importance for Nature Conservation (SINC).
Location 6	ST 25337 80917	Within a species-poor hedge with trees surrounded by semi-improved neutral grassland fields which are grazed by cows, within Marshfield SINC.
Location 7	ST 25419 80816	At the edge of a wet woodland area between the railway line and an improved grassland field in the southern area of the site.
Location 8	ST 25408 80666	Within a species-poor intact hedge intersecting an improved and poor semi-improved grassland fields in the southern area of the site.

The locations were selected using professional judgement to provide a representative sample of the different habitats present within the study area with the aim of identifying the relative importance of these to inform the assessment of any impacts that might arise from the proposed development.

2.4.1 Data Collection

Wildlife Acoustic Song Meter 2 Ultrasonic Bat Detectors (SM2+ BAT) with SMX-U1 microphones were used to record bat activity for five consecutive nights each month from May to October 2017, in line with the recommended effort within the Good Practice Survey Guidelines.

The detectors were set up with the settings shown in Table 6 below to record between 18:00 and 07:00 each night.

Table 6: SM2 + BAT Settings used during data collection

Parameter	Setting
2.5V Microphone Bias	Off
Low noise filter	1kHz
Microphone pre-amp gain	12dB
Sample rate	354800
Monitoring schedule	Adjusted during the season to run from approximately 1hr before sunset to 1hr after sunrise

The microphones used with the detectors during the course of the surveys were regularly checked and calibrated using a Wildlife Acoustics Calibration Unit to ensure that they were functioning properly. Microphones that were found not to be of sufficient sensitivity to the output of the calibration unit or which were damaged were replaced.

2.5 Data Processing and Analysis

The detectors recorded bat activity in Wildlife Acoustics Compression files (.wac). These were downloaded from the detectors and processed using Kaleidoscope Pro Software to produce audio files (.wav) and zero crossing files. The processing also included the automatic identification of bat species based on the classifiers developed by Wildlife Acoustics (Bats of Europe 4.3.0).

The files produced by the processing were then reviewed to ensure correct identification of species and to identify where possible the bat species for any calls which could not be recognised by the software. All calls identified as being either common pipistrelle or soprano pipistrelle were not reviewed except where high levels of insect noise had been recorded leading to uncertainty over the accuracy of identification. All other calls were checked by Pete Wells, a bat specialist with over twenty-five years of experience in bat work and holder of a current NRW bat survey licence.

The number of files (sound clips) recorded by the detectors each night was taken as a proxy value to the number of bat passes. This was then used to calculate a Bat Activity Index (BAI) for each species at each location during each session. The BAI was calculated on the first five nights recorded each month. In some cases, the detector also recorded data on the sixth and seventh nights. These additional nights have been excluded from the BAI as it could not be certain that the detector had recorded data for the entire night. However, where rarer or more notable

species were recorded on these additional nights, they have been included to ensure their representation within the data in terms of species diversity.

The average BAIs for all species (sum of individual BAIs) at each location has been calculated over the active months from May to October 2017.

The time of recording of the first bat of each species, each night, and time of last recording were also compared to sunset and sunrise times obtained using Anasun software to infer the potential proximity of roost sites.

2.6 Limitations and Assumptions

The identification of bat calls can be highly subjective based on decisions on the shape and characteristics of the calls. Whilst every effort has been made to ensure the accurate identification of calls, given the number of bat passes recorded (in excess of 33,000 from static detectors) it has not been possible to differentiate between the *Myotis* species. Due to the subjective nature of bat call analysis it is possible that other ecologists may differ in opinion on the identification of calls, however current reference works⁷ have been used along with BatExplorer software which also includes species identification functions.

There is also the potential that some calls may have been overlooked principally due to the fact that the automatic species identification systems cannot identify multiple species within the same sound clip. However, with the exception of files identified as common or soprano pipistrelle by the software, all other files have been checked and all species recorded within those files included within the results set out in this report.

Whilst effort was made to programme and undertake surveys during suitable weather conditions, the nature of the static activity monitoring surveys, undertaken over a five-night recording session, means that on some occasions these surveys included nights during which there were lower temperatures, periods of rainfall and strong winds (particularly in early spring and autumn months). The recordings, however, do provide an indication of bat activity levels across the Site during these different weather conditions.

During the June monitoring session the detector at Location 4 was thrown into a reek by a third party resulting in the data being lost for this location. At Location 2 in July, Location 5 in May and Location 8 in August, the equipment failed resulting in no data being recorded at those locations in those months.

In some months at some locations, no bats were recorded at all despite the equipment seeming to function correctly (i.e. only white noise and/or birds were recorded). This could be due to a number of factors, such as:

- Heavy winds blowing insects to different areas of the site, leading bats to forage in different areas;
- Heavy winds causing leaf noise to drown out any bats present;

⁷ Russ, J. (2012). *British Bat Calls: A Guide to Species Identification*. Exeter: Pelagic Publishing, and Middleton, N., Froud, A., & French, K. (2014). *Social Calls of the Bats of Britain and Ireland*. Exeter: Pelagic Publishing.

- Microphone failure;
- The natural change in how bats use the site over the course of the months of monitoring; and/or
- Changes in grazing patterns around the site over the months of monitoring.

During some of walked activity transect survey visits, certain fields were inaccessible due to the presence of cattle. Transect routes 1 and 2 were accessible during all six months. However, the only month in which routes 3 and 4 could be surveyed was May 2017. These routes were not surveyed at all during other months due to the presence of cattle. Although the lack of direct observation of bats within these parts of the Site is unfortunate, information on species diversity and bat abundance was recorded by the static detectors within these areas.

It should be stressed that the findings presented in this study represent those at the time of survey and reporting, and data collected from available sources. Ecological surveys are limited by factors which affect the presence of species, such as temporal weather conditions, migration patterns and behaviour. Nevertheless, these surveys were conducted at the optimal survey periods. Every effort has been made to ensure that the findings of the study present as accurate an interpretation as possible of the status of bats within the Study Area.

3 Baseline Environment

3.1 Desk Study

The desk study carried out for the project identified bat species recorded in the area include Natterer's bat (*Myotis nattereri*), whiskered bat (*Myotis mystacinus*), brown long-eared bat (*Plecotus auritus*), common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle (*Pipistrellus nathusii*), greater horseshoe bat, lesser horseshoe bat, serotine (*Eptesicus serotinus*), Daubenton's bat (*Myotis daubentonii*) and Leisler's bat (*Nyctalus leisleri*).

There are recent⁸ records of bat roosts at 650m (whiskered bat), 750m (brown long-eared bat), 930m (pipistrelle species) and 1km (common and soprano pipistrelle species).

There are also numerous records of bat activity in the area; the closest records being Natterer's bat 1km away, whiskered bat 650m, brown long-eared bat 930m, common pipistrelle 170m, soprano pipistrelle 170m, Nathusius' pipistrelle 900m, greater horseshoe bat 4.1km, lesser horseshoe bat 5.1km, serotine 1km, Daubenton's bat 900m and Leisler's bat 1.8km.

Further details of previous records of bats can be found in the Desk Study and Extended Phase 1 Report for the project¹.

3.2 Preliminary Roost Assessment

A total of 142 trees and 86 groups of trees were recorded in the Arboricultural Report and assessed as part of the GLTA. Many of these trees/groups of trees were young and in good condition and did not offer any bat roosting potential.

The GLTA resulted in the following:

- five trees were found to have low bat roosting potential (T4, T5, T39, T52, G67-B3)
- six trees were found to have moderate bat roosting potential (T7, T19, T31, T97, T113, T132), and
- five trees were found to have high bat roosting potential (T16, T21, T41, T42, T114).

Following the tree climbing inspections:

- T4 and T5 were downgraded from Low to Negligible;
- T42 was downgraded from High to Negligible;
- T41 was downgraded from High to Low;
- T7, T19 and T113 were downgraded from Moderate to Negligible.

The locations of the trees listed above are shown on Figure 4. The full results of the GLTA and tree climbing survey are provided in Appendix A.

⁸ Post-2000 records.

To the north of the site there are three metal flat roof gas pumping station buildings (B1-3), approximately 3m high with intact, sealed roofs. The vents were the only access points for potential bats but there were no signs of bat use identified on these features. It was not possible to access the interior of the building. These buildings were identified as having negligible bat suitability. Full details and photos of these buildings are provided in Appendix A.

3.3 Walked Activity Transects

A total of eight species were recorded during the transect surveys: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, noctule, serotine, Daubenton's bat, brown long-eared and at least one *Myotis* species. Figures 5, 6, 7, 8 and 9 show bat activity transect results 10, 20, 30, 60 and over 60 minutes after sunset. The figures show how recorded bat activity changed across the site as time after sunset increased. The majority of the activity recorded was around Hendre Lake and the wooded area between Cypress Drive and Faendre Reen. Figures 10, 11, 12, 13 and 14 show the all recorded locations of activity for each bat species across the site. A summary of the results of the surveys is provided in Table 7 below and in Appendix B. Full results are detailed in the report produced by Wildwood Ecology Ltd⁹ which is provided in Appendix C.

Although the surveys were not designed to find bat roosts, the recording of a significant number of bat passes within a short time of sunset suggests that a pipistrelle roost is located within the residential area to the west of Cypress Drive.

Bats were using both boundary vegetation and open spaces (both water and open field) to forage and commute, with the more light-tolerant species detected along the artificially lit roads.

Table 7: Bat species recorded using the site during walked activity transects

Bat Species	Notes
Noctule	There were a total of 190 confirmed noctule passes throughout the surveys, with calls recorded from across the Site. A number of passes (37) were recorded before sunset indicating that it is likely that roosts for this species are present within the local area. Whilst surveyors observed several noctule bats flying near to Hendre Lake and over fields at a relatively low height (<10m), other calls may have been recorded from animals echo-locating from further away.
Common pipistrelle	The most prolific of bats recorded with 1194 passes detected. Of these, 17 were recorded prior to sunset and so it is likely that there are roosts for this species in the vicinity of the Site, particularly to the north of transect 1. Common pipistrelle remained active throughout the surveys indicating that there is a good foraging resource across the Site, throughout the year.
Soprano pipistrelle	This species recorded 183 passes across the surveys undertaken and was present across the Site and throughout the year. There were no passes for soprano pipistrelle before sunset and all passes were recorded after almost 14 minutes after sunset, until the end of the survey.
Nathusius' pipistrelle	A relatively high number of passes (43) for this species was detected across the Site, with bats observed foraging over Hendre Lake. This bat often is

⁹ Wildwood Ecology (2018). Protected Species Survey Baseline Report (Bats).

Bat Species	Notes
	found in habitats with wetland mosaic and it is unsurprising to find it present within this area of Cardiff. The passes were recorded most often in May and June, with fewer passes recorded in July, August and September, and none in October. This indicates that there may be a smaller resident population with the May activity potentially due to migratory (local and longer distance) movements.
Serotine	Four serotine passes were recorded adjacent to Hendre Lake, in May only, with the bat observed foraging just over an hour into the survey. No other recordings of this species were made during the surveys.
Daubenton's bat	This species was recorded making ten passes, in May, June, July and August, and was associated with Hendre Lake and the reens. This bat is likely to be under-recorded due to its low flight behaviour when foraging over water and several of the unspecified <i>Myotis</i> calls may be attributed to this species. Most of the activity for this species was between 28 minutes after sunset and the end of the survey, with a single early pass at 17 minutes before sunset at the north of the Site, indicating that there is likely to be a roost present in the vicinity.
<i>Myotis</i> sp	Twenty-eight passes were attributed to unspecified <i>Myotis</i> species as the calls were not of a high enough quality to be fully identified, and the variation present within the calls of these species means that identification to species level is unlikely to be 100% accurate. <i>Myotis</i> species were recorded in all months except October. The calls were recorded at locations across the Site, with an accumulation towards the centre within a scrub woodland section of habitat, and a darker part of the Site.
Brown long-eared bat	A single pass of this species was recorded on Cypress Drive near to the end of a survey (at 1hr 54 mins after sunset). The direction of flight and behaviour was not observed, however the location where this pass was recorded was adjacent to an area of scrub, where it is likely that the bat was flying (given the presence of street lighting on the road at this point). The lack of other calls from long-eared bats may be reflective of the quiet nature of their calls and the potential for them to be under recorded.

3.4 Static Activity Monitoring

The results of the static detector surveys are summarized in Table 8 below which shows the BAIs for all species combined at each location. The locations shown are in Figure 3 and described above in the methodology.

Detailed results for individual species are provided Appendix D.

Table 8: BAIs (average bat passes (equivalent) per night) for all species¹⁰

All species	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	174.4	112.6	1883	123.2	No data	1.4	40.6	72.6
June	No bats recorded	683	58.8	No data	49.4	1.2	142.6	571.8
July	35	No data	420.2	213.4	11	No bats recorded	20	44.4
August	No bats recorded	29.2	No bats recorded	3.2	No bats recorded	37.2	392.2	No data
September	18.2	241	No bats recorded	No bats recorded	355.6	36	254	2.4
October	8.2	454.8	66.6	10.8	60.4	26.6	2.8	5.4
Average	58.95	304.1	607.2	87.65	119.1	20.48	142	139.3

Key:

High bat activity level
Moderate bat activity level
Low bat activity level

¹⁰ No bats recorded = no bats of any species were recorded at this location in this month
No data = no data recorded at this location in this month due to equipment failure

Relatively high levels of activity were recorded at each location with the exception of Location 6. Locations 2 and 3 (next to Faendre reen and on the only species-rich hedgerow leading off Faendre reen, respectively) recorded high levels of bat activity on average across the survey period, with Location 3 recording the maximum activity level of 1883 bat passes (equivalent) per night in May 2017. Location 2 recorded a high level of activity in three of the recording sessions, with a maximum of 683 bat passes (equivalent) per night in June.

Location 6 within the Marshfield SINC recorded only a low level of activity on all occasions and it is unclear why levels were so low at this location compared to the others across the Site. The area of the SINC comprises species rich grassland with mature, overgrown hedgerows, however it lacks the open water elements of the reens present at Locations 2, 3, 4 and 5, and livestock grazing is likely to be restricted to the aftermath period once hay has been cut when slightly higher activity levels were recorded post August.

Common pipistrelle were the most commonly recorded bat species across all locations, followed by soprano pipistrelle, noctule and *Myotis* bats.

Myotis species were predominantly recorded in low levels with the exception of Location 3 in May when the activity level was considerably higher. This may have been a result of weather conditions which caused higher insect levels over Faendre Reen compared to other months.

Other species infrequently recorded on a small number of occasions include barbastelle, Nathusius' pipistrelle, serotine and long-eared species. Barbastelle bat were recorded Locations 1 and 2 in May (both single passes) and Location 6 in August (two passes). One serotine pass was recorded at Location 2 in June.

Single passes of Nathusius' pipistrelle were recorded at Location 5 in June and September, and at both Locations 7 and 8 in June and October. Long-eared species were recorded at Locations 2, 3 5 and 6, with the highest levels recorded at Location 2 in August (BAI of 1.2).

No horseshoe bat species were recorded during the surveys.

4 Conclusions and Recommendations

4.1 Bat Roosts

No confirmed bat roosts have been recorded within the study area. Roosts of common species such as pipistrelle are likely to be present within the areas of residential housing to the west of Cypress drive.

The ground level tree assessments and subsequent tree climbing surveys identified several trees with bat roosting potential which will require further surveys, if they are likely to be affected by any development. In particular the five trees which were found to have medium or high potential for bats should be subject to emergence surveys if they are likely to be affected by the first phase of any development on the Site.

4.2 Bat Foraging and Commuting Routes

The transects and static monitoring surveys have shown that the land within the study area provides high value foraging habitat for bats. In particular the corridors along Faendre reen and the mature vegetation along Cypress Drive, and around Hendre Lake, are likely to be important commuting and foraging routes for bats.

Although the transects were limited due to the presence of cattle in some areas, the static monitoring confirmed that bats are active across the study area and that the range of habitats including areas of grazing land, water and linear hedgerows provide suitable foraging areas throughout the year and during different weather conditions.

In designing any proposed development, it will be necessary to retain important flight corridors and where possible foraging. This is likely to be facilitated by the need to retain reens and the connectivity of the water bodies within the landscape due to the Site of Special Scientific Interest designation. Where flight corridors and foraging areas are retained these will need to be kept as dark corridors and it is likely that lighting plans would be required to support any planning application.

Given the likelihood of roosts being present within the housing on the western side of Cypress Drive, it is recommended that Faendre Reen is kept dark, and if possible the corridor along the main reen running east-west is similar not affected from light spill from any development plots. This would therefore ensure that bats from roosts to the west of Cypress Drive are able to access foraging areas within grazed grassland to the south of the railway and to the east of the Study Area.

Figures

Figure 1 Site location and study area (red line boundary)

Figure 2 Walked Activity Transect Routes

Figure 3 Static Detector Locations

Figure 4 Bat Roost Suitability of Trees Following Tree Climbing Surveys

Figure 5 Bat activity transect results within 10 minutes of sunset

Figure 6 Bat activity transect results within 20 minutes of sunset

Figure 7 Bat activity transect results within 30 minutes of sunset

Figure 8 Bat activity transect results within 60 minutes of sunset

Figure 9 Bat activity transect results after 60 minutes following sunset

Figure 10 Plot from transect data showing locations of *Myotis* sp. and Daubenton's bat

Figure 11 Plot from transect data showing locations of noctule

Figure 12 Plot from transect data showing locations of common pipistrelle and soprano pipistrelles, along with social calls

Figure 13 Plot from transect data showing locations of Nathusius' pipistrelle

Figure 14 Plot from transect data showing locations of serotine and brown long-eared bat

Figure 15 Static Detector Surveys Bat Species Proportions May 2019

Figure 16 Static Detector Surveys Bat Species Proportions June 2019

Figure 17 Static Detector Surveys Bat Species Proportions July 2019

Figure 18 Static Detector Surveys Bat Species Proportions August 2019

Figure 19 Static Detector Surveys Bat Species Proportions September 2019

Figure 20 Static Detector Surveys Bat Species Proportions October 2019

Figure 21 Static Detector Surveys Bat Activity Index May 2019

Figure 22 Static Detector Surveys Bat Activity Index June 2019

Figure 23 Static Detector Surveys Bat Activity Index July 2019

Figure 24 Static Detector Surveys Bat Activity Index August 2019

Figure 25 Static Detector Surveys Bat Activity Index September 2019

Figure 26 Static Detector Surveys Bat Activity Index October 2019

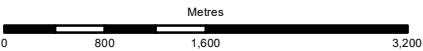


Legend

Redline Boundary

F1	2019-07-08	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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Site location and study area
(red line boundary)

Scale at A3
1:60,000

Job No 252199	Drawing Status For Issue
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Drawing No 001	Issue F1
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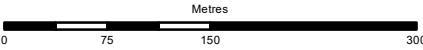
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and



Legend

- Transect 1
- Transect 2
- Transect 3
- Transect 4

F1	2019-07-05	AK	PW	PC
Issue	Date	By	Chkd	Appd



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Walked Activity Transect Routes

Scale at A3
1:5,500

Job No 252199	Drawing Status For Issue
Drawing No 002	Issue F1

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

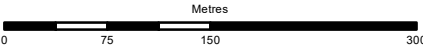


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

Legend

- Redline Boundary
- Static Detector Locations

F1	2019-07-05	AK	PW	PC
Issue	Date	By	Chkd	Appd

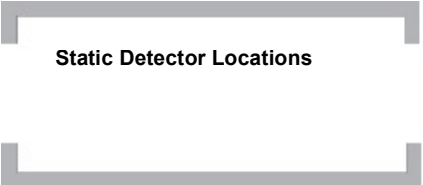


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Scale at A3
1:5,500

Job No 252199	Drawing Status For Issue
Drawing No 003	Issue F1

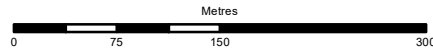


Legend

- Redline Boundary
- High suitability
- Moderate suitability
- Low suitability
- Negligible suitability

F1	2018-07-13	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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**Bat Roost Suitability of Buildings
and of Trees Following Tree
Climbing Surveys**

Scale at A3
1:5,500

Job No 252199	Drawing Status For Issue
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Drawing No 004	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

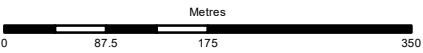


Legend

- Myotis
- Noctule
- Nathusius' pipistrelle
- Common pipistrelle
- Pipistrelle social calls

F1	2019-07-05	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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**Bat activity transect results
within 10 minutes (+ / -)
of sunset**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 005	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

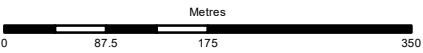


Legend

- Daubenton's
- Noctule
- Nathusius' pipistrelle
- Common pipistrelle
- Soprano pipistrelle
- Pipistrelle social calls

F1	2019-07-08	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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**Bat activity transect results
within 20 minutes of sunset**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 006	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

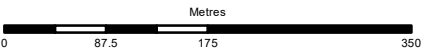


Legend

- Myotis
- Daubenton's
- Noctule
- Nathusius' pipistrelle
- Common pipistrelle
- Soprano pipistrelle

F1	2019-07-08	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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**Bat activity transect results
within 30 minutes of sunset**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 007	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

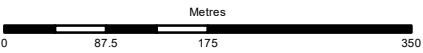


Legend

- Myotis
- Noctule
- Nathusius' pipistrelle
- Common pipistrelle
- Soprano pipistrelle
- Pipistrelle social calls

F1	2019-07-08	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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**Bat activity transect results
within 60 minutes of sunset**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 008	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

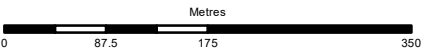


Legend

- Serotine
- Myotis
- Daubenton's
- Noctule
- Nathusius' pipistrelle
- Common pipistrelle
- Soprano pipistrelle
- Pipistrelle social calls
- Brown long-eared

F1	2019-07-08	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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**Bat activity transect results
after 60 minutes following sunset**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 009	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

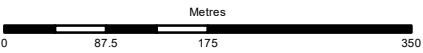


Legend

- Myotis
- Daubenton's

F1	2019-07-05	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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Plot showing locations of
Myotis sp. and Daubenton's bat

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 010	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

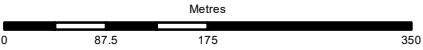


Legend

● Noctule

F1	2019-07-05	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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**Plot showing locations of
noctule**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 011	Issue F1
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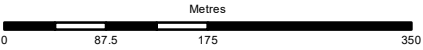
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and



Legend

- Common pipistrelle
- Soprano pipistrelle
- Pipistrelle social calls

F1	2019-07-05	KJ	PW	PC
Issue	Date	By	Chkd	Appd



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**Plot showing locations of
common pipistrelle and
soprano pipistrelles,
along with social calls**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 012	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

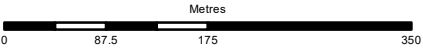


Legend

● Nathusius'

F1	2019-07-05	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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**Plot showing locations of
Nathusius' pipistrelle**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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Drawing No 013	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

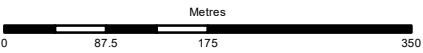


Legend

- Serotine
- Brown long-eared bat

F1	2019-07-05	KJ	PW	PC
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Issue	Date	By	Chkd	Appd
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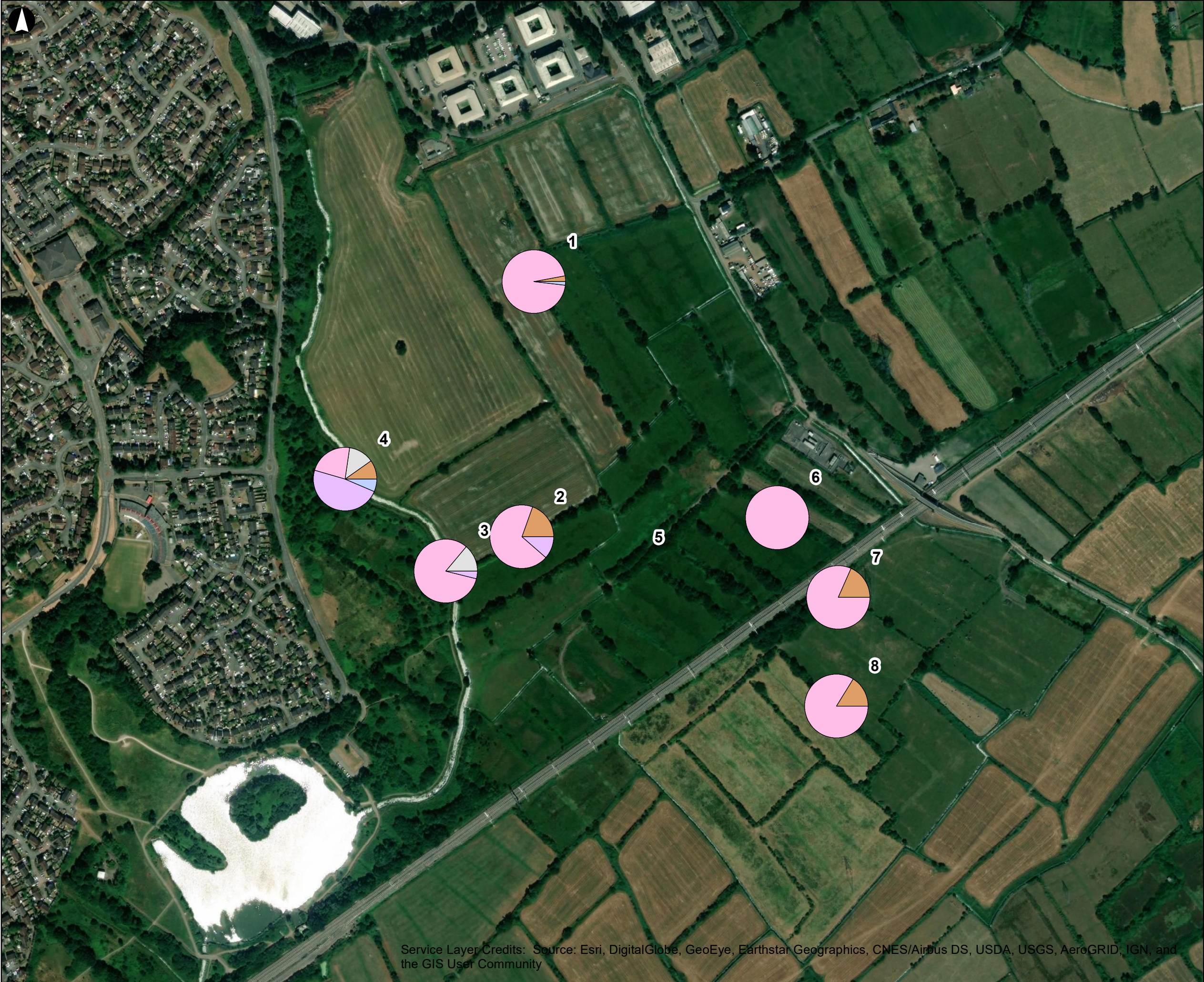
**Plot showing locations of
serotine and brown
long-eared bat**

Scale at A3
1:6,500

Job No 252199	Drawing Status For Issue
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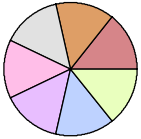
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar
Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and



Legend

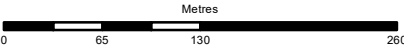
May Species



- BARBAR
- NYCNOC
- MYOTIS
- PIPPIP
- PIPPYG
- PIPSPE
- PLESPE

F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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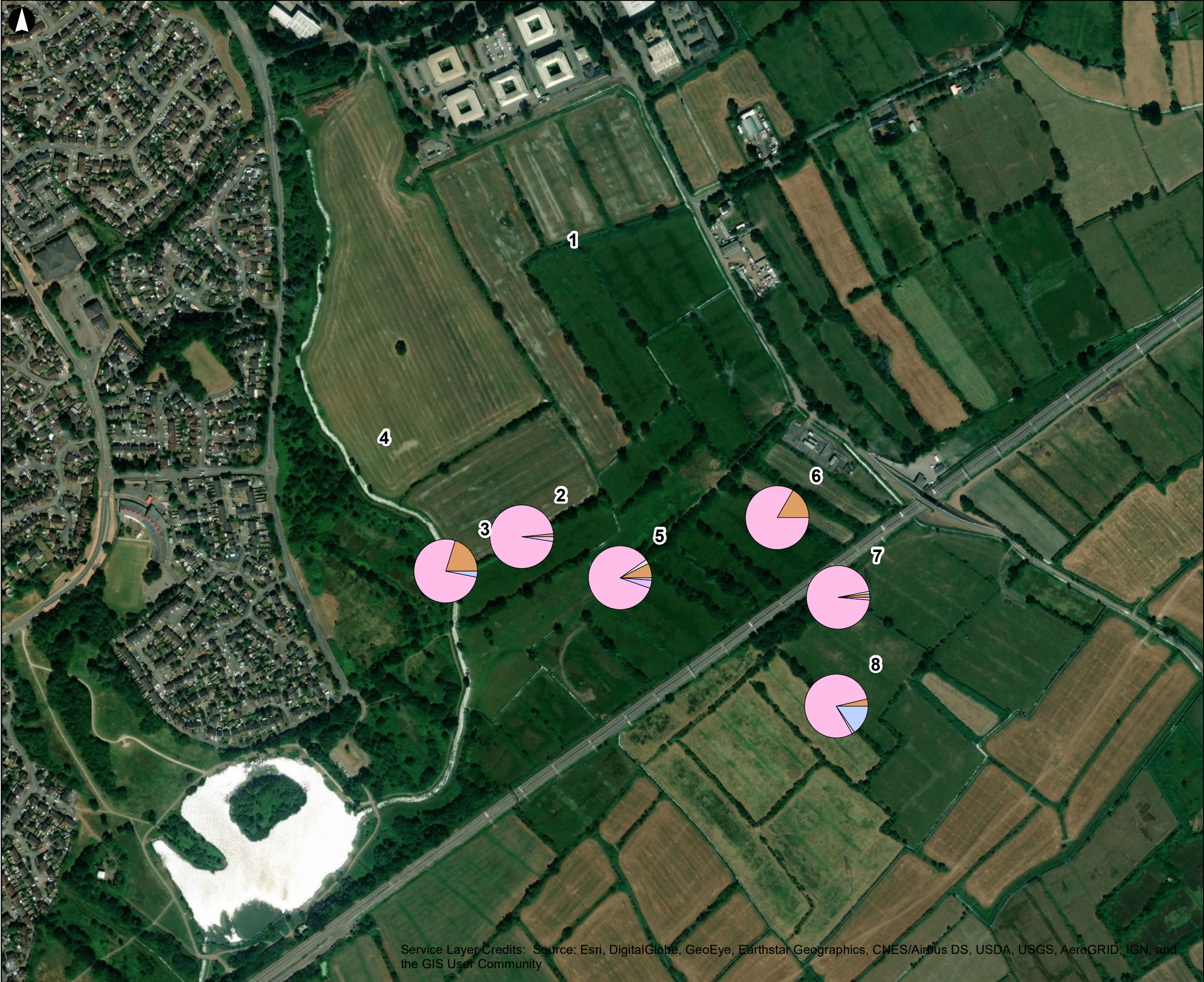
Job Title
Cardiff Hendre Lakes

**Static Detector Surveys
Bat Species Proportions
May 2019**

Scale at A3
1:5,000

Job No 252199	Drawing Status For Issue
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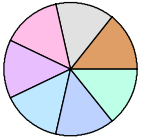
Drawing No 015	Issue F1
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

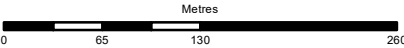
June Species



- NYCNO
- MYOTIS
- PIPPIP
- PIPPYG
- PIP NAT
- PIPSPE
- EPTSER

F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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Job Title
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Static Detector Surveys
Bat Species Proportions
June 2019

Scale at A3
1:5,000

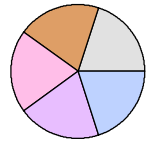
Job No 252199	Drawing Status For Issue
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Drawing No 016	Issue F1
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Legend

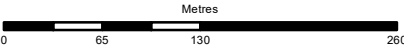
July Species



- MYOTIS
- NYCNO
- PIPIP
- PIPYG
- PIPSPE

F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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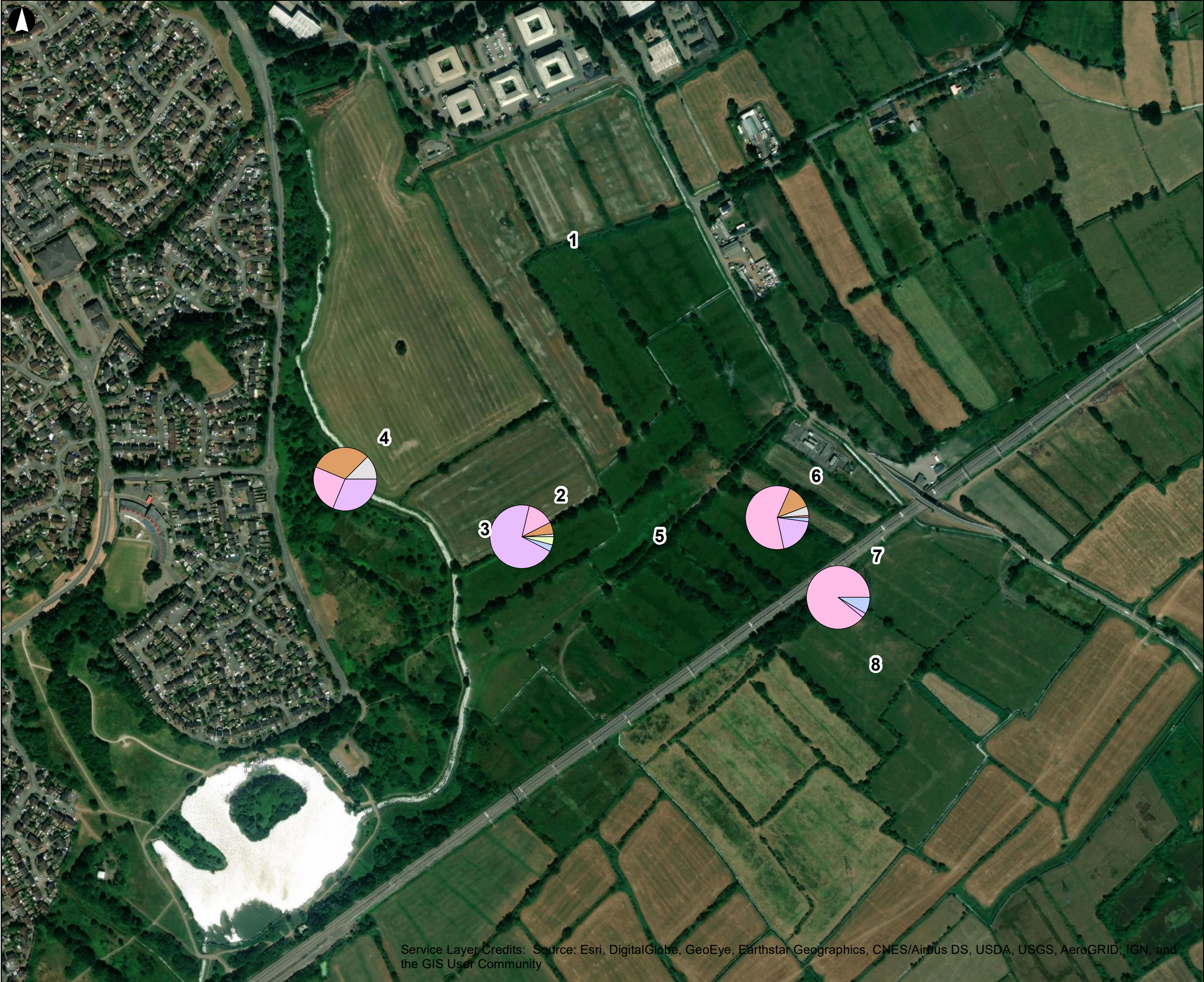
Job Title
Cardiff Hendre Lakes

**Static Detector Surveys
Bat Species Proportions
July 2019**

Scale at A3
1:5,000

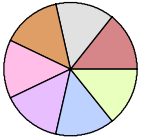
Job No 252199	Drawing Status For Issue
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Drawing No 017	Issue F1
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Legend

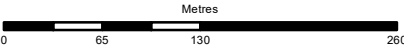
August Species



- BARBAR
- MYOTIS
- NYCNOC
- PIPPIP
- PIPPYG
- PIPSPE
- PLESPE

F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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Client
Cardiff Parkway Developments Ltd

Job Title
Cardiff Hendre Lakes

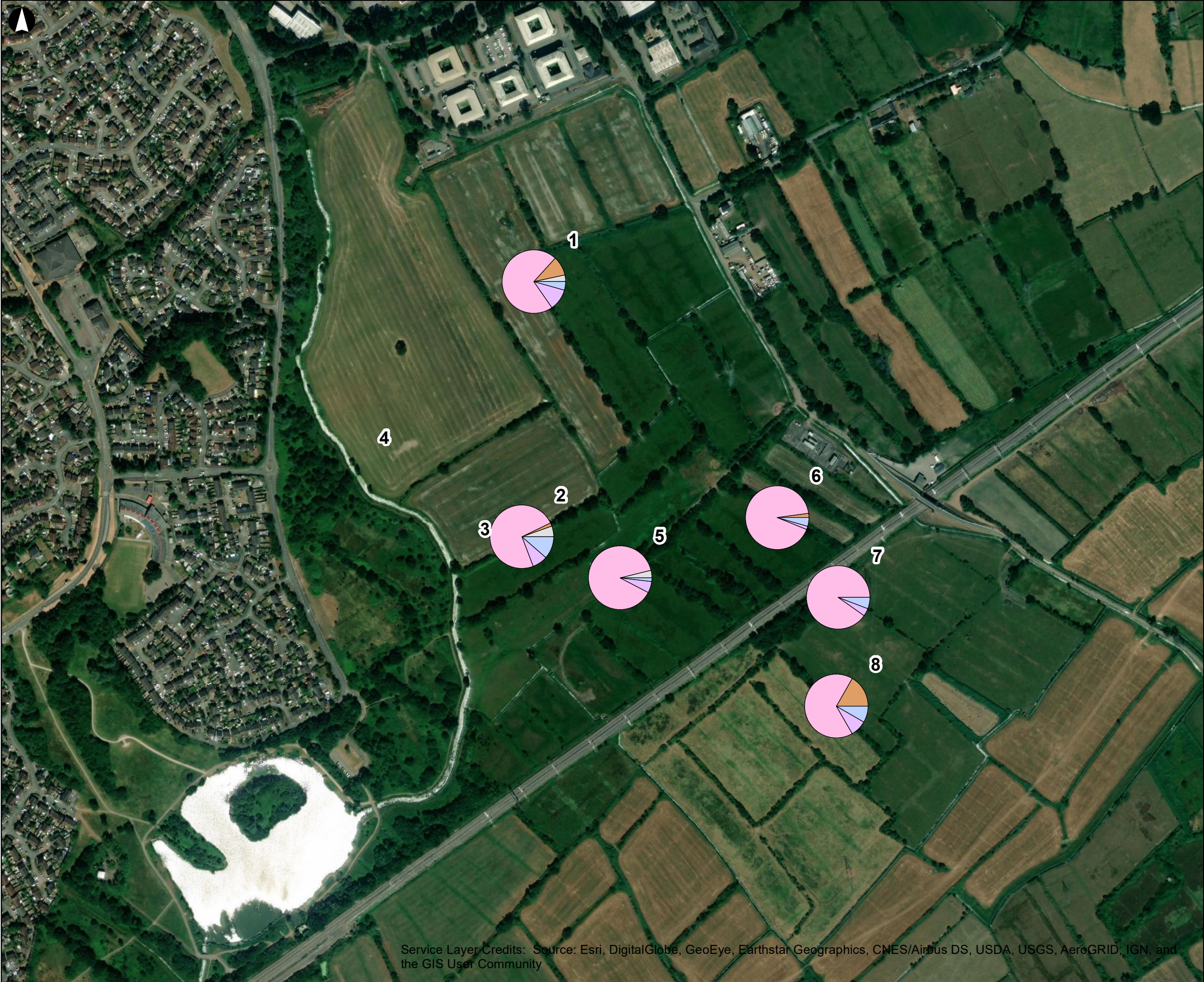
**Static Detector Surveys
Bat Species Proportions
August 2019**

Scale at A3
1:5,000

Job No 252199	Drawing Status For Issue
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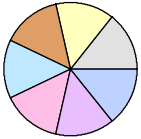
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Legend

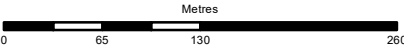
September Species



- MYOTIS
- NYCLEI
- NYCNO
- PIP NAT
- PIPPIP
- PIPPYG
- PIPSPE

F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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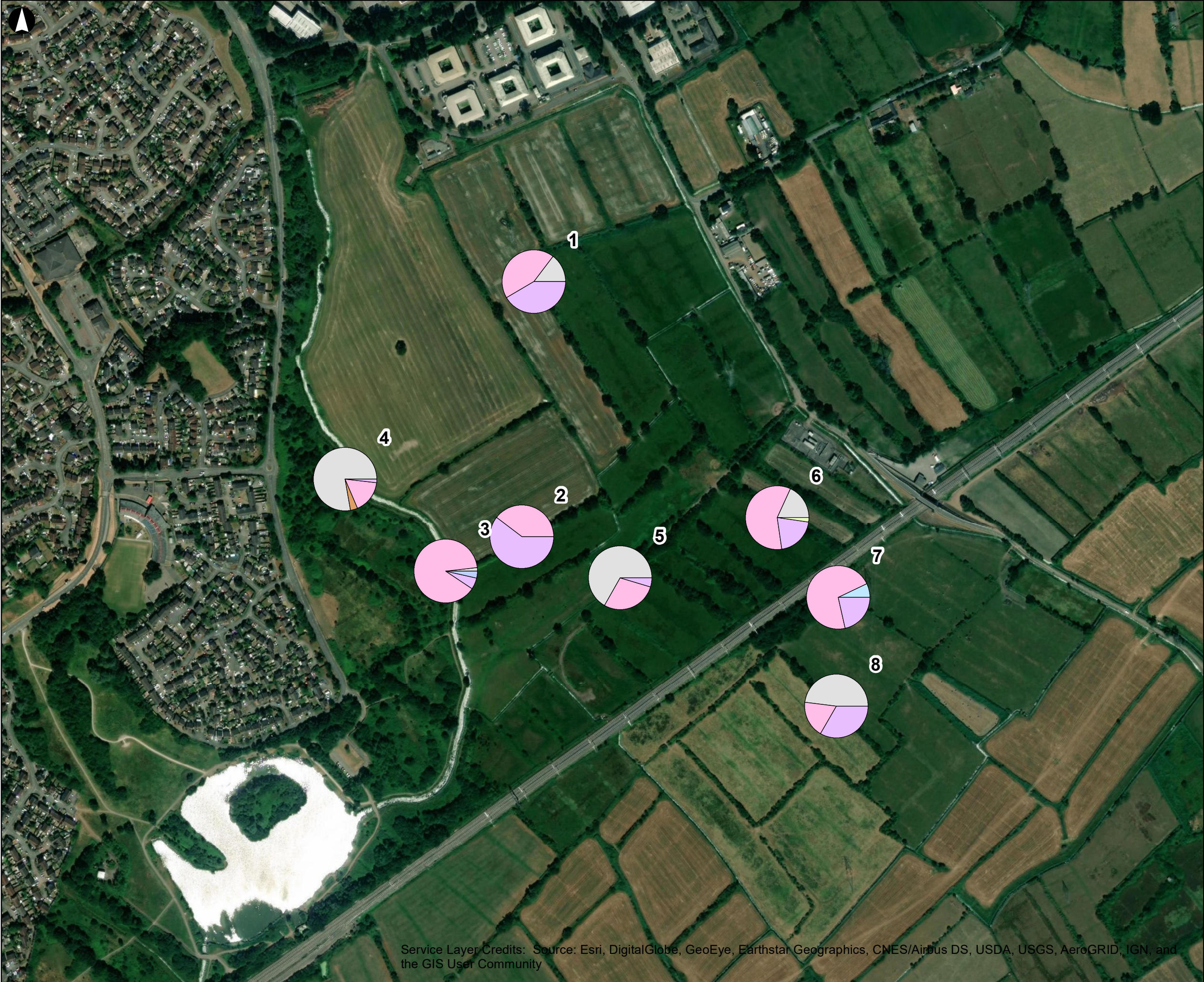
**Static Detector Surveys
Bat Species Proportions
September 2019**

Scale at A3
1:5,000

Job No 252199	Drawing Status For Issue
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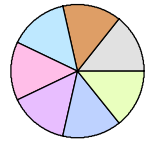
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Legend

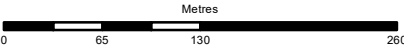
October Species



- MYOTIS
- NYCNOG
- PIP NAT
- PIPPIP
- PIPPYG
- PIPSPE
- PLESPE

F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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**Static Detector Surveys
Bat Species Proportions
October 2019**

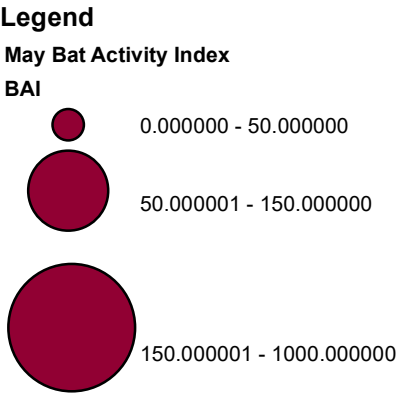
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Job No 252199	Drawing Status For Issue
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Drawing No 020	Issue F1
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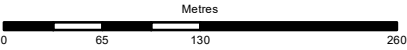


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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Job Title
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Static Detector Surveys
Bat Activity Index
May 2019

Scale at A3
1:5,000

Job No 252199	Drawing Status For Issue
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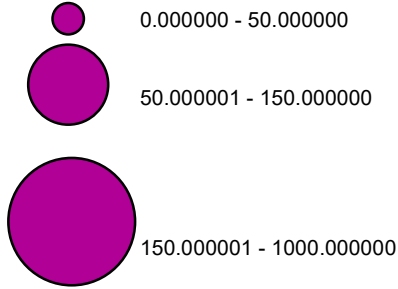
Drawing No 021	Issue F1
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Legend

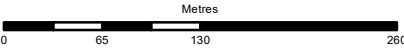
June Bat Activity Index

BAI



F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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Static Detector Surveys
Bat Activity Index
June 2019

Scale at A3
1:5,000

Job No 252199	Drawing Status For Issue
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Drawing No 022	Issue F1
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Legend

July Bat Activity Index

BAI

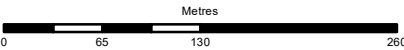
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50.000001 - 150.000000

150.000001 - 1000.000000

F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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Bat Activity Index

July 2019

Scale at A3
1:5,000

Job No 252199	Drawing Status For Issue
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Drawing No 023	Issue F1
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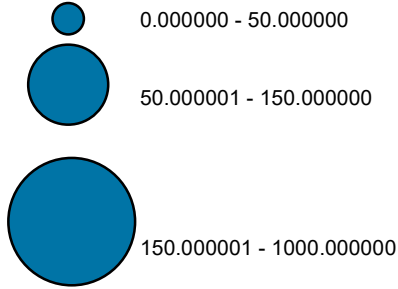


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

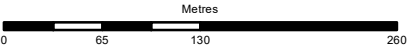
August Bat Activity Index

BAI



F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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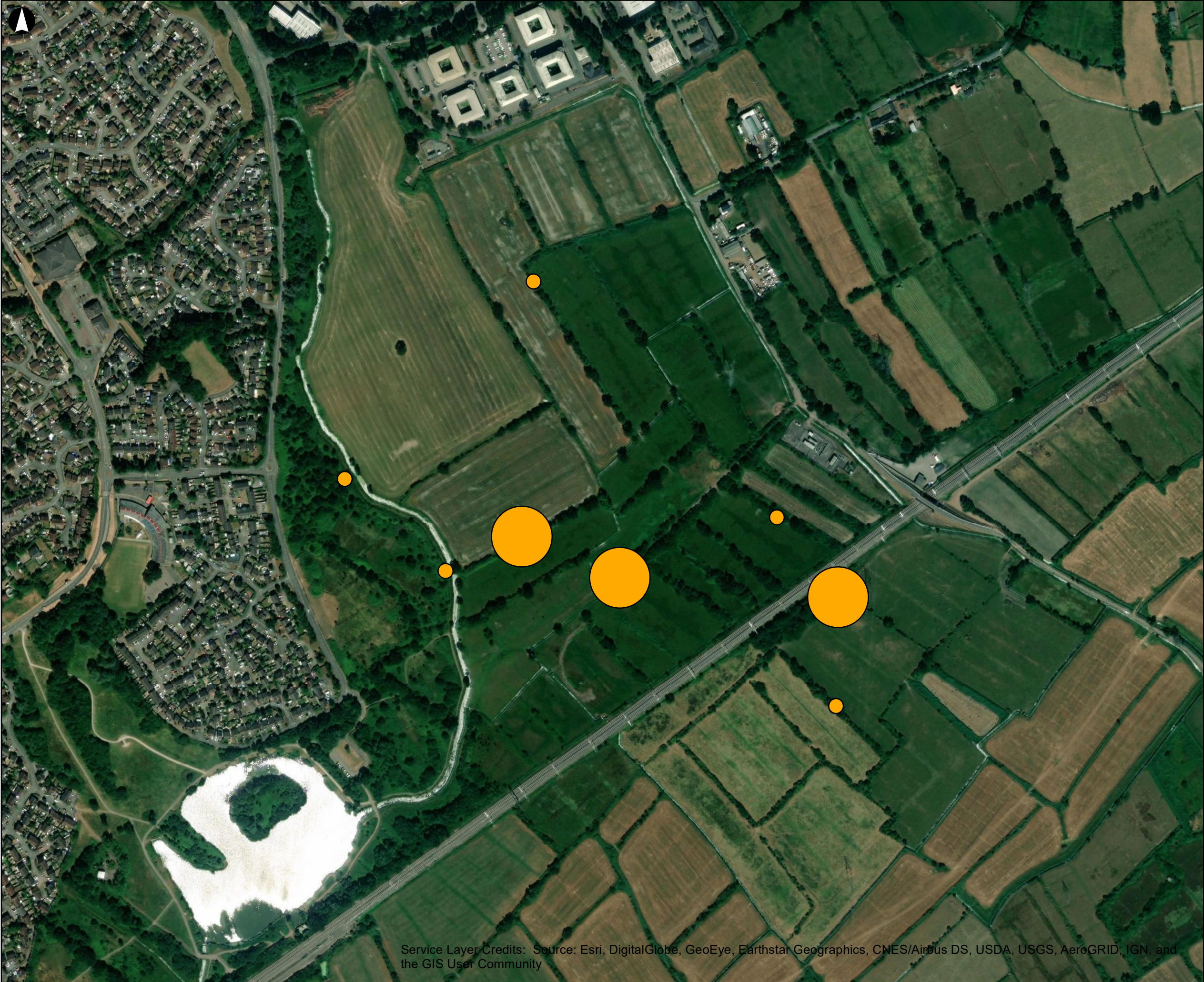
Job Title
Cardiff Hendre Lakes

Static Detector Surveys
Bat Activity Index
August 2019

Scale at A3
1:5,000

Job No 252199	Drawing Status For Issue
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Drawing No 024	Issue F1
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Legend

September Bat Activity Index

BAI

- 0.000000 - 50.000000
- 50.000001 - 150.000000
- 150.000001 - 1000.000000

F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd

Metres

0 65 130 260

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Static Detector Surveys
Bat Activity Index
September 2019

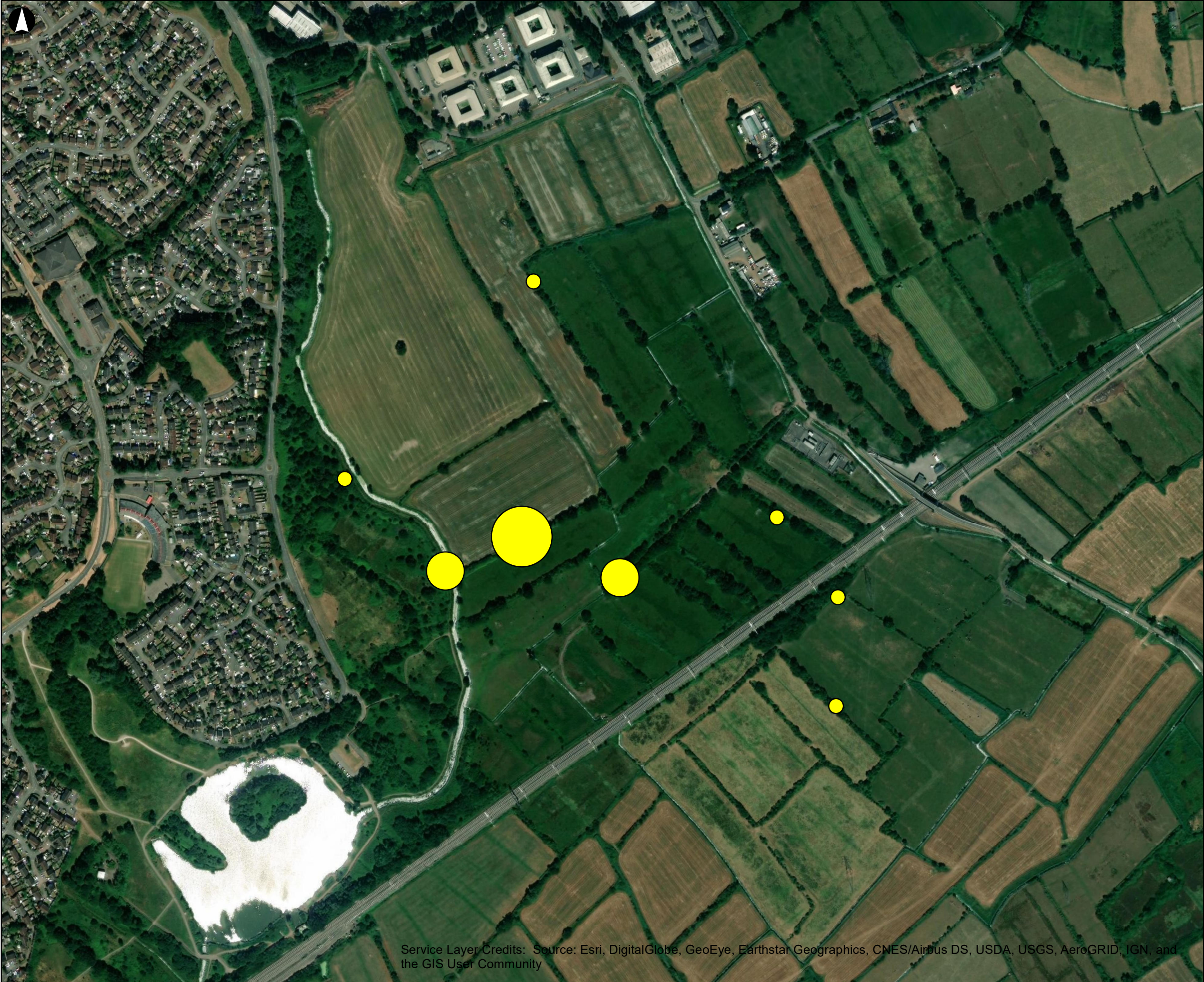
Scale at A3

1:5,000

Job No	Drawing Status
252199	For Issue

Drawing No	Issue
025	F1

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

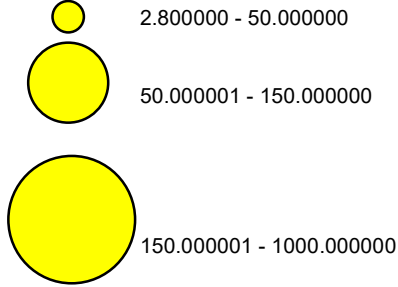


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Legend

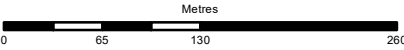
October Bat Activity Index

BAI



F1	2020-03-18	KSJ	PW	PW
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Issue	Date	By	Chkd	Appd
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**Static Detector Surveys
Bat Activity Index
October 2019**

Scale at A3
1:5,000







Job No 252199	Drawing Status For Issue
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Drawing No 026	Issue F1
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Appendix A



Preliminary Roost Assessment Results



A1 Preliminary Roost Assessment Results – Trees











Tree ref.	Species	GLTA date	GLTA category	Climbing?	Emergence?	Visit #1	Date	Results	Updated category	Visit #2	Results	Visit #3	Results	Final category	Final recomm.	Follow up visits?
T52	Oak	31/07/2018	Low	No	No	None required								Low	Inspect before felling under PMW	No
<div></div>																
T41	Oak	31/07/2018	High	Yes	TBC	Climbing inspection	01/08/2018	Hornet nest in branch cavity 7m west. All inspected features are shallow and therefore negligible, except for the first main branch wound where there is a shallow crevice around the heartwood that could potentially harbour the odd small bat (therefore classed as low potential). No signs of bat use.	Low	None required		None required		Low	Inspect before felling under PMW	No
<div></div>																
T42	Oak	31/07/2018	High	Yes	TBC	Climbing inspection	01/08/2018	None of the potential features (various cavities around rott holes etc) noted from the ground are actual cavities. Downgrade to negligible.	Negligible	None required		None required		Negligible	No action required	No



Tree ref.	Species	GLTA date	GLTA category	Climbing?	Emergence?	Visit #1	Date	Results	Updated category	Visit #2	Results	Visit #3	Results	Final category	Final recomm.	Follow up visits?
																
T4	Oak	31/07/2018	Low	Yes	TBC	Climbing inspection	01/08/2018	Callous around dead broken branch 4m W shallow, downgrade.	Negligible	None required				Negligible	No action required	No
																
T5	Oak	31/07/2018	Low	Yes	TBC	Climbing inspection	01/08/2018	Features are all shallow and negligible.	Negligible	None required				Negligible	No action required	No
																

Tree ref.	Species	GLTA date	GLTA category	Climbing?	Emergence?	Visit #1	Date	Results	Updated category	Visit #2	Results	Visit #3	Results	Final category	Final recomm.	Follow up visits?
T21	Oak	31/07/2018	High	Yes	TBC	Climbing inspection	01/08/2018	Feature 1: large cavity on codominant trunk, 4mSW. Bottom smooth indicating something has/had been using it, and containing white down feathers consistent with that of barn owl. The apex above is dusty with brown rot evidence. Feature 2: branch cavity 6m SW, likely used by squirrel due to clean sides and mammal hair found within. Owl pellet found at the entrance. Cavity is clean, goes up 15cm and is connected a second cavity on the same branch: Feature 3: branch cavity approx 80cm above Feature 2, which cannot be seen from the ground, extending approx 1m horizontally. Some bird feathers found inside. This could not be inspected fully with confidence, so recommend follow up inspection and emergence survey. 2x woodpecker hole at 8m W, both full of brown rot and debris. Not connected to each other. No great deal of potential now but feature will get more suitable with time.	High	29/08/2018	Same as 01/08/2018. Feature 3 is the most suitable for bats and requires an emergence survey.	Outstanding	Outstanding	Outstanding	Outstanding	Yes x1
<div></div>																
T19	Oak	31/07/2018	Moderate	Yes	TBC	Climbing inspection	29/08/2018	All the features inspected are shallow. Downgrade to negligible.	Negligible	None required				Negligible	No action required	No
<div></div>																

Tree ref.	Species	GLTA date	GLTA category	Climbing?	Emergence?	Visit #1	Date	Results	Updated category	Visit #2	Results	Visit #3	Results	Final category	Final recomm.	Follow up visits?
T31	Oak	31/07/2018	Moderate	Yes	TBC	Climbing inspection	29/08/2018	Large north-facing tear out only seen from approaching from the east side. 3-4m in length. Shallow edges but dry so status remains Moderate and requires another visit.	Moderate	Requires one more visit.	Outstanding	None required	N/A	Outstanding	TBC following emergence survey	Yes x1
																
T7	Oak	31/07/2018	Moderate	Yes	TBC	Climbing inspection	01/08/2018	Features are all shallow and negligible.	Negligible	None required		None required		Negligible	No action required	No
																
T132	Crack willow	31/07/2018	Moderate	Yes	TBC	Endoscopic inspection	31/07/2018	Rotten buttress and stress cracks 0-1.5m. Dry within and some potential for individual bats but limited by fungal disease. Some hibernation potential. Recommend another endoscope inspection.	Moderate	Requires one more visit.	Outstanding	None required	N/A	Outstanding	Outstanding	

Tree ref.	Species	GLTA date	GLTA category	Climbing?	Emergence?	Visit #1	Date	Results	Updated category	Visit #2	Results	Visit #3	Results	Final category	Final recomm.	Follow up visits?
																
G67	Willow	31/07/2018	Low	Yes	TBC	Endoscopic inspection	31/07/2018	Collapsed willow within wet woodland area south of railway line, adjacent to T119. Area generally wet and most features (limb cavities) are shallow and likely exposed to rain/humidity throughout the year.	Low	None required		None required		Low	Inspect before felling under PMW	No
																
T97	Oak		Moderate	Yes	TBC	Endoscopic inspection	31/07/2018	large vertical central wound, likely from lighting strike, facing east. Several cavities behind the dead heartwood, 0-5m. No signs of bat use. Potential union 6mNE noted.	Moderate	Requires at least one climbing survey.	Outstanding	None required	N/A	Outstanding	Outstanding	Yes x1

Tree ref.	Species	GLTA date	GLTA category	Climbing?	Emergence?	Visit #1	Date	Results	Updated category	Visit #2	Results	Visit #3	Results	Final category	Final recomm.	Follow up visits?
																
T16	Oak	31/07/2018	High	Yes	TBC	Outstanding		TBC	TBC	TBC		TBC	TBC	Outstanding	Outstanding	Yes x1
																
T39	Oak	29/08/2018	Low	Yes	TBC	Endoscopic inspection	29/08/2018		Low	None required		None required		Low	Inspect before felling under PMW	No
																

Tree ref.	Species	GLTA date	GLTA category	Climbing?	Emergence?	Visit #1	Date	Results	Updated category	Visit #2	Results	Visit #3	Results	Final category	Final recomm.	Follow up visits?
T113	Oak	29/08/2018	Moderate	Yes	TBC	Climbing inspection	29/08/2018	Features are all shallow and negligible.	Negligible	None required		None required		Negligible	No action required	No
																
T114	Oak	29/08/2018	High	Yes	TBC	Climbing inspection	29/08/2018	Barn owl roost at top of the lightning strike upper cavity which goes up 30cm. North facing. Large pellets seen below. Hollow shows signs of decay/ brown rot.WPH at 6m N. Doesn't extend up. Evidence of use by birds (nest at bottom). Goes 30/40cm down. Nice and dry and smooth. Keep potential as high. Good for noctules. WPH at 4m facing north on branch above reen. Clear drop zone. Cavity extends downwards by 25cm. Bird's nest at the base. Doesn't extend upwards and there is a small nodule/ hole nodule/ hole above which opens down into the cavity of moderate potential.	High	Requires another 2 visits.	Outstanding	Outstanding	Outstanding	Outstanding	Outstanding	Yes x2
																

A2 Preliminary Roost Assessment Results - Buildings

Reference Number:	B1-3
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Date:	13/08/2018
-------	------------

GPS:	51.5268, -3.0846
------	------------------

Type:	Building
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Signs of Bat Use:	None;
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Potential:	Negligible
------------	------------

Comments:	
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Three metal flat roof gas pumping station buildings. Approximately 3m high. Roofs sealed. Vents are only access points. Building descriptions not applicable.

Building Type	
Building Age	New
Height of Eaves (m)	
Pitch Height at Gable End	
Roof Aspect	
Roof Complexity	
Roof Covering	
Suitable Bat Features	

Photo 1



Photo 2



Photo 3



Photo 4



Appendix B

Walked Activity Transects Results

B1 Transect 1

Table B1: Results of transect 1 (surveyor notes)

Date	General observations
24/05/2017	Regular bat passes throughout survey. Most activity observed was associated with Hendre Lake (particularly the southern side) and Faendre Reen. Predominant species were noctule (foraging and commuting at 20-30m over the Site) and common pipistrelle. Other species encountered comprised Daubenton's bat, soprano pipistrelle and serotine (again, mostly foraging near the lake).
24/06/2017	Regular common and soprano pipistrelle passes, particularly around Hendre Lake, along with Nathusius' pipistrelle, noctule and Daubenton's bat.
27/07/2017	Very low bat activity throughout survey. Only common pipistrelle and soprano pipistrelle observed, foraging in mixed groups of 3+.
31/08/2017	Very low bat activity throughout survey – most activity near Hendre Park Lake. Common pipistrelle foraging in groups of 5+. Other species encountered comprised Daubenton's bat, noctule and soprano pipistrelle.
26/09/2017	Regular bat passes throughout survey, predominantly common pipistrelle (mostly observed in ones and twos commuting along hedgerows). Other species encountered comprised long-eared bat, <i>Myotis</i> sp, noctule and soprano pipistrelle.
31/10/2017	Very low bat activity throughout survey – all activity in the northern part of the transect route. Species encountered – common and soprano pipistrelle.

B2 Transect 2

Table B2: Results of transect 2 (surveyor notes)

Date	General observations
24/05/2017	Infrequent, but regular bat passes throughout the survey, predominantly common pipistrelle and noctule (foraging and commuting at 20-30m over the Site, north to south). Some soprano pipistrelle passes were also observed.
24/06/2017	Regular passes by common pipistrelle with occasional noctule heard and seen.
27/07/2017	Low amount of bat passes, predominantly common pipistrelle. Other species encountered comprised soprano pipistrelle and noctule.
31/08/2017	Low amount of bat passes, predominantly common pipistrelle. Noctule was also encountered.
26/09/2017	Regular bat passes throughout survey, predominantly common pipistrelle (single bats commuting along boundaries and foraging over boundary and field habitats). Other species encountered comprised long-eared bat, <i>Myotis</i> sp, noctule and soprano pipistrelle.
31/10/2017	Very low bat activity throughout survey. Species encountered – common pipistrelle.

B3 Transect 3

Table B3: Results of transect 3 (surveyor notes)

Date	General Observations
24/05/2017	Infrequent, but regular bat passes throughout the survey, predominantly groups of common pipistrelle (max seen close together x4) and noctule (max seen close together 4+) - foraging and commuting (N-S) at 20-30m over the Site. Some soprano pipistrelle passes were also observed.
24/06/2017	No survey possible (cattle in fields)
27/07/2017	No survey possible (cattle in fields)
31/08/2017	No survey possible (cattle in fields)
26/09/2017	No survey possible (cattle in fields)
31/10/2017	No survey possible (cattle in fields)

B4 Transect 4

Table B4: Results of transect 9 (surveyor notes)

Date	General observations
24/05/2017	Low amount of bat passes, predominantly common pipistrelle. Other species encountered comprised soprano pipistrelle, noctule, heard not seen, and a possible long-eared bat. There were also other bat encounters (unidentified pipistrelle). Pipistrelle species bats were observed commuting along boundaries and foraging over boundary and field habitats at an approximate height of c.2m.
24/06/2017	No survey possible (cattle in fields)
27/07/2017	No survey possible (cattle in fields)
31/08/2017	No survey possible (cattle in fields)
26/09/2017	No survey possible (cattle in fields)
31/10/2017	No survey possible (cattle in fields)

Appendix C

Wildwood Ecology Ltd
Protected Species Survey
Baseline Report (Bats)

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CF83 3GG

029 2002 2320

info@wildwoodecology.com
www.wildwoodecology.com

PROTECTED SPECIES SURVEY BASELINE REPORT (BATS)

CARDIFF PARKWAY, ST MELLONS, CARDIFF

OVE ARUP & PARTNERS LTD

DOCUMENT REF: WWE17063 PSS REV A | JANUARY 2018

Client:	Ove Arup & Partners Ltd
Site/Job:	Cardiff Parkway, St Mellons, Cardiff
Report title:	Protected Species Survey Baseline Report (Bats)
Report reference:	WWE17063 PSS Rev A

Grid Reference:	ST 24957 80953
Survey date(s):	24/05/2017 24/06/2017 27/07/2017 31/08/2017 26/09/2017 31/10/2017
Surveyed by:	Dr Matt Davies, Dr Alex Pollard, Charlotte Poole, Matt Attrill, Peter Hacker, Sam Hillman, Emma Douglas, Jodie Webb, Heather Nixon.
Architect/Agent:	-
Planning reference:	-

VERSIONING AND QUALITY ASSURANCE

Rev	Status	Date	Author(s)	Reviewed by	Approved by
A	Draft	24/01/2018	A Pollard MCIEEM Senior Ecologist	R Dodd CEcol MCIEEM	

DISCLAIMER

This document has been prepared by Wildwood Ecology Limited for Ove Arup & Partners Ltd solely as a Protected Species Survey Baseline Report (Bats). Wildwood Ecology Limited accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

The evidence which we have prepared and provided is true, and has been prepared and provided in accordance with the guidance of The Chartered Institute of Ecology and Environmental Management's Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

SUMMARY

Purpose	<ul style="list-style-type: none"> Wildwood Ecology was commissioned to undertake a series of bat transect surveys on an area of land to the east of St Mellons in Cardiff. The surveys were required to inform the construction of a new railway station ('Cardiff Parkway') and of expansion of the existing St Mellons Business Park.
Methodology	<ul style="list-style-type: none"> Monthly bat transect surveys were undertaken from May to October 2017. As a baseline report only was commissioned, a desk study was not undertaken in this instance.
Key issues	<ul style="list-style-type: none"> The survey confirmed the presence of at least seven species of bats using the area for commuting and foraging. In the absence of mitigation, the proposed development will have a negative effect on bat species.
Recommendations	<ul style="list-style-type: none"> A mitigation strategy should be devised. This should aim to avoid or minimise the impacts on bat species as a result of the development.
Conclusions	<ul style="list-style-type: none"> The ecological impacts of the potential development in terms of bat species are likely to be avoided / mitigated for / compensated for, provided that the recommendations set out in this report are followed. This ecological report will remain valid for a period of 2 years from the date of the last survey – i.e. until October 2019.

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Table 3 - Results of the transect surveys (surveyor notes).	5

1 INTRODUCTION

- 1.1 In May 2017, Wildwood Ecology was commissioned by Ove Arup & Partners Ltd to undertake a series of bat transect surveys (x4 routes) on a large area of land to the east of St Mellons in Cardiff (the site). The survey was required to inform the construction of a new railway station ('Cardiff Parkway') and of expansion of the existing St Mellons Business Park (the proposed development).
- 1.2 This document represents a baseline report of the findings of the survey.

Site description

- 1.3 The aerial image of the overall site shows the habitat to consist predominantly of agricultural fields separated by hedgerows and scrub. Some of the fields are also bounded by reens, with the largest example (Faendre Reen) running along the western boundary of the site and eventually draining into Hendre Park Lake in the south western corner of the site.
- 1.4 To the west of the site are the residential houses and gardens of St Mellons, to the south and east there are more extensive areas of agricultural fields with hedgerows and to the north there is a small industrial estate with St Mellons Golf Club beyond this. Separating off the southern section of the site is the Newport to Cardiff rail link.



Figure 1 – Aerial image of the location of the site (orange line boundary). Image used under licence (© 2015 Google, imagery date 16/08/2016).

Purpose of this report

- 1.5 This report confirms the findings of the bat transect surveys, which was undertaken by teams of experienced ecologists once every month between May and October 2017. The report outlines any

ecological constraints or opportunities, includes mitigation/compensation measures where necessary, and sets out the need for any further surveys if required.

2 METHODOLOGY

Desk study

2.1 As a baseline report only was commissioned, a desk study was not undertaken in this instance.

Field survey

2.2 A total of four transect routes were determined to cover the whole of the site area (see Appendix I). The chosen routes were influenced by ease of accessibility and navigation. All routes were walked in daylight to identify hedge and reën crossing points and to identify any hazards present. Each transect surveys was undertaken by a pair of surveyors (at least one of the pair had walked the route in daylight). Pairs walking different routes were in communication using mobile phones.

2.3 The pairs of surveyors walked their respective routes at a constant speed to ensure the sampling area was the same per unit time.

2.4 Within each pair, one surveyor recorded each bat echolocation call using an Elekon Batlogger M (which enabled them to be linked to a specific location (GPS) and time, whilst the other surveyor acted as scribe. The scribe noted down any relevant observations, for example, numbers of bats, flight direction, flight height and behaviour (commuting or foraging). Both surveyors also identified bat species by ear during the transect surveys.

2.5 Each month, the transect routes were walked in a different direction.

2.6 All surveys were carried out at dusk, commencing at sunset and ending two hours after sunset.

Surveyor information

2.7 The surveys were led either by Dr Matt Davies MCIEEM or Dr Alex Pollard MCIEEM with a number of assistants (see Table 1 for further information).

Table 1 - Surveyor information.

Surveyor	Licences	Ecological experience
Matt Davies (MD) Ph.D., B.Sc. (Hons), MCIEEM Senior Ecologist	Bat Dormouse	Holds a Ph.D. (Chemical communication in the European otter). Knowledge of otter and mustelid ecology in general. Experienced in undertaking bat surveys and is a licensed bat ecologist in Wales. Experienced in undertaking common dormouse surveys and is a licenced dormouse ecologist in England and Wales.
Alex Pollard (AP) Ph.D., B.Sc. (Hons.), MCIEEM Senior Ecologist	Bat Dormouse	Holds a Ph.D (Visual constraints in bird behaviour). Experienced in undertaking ornithological surveys, and bat surveys. Is a licensed bat ecologist in England and Wales. Supervisor and advisor to undergraduate and postgraduate ecological research projects.
Matt Attrill (MA) B.Sc. (Hons), Grad CIEEM Assistant Ecologist	GCN	Holds a 2:1 Honours degree in Biology. Worked as a sub-contractor for various ecological consultancies as a surveyor for great crested newt, bats, reptiles, water vole and moths. Has also worked in the contractor side of consultancy installing wildlife fencing, creating habitats and other mitigation works.
Charlotte Poole (CP) M.Sc., B.Sc. (Hons) Seasonal Ecologist	-	Holds a 2:1 Honours degree in Biology and a Masters (Conservation and Geographical Information Systems). Experience of working with ecological consultancies and local authorities as a surveyor of bats and newts.
Peter Hacker (PH) M.Sc. (Hons.), B.Sc. (Hons) Seasonal Ecologist	-	Holds a 2:1 Honours degree in Ecological Consultancy. Has field experience gained through both academic and professional training. Experience of surveying a range of protected species including reptiles, bats, great crested newt, and common dormice.

Surveyor	Licences	Ecological experience
Survey assistants Emma Douglas Sam Hillman Heather Nixon Jody Webb	-	All survey assistants received training in use of bat detectors and survey methodologies. Deemed competent and confident to use bat detectors to observe bats in flight and conduct an emergence/re-entry survey in conjunction with a licenced ecologist. Assistants backed up by experienced surveyors and/or recording detectors where possible.

Limitations and assumptions

- 2.8 During some of the site visits, certain fields were inaccessible due to the presence of cattle. Routes 1 and 2 were accessible during each of the six months, however, routes 3 and 4 were only accessible during the surveys undertaken in May 2017.

3 RESULTS

Field survey

3.1 Timings and weather conditions for all transect survey visits can be seen in Table 2.

Table 2 - Timings and weather conditions for all transect surveys.

Date	Survey duration	Sunset	Conditions (Temp [°C], Cloud cover [Oktas], Wind speed [Beaufort], Rain)
24/05/2017	2 hours	21:11	Start – 17, 1/8, F1, nil Finish – 17, 0/8, F1, nil
27/06/2017	2 hours	21:34	Start – 22, 8/8, F0, nil Finish – 18, 8/8, F0, nil
27/07/2017	2 hours	21:08	Start – 16, 1/8, F3/4, nil Finish – 15, 2/8, F3, nil
31/08/2017	2 hours	20:01	Start – 15, 5/8, F2, nil Finish – 12, 4/8, F2, nil
26/09/2017	2 hours	19:01	Start – 18, 8/8, F1/2, nil Finish – 16, 7/8, F3, nil
31/10/2017	2 hours	16:47	Start – 13, 8/8, F2/3, nil Finish – 12, 7/8, F1/2, nil

3.2 The results of the transect surveys (surveyor notes) are summarised in Table 3.

3.3 Appendix II and III visualise the data recorded in relation to sunset; and according to species.

Table 3 - Results of the transect surveys (surveyor notes).

Survey dates	Route number (colour)	General observations
24/05/2017	1 (yellow)	Regular bat passes throughout survey. Most activity observed was associated with Hendre Park Lake (particularly the southern side) and Faendre Reen. Predominant species were noctule (foraging and commuting at 20-30m over the site) and common pipistrelle. Other species encountered comprised Daubenton's bat, soprano pipistrelle and serotine (again, mostly foraging near the lake).
	2 (green)	Infrequent, but regular bat passes throughout the survey, predominantly common pipistrelle and noctule (foraging and commuting at 20-30m over the site, north to south). Some soprano pipistrelle passes were also observed.
	3 (purple)	Infrequent, but regular bat passes throughout the survey, predominantly groups of common pipistrelle (max seen close together x4) and noctule (max seen close together 4+) - foraging and commuting (N-S) at 20-30m over the site. Some soprano pipistrelle passes were also observed.
	4 (red)	Low amount of bat passes, predominantly common pipistrelle. Other species encountered comprised soprano pipistrelle, noctule, heard not seen, and a possible long-eared bat. There were also other bat encounters (unidentified pipistrelle). Pipistrelle species bats were observed commuting along boundaries and foraging over boundary and field habitats at an approximate height of c.2m.

Table 3 – (cont)

Survey dates	Route number (colour)	General observations
24/06/2017	1 (yellow)	Regular common and soprano pipistrelle passes, particularly around Hendre Lake, along with Nathusius' pipistrelle, noctule and Daubenton's bat.
	2 (green)	Regular passes by common pipistrelle with occasional noctule heard and seen.
	3 (purple)	No survey possible (cattle in fields)
	4 (red)	
27/07/2017	1 (yellow)	Very low bat activity throughout survey. Only common pipistrelle and soprano pipistrelle observed, foraging in mixed groups of 3+.
	2 (green)	Low amount of bat passes, predominantly common pipistrelle. Other species encountered comprised soprano pipistrelle and noctule.
	3 (purple)	No survey possible (cattle in fields)
	4 (red)	
31/08/2017	1 (yellow)	Very low bat activity throughout survey – most activity near Hendre Park Lake. Common pipistrelle foraging in groups of 5+. Other species encountered comprised Daubenton's bat, noctule and soprano pipistrelle.
	2 (green)	Low amount of bat passes, predominantly common pipistrelle. Noctule was also encountered.
	3 (purple)	No survey possible (cattle in fields)
	4 (red)	
26/09/2017	1 (yellow)	Regular bat passes throughout survey, predominantly common pipistrelle (mostly observed in ones and twos commuting along hedgerows). Other species encountered comprised long-eared bat, <i>Myotis</i> sp, noctule and soprano pipistrelle.
	2 (green)	Regular bat passes throughout survey, predominantly common pipistrelle (single bats commuting along boundaries and foraging over boundary and field habitats). Other species encountered comprised long-eared bat, <i>Myotis</i> sp, noctule and soprano pipistrelle.
	3 (purple)	No survey possible (cattle in fields)
	4 (red)	
31/10/2017	1 (yellow)	Very low bat activity throughout survey – all activity in the northern part of the transect route. Species encountered – common and soprano pipistrelle.
	2 (green)	Very low bat activity throughout survey. Species encountered – common pipistrelle.
	3 (purple)	No survey possible (cattle in fields)
	4 (red)	

4 INTERPRETATION AND ASSESSMENT

- 4.1 The surveys have confirmed the presence of at least seven species of bat using the site to commute and forage: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, noctule, serotine, Daubenton's bat, brown long-eared and unspecified *Myotis* species.
- 4.2 The surveys undertaken were not designed to find bat roosts and no confirmed roosts were identified.
- 4.3 Bats were using both boundary vegetation and open spaces (both water and open field) to forage and commute.
- 4.4 The more light tolerant species were detected along the artificially lit roads, and those less so, associated with darker green corridors, fields and scrub/hedge boundaries.

Noctule

- 4.5 There were a total of 190 confirmed noctule passes throughout the surveys, with calls recorded from across the site.
- 4.6 A number of passes (37) were recorded before sunset indicating that it is likely that roosts for this species are present within the local area.
- 4.7 Whilst surveyors observed several noctule bats flying near to Hendre lake and over fields at a relatively low height (<10m), other calls may have been recorded from animals echo-locating from further away.

Common pipistrelle

- 4.8 The most prolific of bats recorded with 1194 passes detected. Of these, 17 were recorded prior to sunset and so it is likely that there are roosts for this species in the vicinity of the site, particularly to the north of transect 1.
- 4.9 Common pipistrelle remained active throughout the surveys indicating that there is a good foraging resource across the site, throughout the year.

Soprano pipistrelle

- 4.10 This species recorded 183 passes across the surveys undertaken, and was present across the site and throughout the year.
- 4.11 There were no passes for soprano pipistrelle before sunset and all passes were recorded after almost 14 minutes after sunset, until the end of the survey.

Nathusius' pipistrelle

- 4.12 A relatively high number of passes (43) for this species was detected across the site, with bats observed foraging over Hendre Lake.
- 4.13 This bat often is found in habitats with wetland mosaic and it is unsurprising to find it present within this area of Cardiff.
- 4.14 The passes were recorded most often in May and June, with fewer passes recorded in July, August and September, and none in October. This indicates that there may be a smaller resident population with the May activity potentially due to migratory (local and longer distance) movements.

Serotine

- 4.15 Four serotine passes were recorded adjacent to Hendre Lake, in May only, with the bat observed foraging just over an hour into the survey.
- 4.16 No other recordings of this species were made during the surveys.

Daubenton's bat

- 4.17 This species was recorded making ten passes, in May, June, July and August, and was associated with Hendre Lake and the reens.
- 4.18 This bat is likely to be under-recorded due to its low flight behaviour when foraging over water and several of the unspecified *Myotis* calls may be attributed to this species.
- 4.19 Most of the activity for this species was between 28 minutes after sunset and the end of the survey, with a single early pass at 17 minutes before sunset at the north of the site, indicating that there is likely to be a roost present in the vicinity.

Myotis sp

- 4.20 Twenty-eight passes were attributed to unspecified *Myotis* species as the calls were not of a high enough quality to be fully identified, and the variation present within the calls of these species means that identification to species level is unlikely to be 100% accurate.
- 4.21 *Myotis* species were recorded in all months except October.
- 4.22 The calls were recorded at locations across the site, with an accumulation towards the centre within a scrub woodland section of habitat, and a darker part of the site.

Brown long-eared bat

- 4.23 A single pass of this species was recorded on Cypress Drive near to the end of a survey (at 1hr 54 mins after sunset). The direction of flight and behaviour was not observed, however the location where this pass was recorded was adjacent to an area of scrub, where it is likely that the bat was flying (given the presence of street lighting on the road at this point).
- 4.24 The lack of other calls from long-eared bats may be reflective of the lack of roosting locations suitable nearby, and bats of this species which use the area to forage may arrive later.

5 CONCLUSIONS AND RECOMMENDATIONS

- 5.1 Wildwood Ecology was commissioned to undertake a series of bat transect surveys on a large area of land to the east of St Mellons in Cardiff, required to inform the construction of a new railway station ('Cardiff Parkway') and of expansion of the existing St Mellons Business Park.
- 5.2 At least seven bat species (omitting unspecified *Myotis* species) were recorded during the surveys.
- 5.3 The surveys were not designed to locate roosts, only to determine bat activity across the site.
- 5.4 In the absence of mitigation, the proposed development (dependent on its scope) may have a negative effect on bat species due to loss of roosts (if present), loss of foraging grounds and habitat fragmentation through loss of vegetation and lighting.
- 5.5 A full mitigation strategy will be required in order to prevent impacts on the local bat populations. This will incorporate the following elements.
- 5.6 A lighting plan is recommended to be in place to minimise the habitat fragmentation that may occur as a result of additional lighting.
- 5.7 Retained or compensatory dark corridors of protected mixed habitat (i.e. open space, lake, reed and scrub) across the site in both north-south and east-west directions will allow the bats known to use the site to continue to do so.
- 5.8 Enhancement measures will depend on the scope and location of the proposals. Additional planting schemes to incorporate native species of nectar rich varieties, and those which are likely to provide a foraging resource later and earlier into the year e.g. ivy, blackthorn.

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- Dietz, C., von Helverson, O. & Nill, D. (2009) Bats of Britain, Europe and Northwest Africa. A & C Black, London.
- Mitchell-Jones, A.J. & McLeish, A.P. Ed., (2004) 3rd Edition Bat Workers' Manual. Joint Nature Conservation Committee, Peterborough.
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APPENDIX I: TRANSECT ROUTES



Figure 2 - Transect route 1. Image used under licence (© 2018 Google, imagery date 16/08/2016).



Figure 3 - Transect route 2. Image used under licence (© 2018 Google, imagery date 16/08/2016).

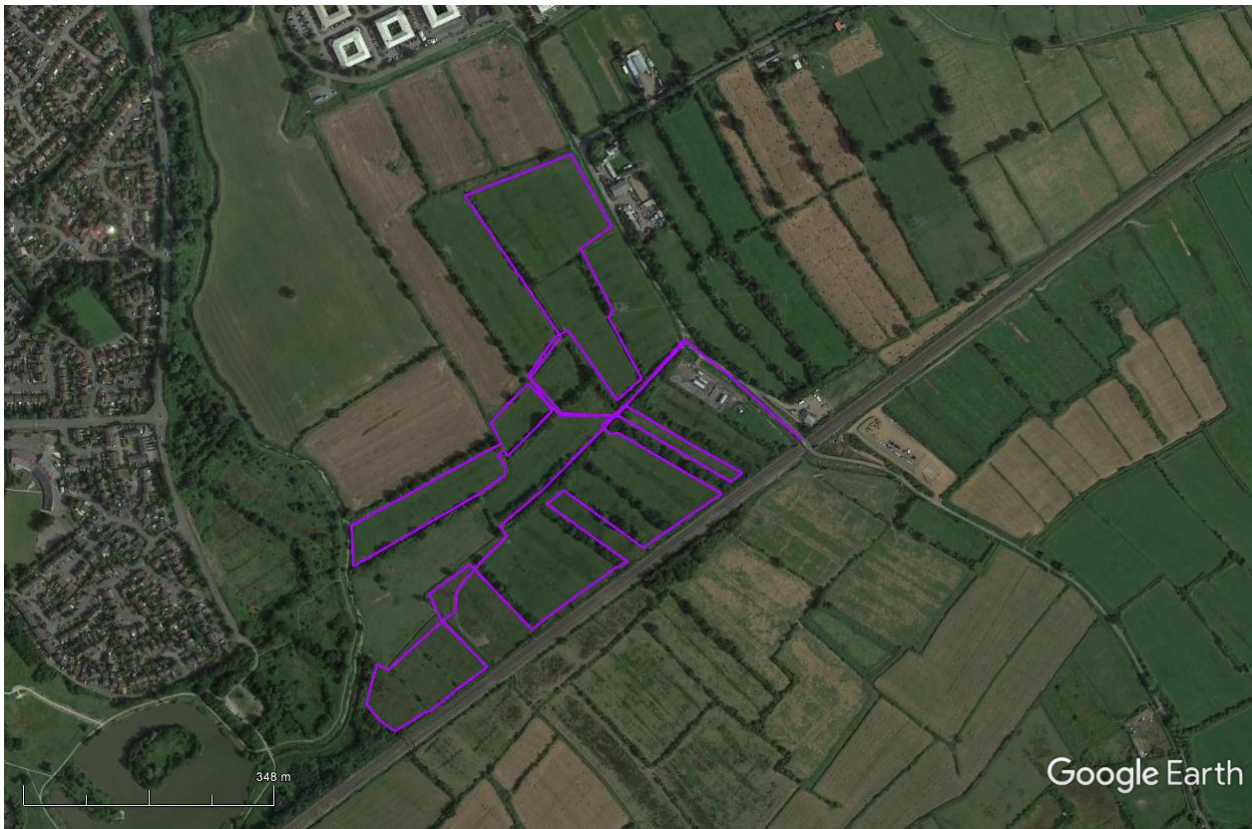
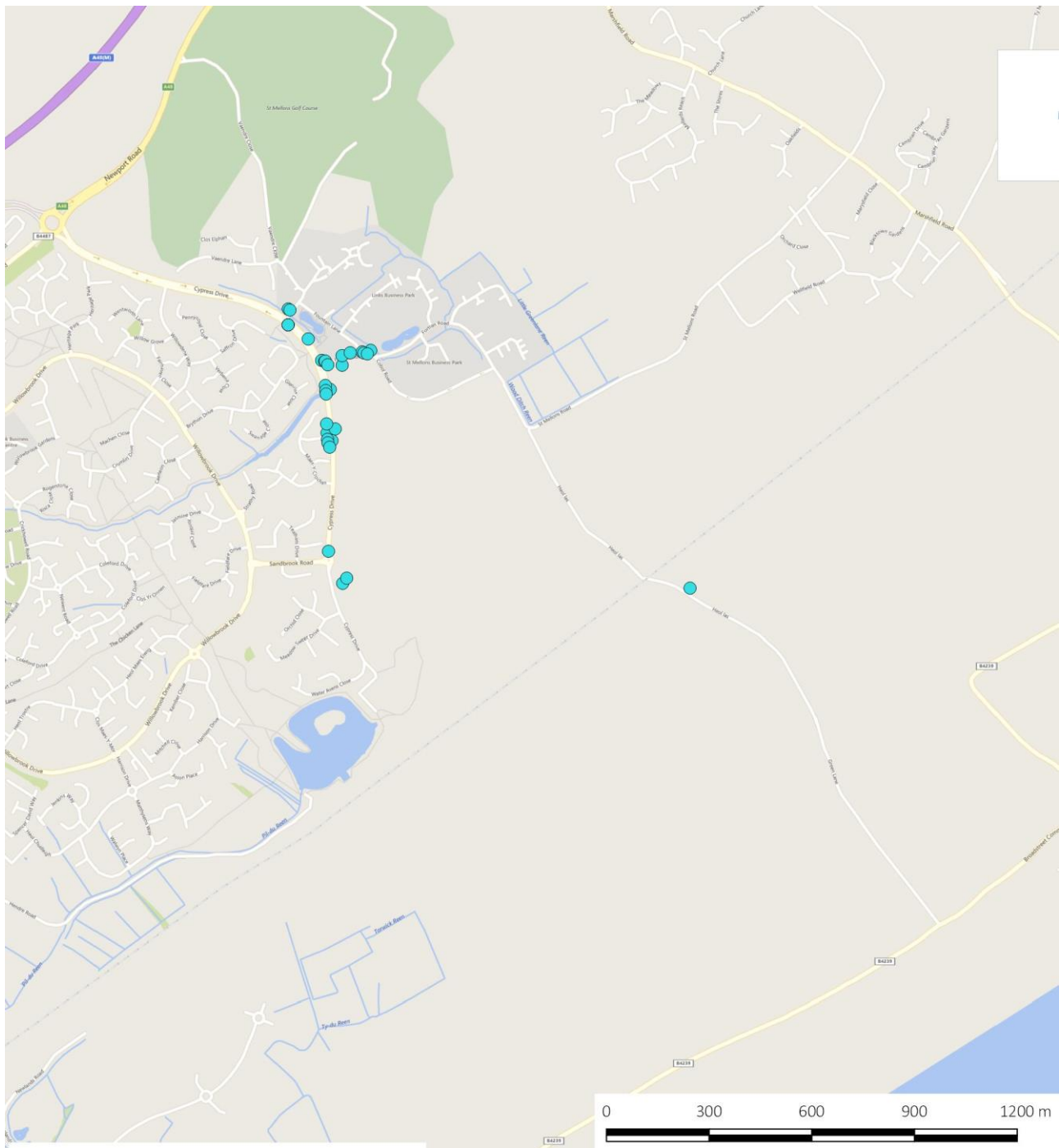


Figure 4 – Transect route 3. Image used under licence (© 2018 Google, imagery date 16/08/2016).



Figure 5 - Transect route 4. Image used under licence (© 2018 Google, imagery date 16/08/2016).

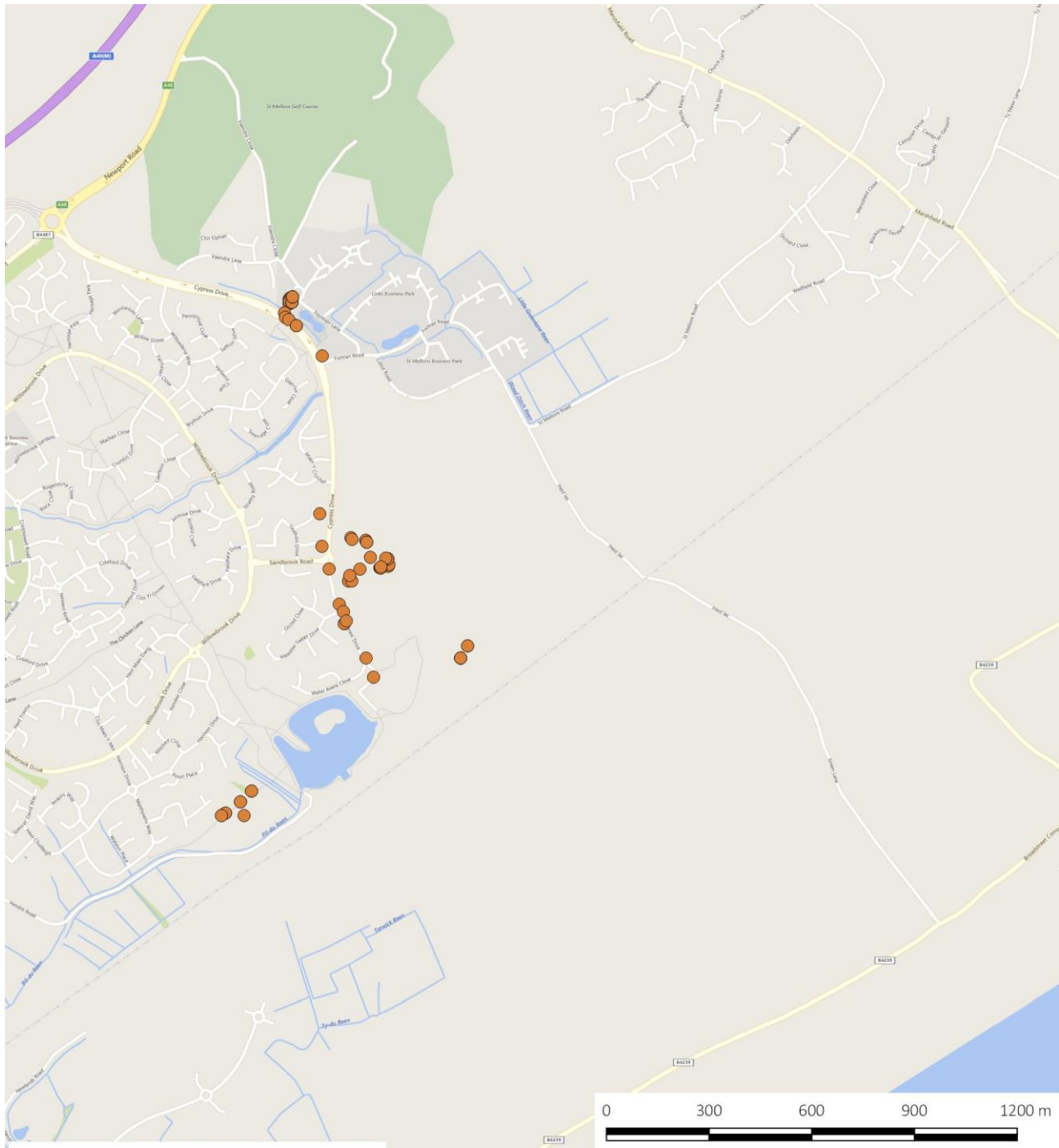
APPENDIX II: LOCATIONS OF ACTIVITY



Key

- bat observed within ten minutes (+/-) of sunset

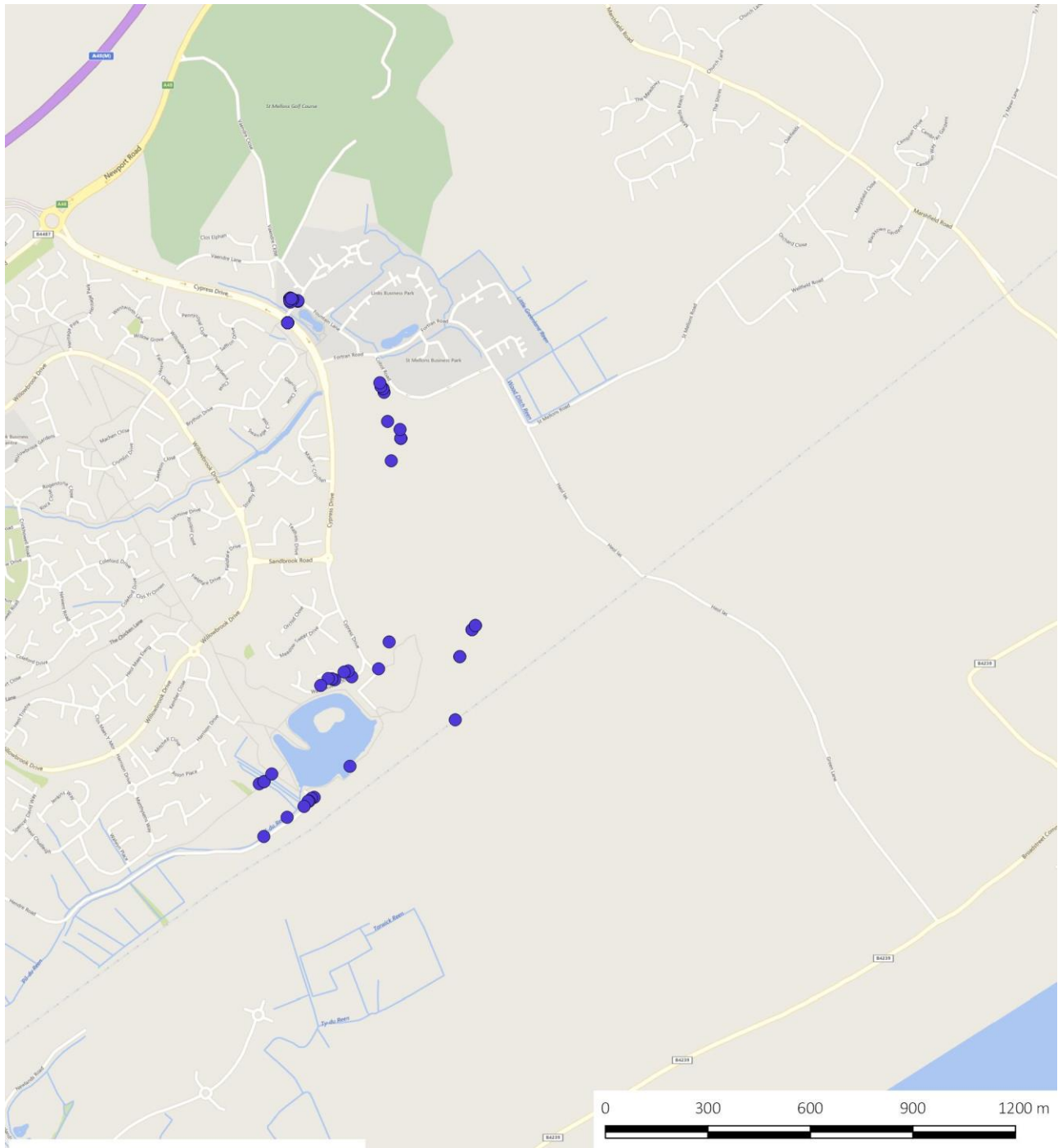
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Key

- bat observed within 20 minutes of sunset

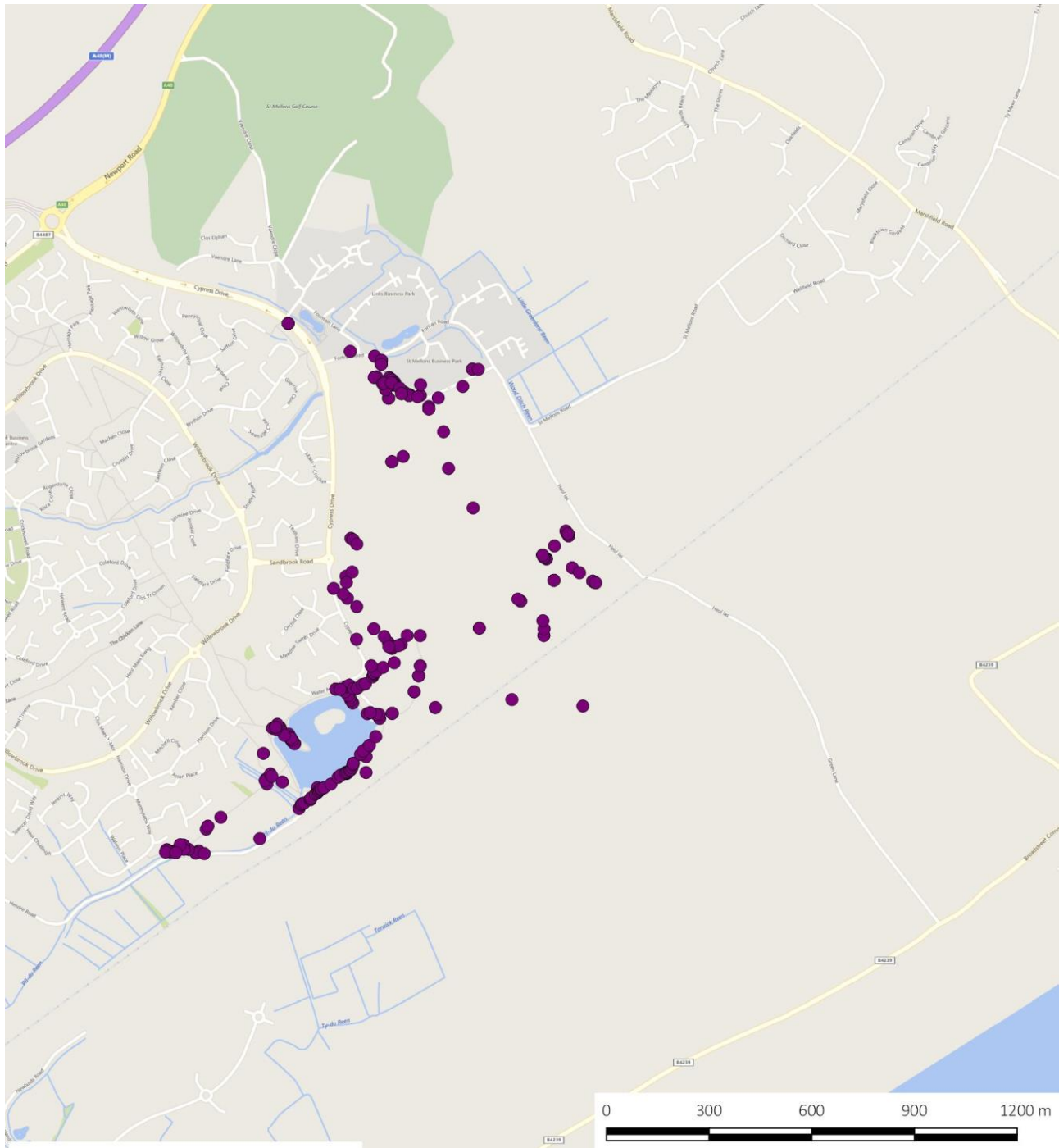
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Key

- bat observed within 30 mins of sunset

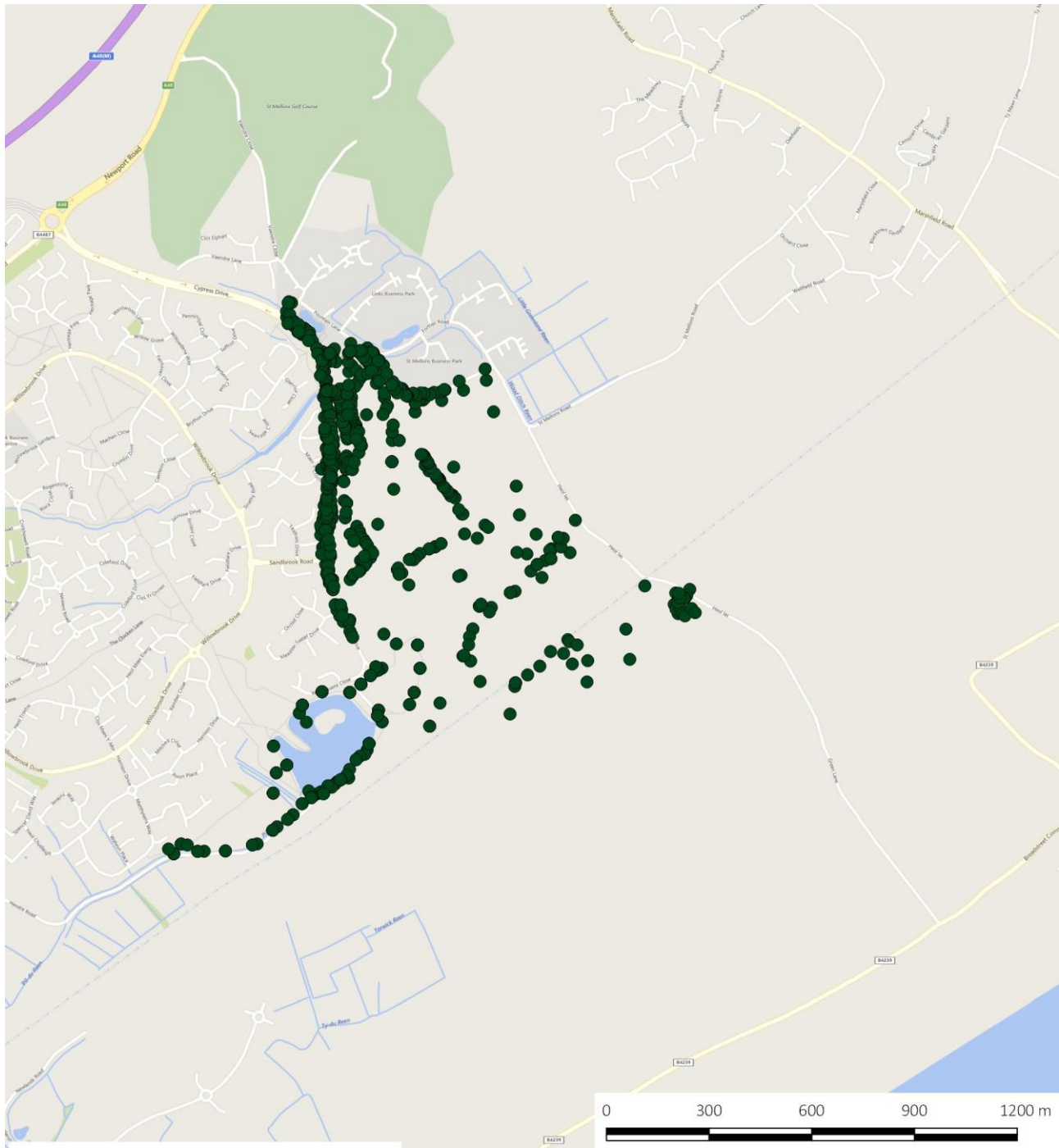
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Key

- bat observed within 60 mins of sunset

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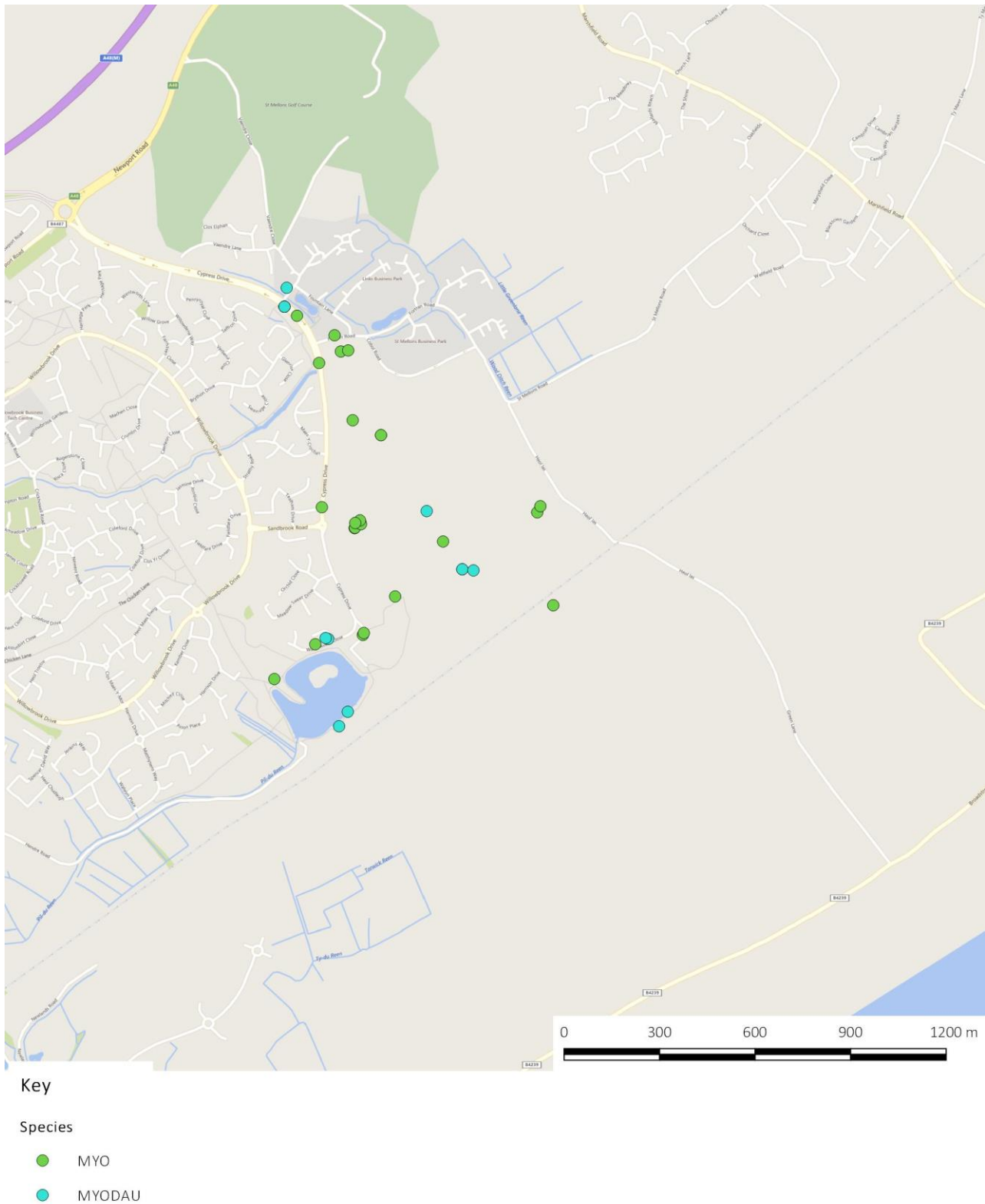


Key

- bat observed after 60 mins following sunset

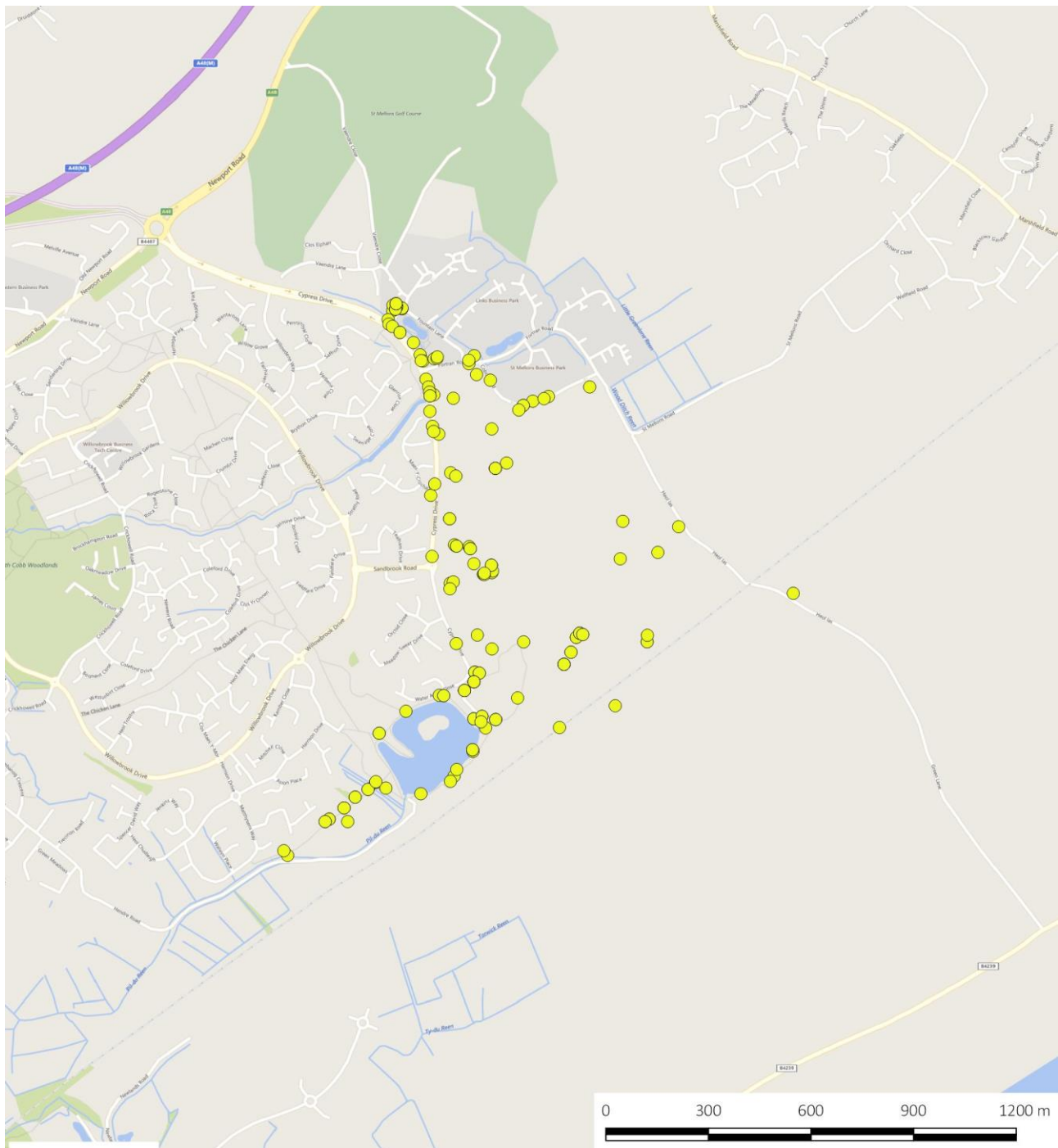
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APPENDIX III: SPECIES PLOTS



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Figure 6 - Plot showing locations of *Myotis sp* and Daubenton's bat



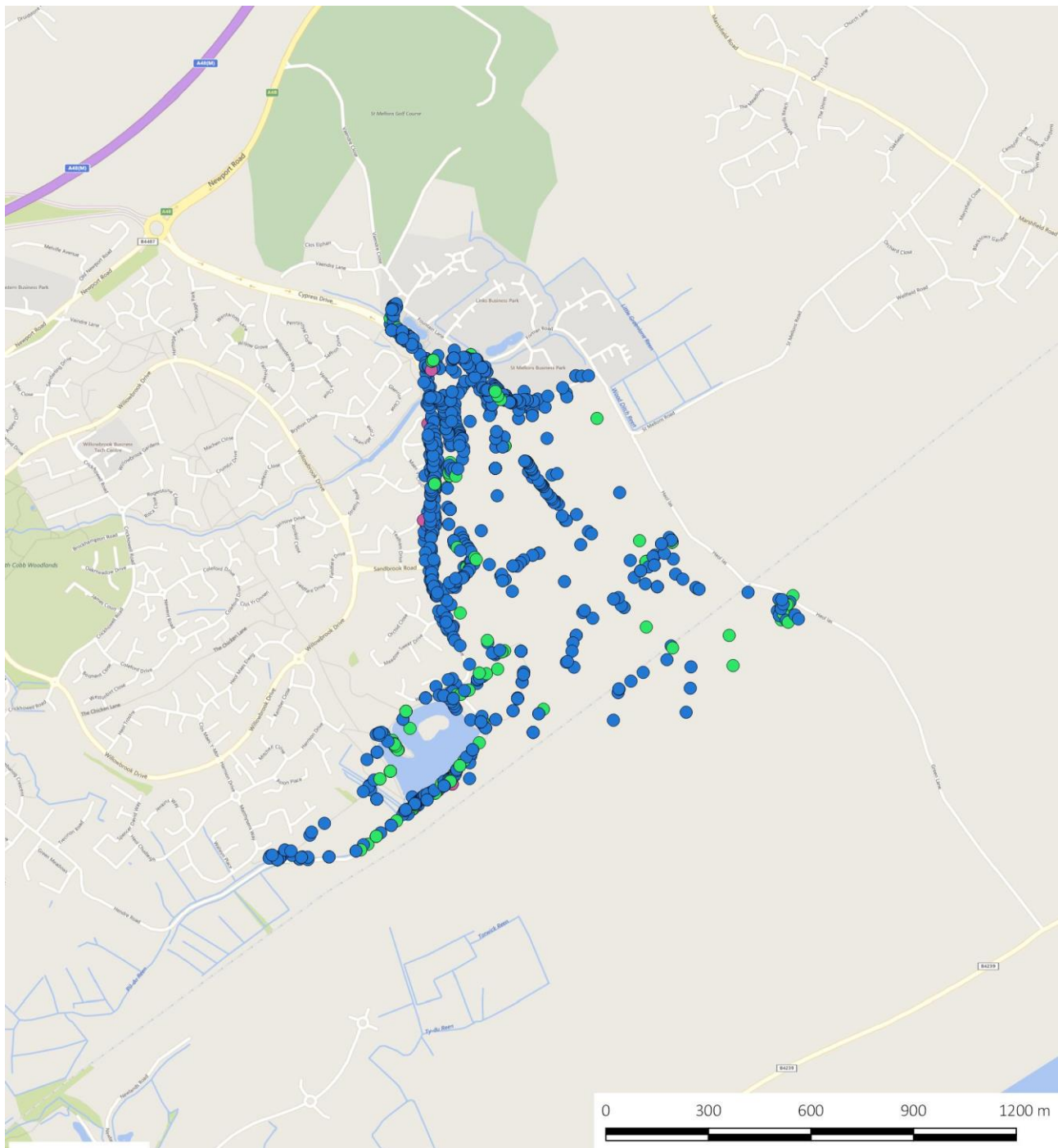
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Species

● NYCNO

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Figure 7 - Plot showing locations of noctule



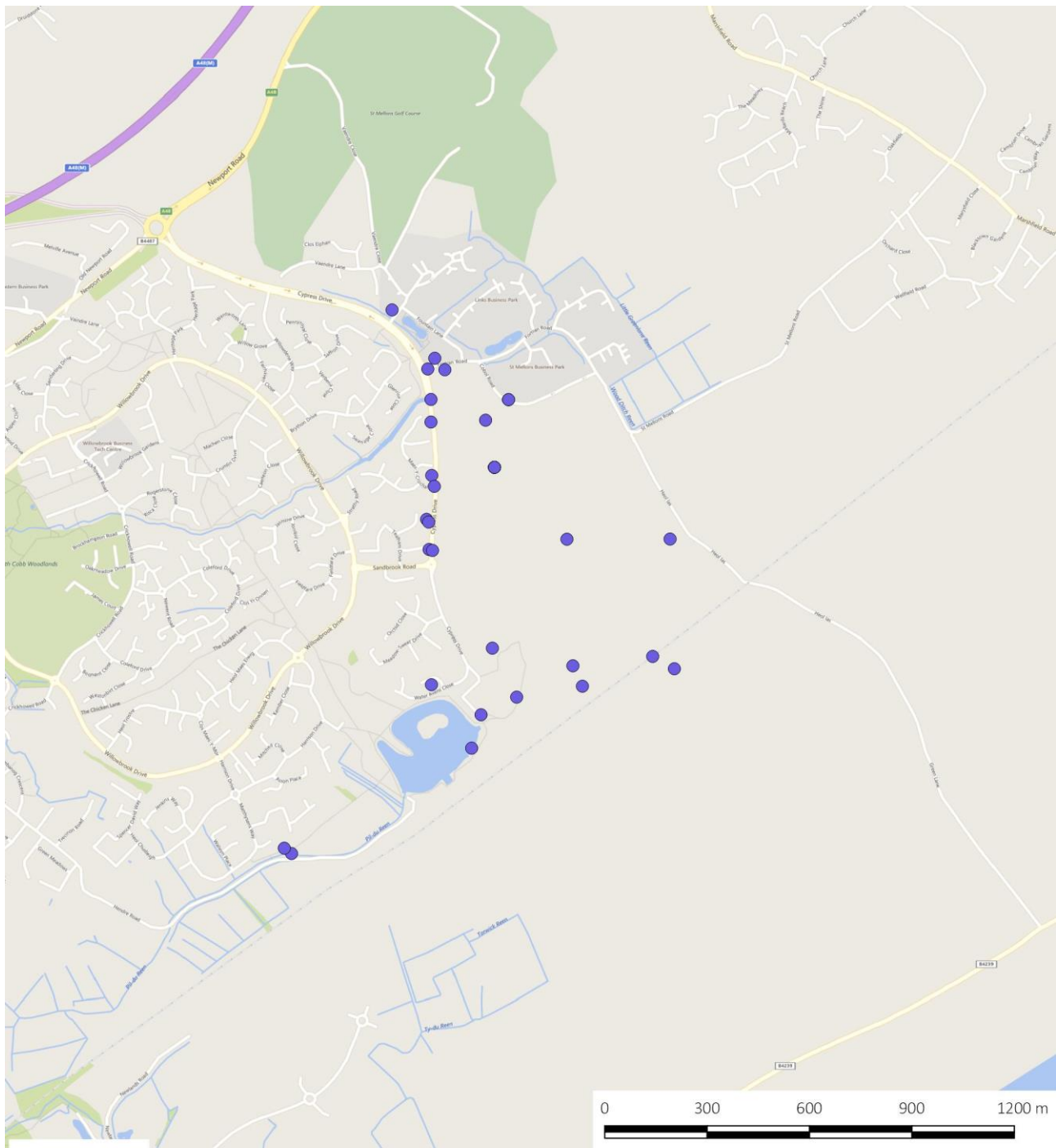
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Species

- PIPPIP
- PIPPYG
- PIPSOC

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Figure 8 - Plot showing locations of common pipistrelle and soprano pipistrelle, along with social calls



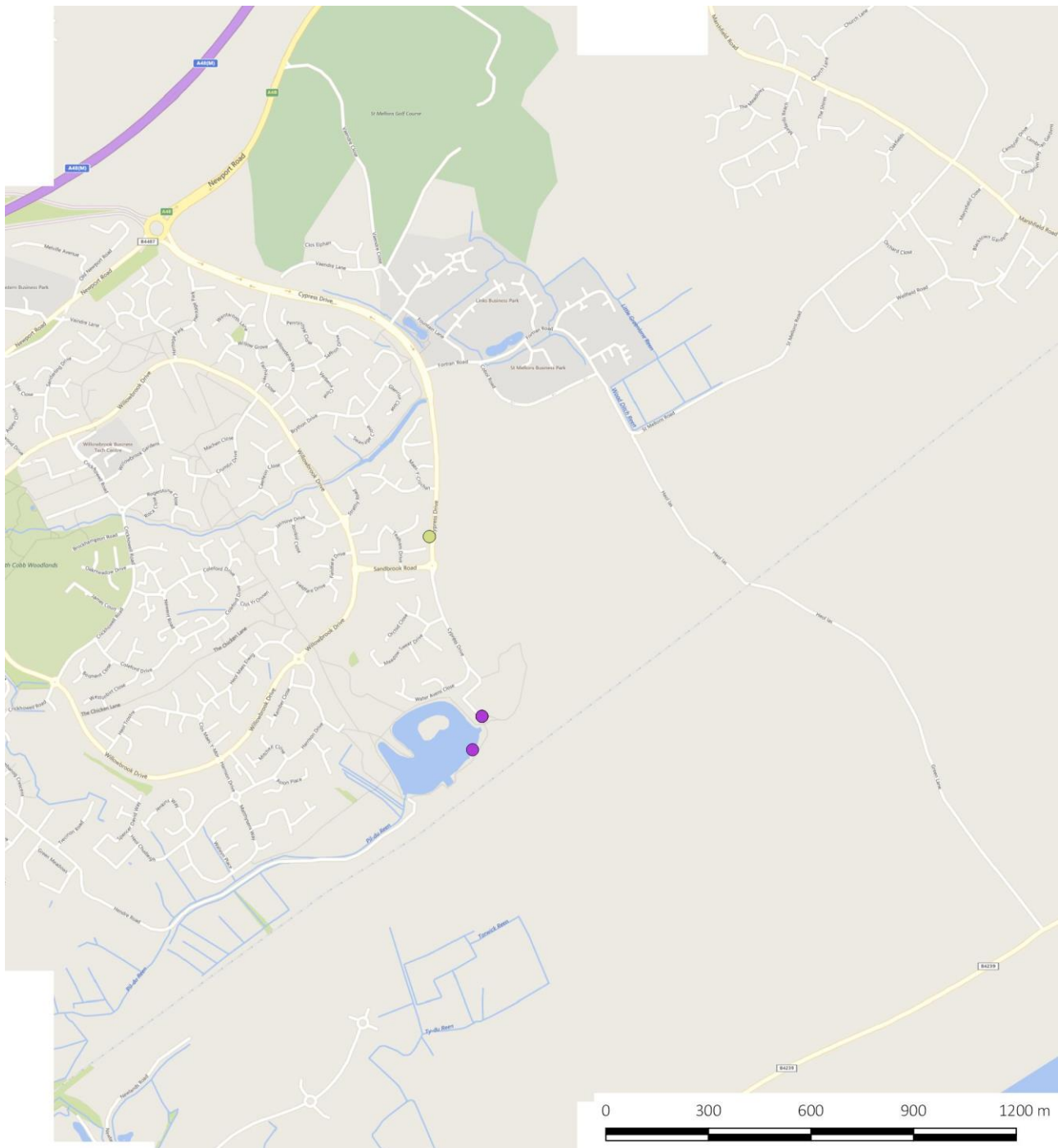
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Species

- PIP NAT

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Figure 9 - Plot showing locations of Nathusius' pipistrelle



Key

Species

- EPTSER
- PLEAUR

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Figure 10 - Plot showing locations of serotine and brown long-eared bat

APPENDIX IV: PLANNING POLICY AND LEGISLATION

The following local and national planning policy and both primary and European legislation relating to nature conservation and biodiversity status are considered of relevance to the current proposal.

Planning and biodiversity

Local Authorities have a requirement to consider biodiversity and geological conservation issues when determining planning applications under the following planning policies.

Planning Policy Wales (2016) and Technical Advice Note 5 (2009)

Planning Policy Wales (Edition 9, November 2016) sets out the land use planning policies of the Welsh Government, with Chapter 5 dealing with Conserving and Improving Natural Heritage and the Coast. The advice contained within Planning Policy Wales (PPW) is supplemented for some subjects by Technical Advice Notes (TAN's).

TAN 5 (Welsh Government, 2009) specifically provides advice about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. The TAN provides advice for local planning authorities on the key principles of positive planning for nature conservation; nature conservation and Local Development Plans; nature conservation in development management procedures; development affecting protected internationally and nationally designated sites and habitats; and development affecting protected and priority habitats and species.

Under Section 2.4 within the TAN 5, 'when deciding planning applications that may affect nature conservation local planning authorities should':

- Pay particular attention to the principles of sustainable development, including respect for environmental limits, applying the precautionary principle, using scientific knowledge to aid decision making and taking account of the full range of costs and benefits in a long term perspective;
- Contribute to the protection and improvement of the environment, so as to improve the quality of life and protect local and global ecosystems, seeking to avoid irreversible harmful effects on the natural environment;
- Promote the conservation and enhancement of statutorily designated areas and undeveloped coast;
- Ensure that appropriate weight is attached to designated sites of international, national and local importance;
- Protect wildlife and natural features in the wider environment, with appropriate weight attached to priority habitats and species in Biodiversity Action Plans;
- Ensure that all material considerations are taken into account and decisions are informed by adequate information about the potential effects of development on nature conservation;
- Ensure that the range and population of protected species is sustained;
- Adopt a step-wise approach to avoid harm to nature conservation, minimise unavoidable harm by mitigation measures, offset residual harm by compensation measures and look for new opportunities to enhance nature conservation; where there may be significant harmful effects local planning authorities will need to be satisfied that any reasonable alternative sites that would result in less or no harm have been fully considered;

Legislation and biodiversity

Certain species of animals and plants found in the wild in the UK are legally protected from being harmed or disturbed. These species are listed in the Wildlife and Countryside Act 1981 (as amended) or are named as European Protected Species (EPS) in the Conservation of Habitats and Species Regulations 2017. These two main pieces of legislation have been consulted when writing this report and are therefore described in detail within this section.

Other relevant legislation and policy documents that have been consulted include – The Environment (Wales) Act 2016; The Countryside and Rights of Way Act 2000; The Hedgerow Regulations 1997; Biodiversity Action Plans, both UK-wide (UKBAP) and Local plans (LBAPs), and The National Planning Policy Framework (NPPF).

There is also legislation that legally protects certain animals - for example, the Protection of Badgers Act (1992) protects badgers and their setts, and the Deer Act (1991) places restrictions on actions that can be taken against deer species.

Environment (Wales) Act 2016

Section 6 of the Act places a duty on public authorities to 'seek to maintain and enhance biodiversity' so far as it is consistent with the proper exercise of those functions. In so doing, public authorities must also seek to 'promote the resilience of ecosystems'. The duty replaces the section 40 duty in the Natural Environment and Rural Communities Act 2006 (NERC Act 2006), in relation to Wales, and applies to those authorities that fell within the previous duty.

Public authorities will be required to report on the actions they are taking to improve biodiversity and promote ecosystem resilience.

Section 7 replaces the duty in section 42 of the NERC Act 2006. The Welsh Ministers will publish, review and revise lists of living organisms and types of habitat in Wales, which they consider are of key significance to sustain and improve biodiversity in relation to Wales.

The Welsh Ministers must also take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section, and encourage others to take such steps.

Wildlife & Countryside Act 1981 (as amended)

The Wildlife & Countryside Act 1981 (as amended) [WCA] is the primary legislation for England and Wales for the protection of flora, fauna and the countryside. Part I within the Act deals with the protection of wildlife.

Most European Protected Species offences are now covered under the Conservation of Habitats and Species Regulations (see below), but some 'intentional' acts are still covered under the WCA, such as obstructing access to a bat roost.

The WCA prohibits the release to the wild of non-native animal species listed on Schedule 9 (e.g. Signal Crayfish and American Mink). It also prohibits planting in the wild of plants listed in Schedule 9 (e.g. Japanese Knotweed and Rhododendron ponticum) or otherwise deliberately causing them to grow in the wild. This is to prevent the release of invasive non-native species that could threaten our native wildlife.

The provisions relating to animals in the Act only apply to 'wild animals'; these are defined as those that are living wild or were living wild before being captured or killed. It does not apply to captive bred animals being held in captivity.

There are 'defences' provided by the WCA. These are cases where acts that would otherwise be prohibited by the legislation are permitted, such as the incidental result of a lawful operation which could not be reasonably avoided, or actions within the living areas of a dwelling house.

Licensing: certain prohibited actions under the Wildlife and Countryside Act may be undertaken under licence by the proper authority. For example scientific study that requires capturing or disturbing protected animals can be allowed by obtaining a licence – e.g. bat surveys.

Conservation of Habitats and Species Regulations 2017

The Conservation of Habitats and Species Regulations 2017 (which are the principal means by which the EC Habitats Directive is transposed in England and Wales) update the legislation and consolidate all the many amendments which have been made to the Regulations since they were first made in 1994.

These regulations provide for the:

- protection of European Protected Species [EPS] (animals and plants listed in Annex IV Habitats Directive which are resident in the wild in Great Britain) including bats, dormice, great crested newts, and otters;
- designation and protection of domestic and European Sites - e.g. Site of Special Scientific Interest [SSSI] and Special Area of Conservation [SAC]; and
- adaptation of planning controls for the protection of such sites and species.

Public bodies (including the Local Planning Authority) have a duty to have regard to the requirements of the Habitats Directive in exercising their function – i.e. when determining a planning application.

There is no defence that an act was the incidental and unavoidable result of a lawful activity.

Licensing: it is possible for actions which would otherwise be an offence under the Regulations to be undertaken under licence issued by the proper authority. For example, where a European Protected Species has been identified and the development risks deliberately affecting an EPS, then a 'development licence' may be required.

Species protection

The following protected species information is relevant to this report. Legislation is only discussed in relation to planning and development; other offences may exist.

Bats

All British bats are classed as European Protected Species and therefore receive protection under the Conservation of Habitats and Species Regulations 2010 (as amended), making it an offence inter alia to:

- Deliberately kill, injure or capture a bat;
- Deliberately disturb bats;
- Damage or destroy a breeding site or resting place of a bat.

In addition, all British bats are also listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) which contains further provisions making it an offence to intentionally or recklessly:

- Obstruct access to any structure or place which any bat uses for shelter or protection; or
- Disturb any bat while occupying a structure or place which it uses for that purpose.

If proposed development work is likely to destroy or disturb bats or their roosts, then a licence will need to be obtained from Natural Resources Wales, which would be subject to appropriate measures to safeguard bats.

Appendix D

Static Activity Monitoring Results

D1 BAIs for *Myotis* species (MYOTIS)

Myotis sp. ¹¹	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	0.2	1	257.8	16	No data	0	0	0.2
June	No bats recorded	1.8	0.2	No bats recorded	1.2	0	1.8	1.8
July	0	No data	4.8	1.2	0.4	No bats recorded	0	0
August	No bats recorded	0.4	No bats recorded	0.4	No bats recorded	1.8	3.2	no data
September	0.6	13.2	No bats recorded	No bats recorded	13.4	0	1	0
October	1.2	2.2	1.2	8.4	39.8	4.8	0	2.6
Average	0.5	3.72	66	6.5	13.7	1.32	1	0.92

D2 BAIs for common pipistrelle (PIPPIP)

Com pip. ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	164.6	77	1526	28	No data	1.4	33	60
June	No bats recorded	650.8	44.8	No bats recorded	41.8	1	134.8	454.4
July	19.8	No data	273	181.6	5.2	No bats recorded	16	30.4
August	No bats recorded	4	No bats recorded	0.8	No bats recorded	22.4	345	No data

¹¹ No bats recorded = no bats of any species were recorded at this location in this month

No data = no data recorded at this location in this month due to equipment failure

0 = no recordings of this particular species at this location in this month, although other bat species were recorded (as detailed in other species-specific tables)

Red = high bat activity level; Yellow = moderate bat activity level; Green = low bat activity level

Com pip. ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
September	13	177.4	No bats recorded	No bats recorded	314.4	33	226.8	1.6
October	3.6	178.6	58.6	1.8	17	15.6	2	1
Average	50.25	217.6	475.6	53.05	94.6	14.68	126.3	109.5

D3 BAIs for barbastelle (BARBAR)

Barbastelle ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	0.2	0.2	0	0	No data	0	0	0
June	No bats recorded	0	0	No bats recorded	0	0	0	0
July	0	No data	0	0	0	No bats recorded	0	0
August	No bats recorded	0	No bats recorded	0	No bats recorded	0.4	0	No data
September	0	0	No bats recorded	No bats recorded	0	0	0	0
October	0	0	0	0	0	0	0	0
Average	0.05	0.04	0	0	0	0.08	0	0

D4 BAIs for Leisler's bat (NYCLEI)

Leisler's ¹¹	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	0	0	0	0	No data	0	0	0
June	No bats recorded	0	0	No bats recorded	0	0	0	0
July	0	No data	0	0	0	No bats recorded	0	0

Leisler's ¹¹	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
August	No bats recorded	0	No bats recorded	0	No bats recorded	0	0	No data
September	0	0.4	No bats recorded	No bats recorded	0	0	0	0
October	0	0	0	0	0	0	0	0
Average	0	0.08	0	0	0	0	0	0

D5 BAIs for soprano pipistrelle (PIPPYG)

Soprano ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	1.2	12.6	72.6	59.2	No data	0	0	0.2
June	No bats recorded	16.2	0.2	No bats recorded	2	0	1.8	7.6
July	4.6	No data	19.8	1.2	1.2	No bats recorded	0.6	0.2
August	No bats recorded	20.8	No bats recorded	1	No bats recorded	7.2	9.2	No data
September	2	18.6	No bats recorded	No bats recorded	20.4	0.6	10.2	0.2
October	3.4	271.8	3.8	0.2	2.8	5.4	0.6	1.8
Average	2.8	68	24.1	15.4	6.6	2.64	3.733	2

D6 BAIs for serotine (EPTSER)

Serotine ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	0	0	0	0	No data	0	0	0
June	No bats recorded	0.2	0	No bats recorded	0	0	0	0

Serotine ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
July	0	No data	0	0	0	No bats recorded	0	0
August	No bats recorded	0	No bats recorded	0	No bats recorded	0	0	No data
September	0	0	No bats recorded	No bats recorded	0	0	0	0
October	0	0	0	0	0	0	0	0
Average	0	0.04	0	0	0	0	0	0

D7 BAIs for noctule (NYCNOC)

Noctule ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	5	21.6	17.8	12	No data	0	7.4	11.6
June	No bats recorded	10.8	11.8	No bats recorded	3.6	0.2	2.6	20.6
July	2.8	No data	20.2	28.6	3.8	No bats recorded	3.4	13.4
August	No bats recorded	1.8	No bats recorded	1	No bats recorded	4.6	2.2	No data
September	1.8	4	No bats recorded	No bats recorded	0.2	0.8	1.6	0.4
October	0	1	0.2	0.4	0	0.2	0	0
Average	2.4	7.84	12.5	10.5	1.9	1.16	2.867	9.2

D8 BAIs for Nathusius' pipistrelle (PIP NAT)

Nathusius ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	0	0	0	0	No data	0	0	0

Nathusius ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
June	No bats recorded	0	0	No bats recorded	0.2	0	0.2	0.2
July	0	No data	0	0	0	No bats recorded	0	0
August	No bats recorded	0	No bats recorded	0	No bats recorded	0	0	No data
September	0	0	No bats recorded	No bats recorded	0.2	0	0	0
October	0	0	0	0	0	0	0.2	0.2
Average	0	0	0	0	0.1	0	0.067	0.067

D9 BAIs for *Pipistrellus* species (PIPSPE)

Pip sp. ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	3.2	0.2	8.6	8	No data	0	0	0.2
June	No bats recorded	3.2	1.8	No bats recorded	0.6	0	1.8	7.6
July	7.8	No data	102.4	0.8	0.4	No bats recorded	0.6	0.2
August	No bats recorded	1	No bats recorded	0	No bats recorded	7.2	9.2	No data
September	0.8	27.4	No bats recorded	No bats recorded	7	0.6	10.2	0.2
October	0	1.2	2.4	0	0.4	5.4	0.6	1.8
Average	2.95	6.6	28.8	2.2	2.1	2.64	3.733	2

D10 BAIs for long-eared species (PLESPE)

Long-eared ¹²	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
May	0	0	0.4	0	No data	0	0	0
June	No bats recorded	0	0	No bats recorded	0	0	0	0
July	0	No data	0	0	0	No bats recorded	0	0
August	No bats recorded	1.2	No bats recorded	0	No bats recorded	0	0	No data
September	0	0	No bats recorded	No bats recorded	0	0	0	0
October	0	0	0.4	0	0.4	0.6	0	0
Average	0	0.24	0.2	0	0.1	0.12	0	0