HELIOS RENEWABLE ENERGY PROJECT

PINS Document Number:
EN010140/APP/6.3.8.6

Pursuant to:
APFP Regulation 5(2)(a)

Environmental Statement Appendix 8.6: Bat Activity Survey Report

June 2024

Helios Renewable Energy Project

on behalf of Enso Green Holdings D Limited.

Technical Appendix 8.6: Bat Activity Survey Report

avianecology

Report Verification

Document Control				
Project Name:		Helios Renewable Energy Project		
Project Number:		EnsoE-517-1435		
Report Title:		Technical Appendix 8.6: Bat Activity Survey Report		
Issue	**Date**	**Notes**	**Prepared**	**Reviewed**
V1	31/01/2024	First Draft	L Quarton *BSc (Hons.) MSc* **Ecologist**	C Scott *MRes ACIEEM* **Senior ecologist**

CONTENTS

FIGURES

ANNEXES

1 INTRODUCTION

1.1 Background and Scope

1.1.1 Avian Ecology Ltd. (AEL) was commissioned by Enso Green Holdings D Limited (the Applicant) to undertake bat activity surveys in relation to the proposed development of a renewable energy generating project; consisting of ground-mounted solar photovoltaic arrays, together with on-site energy storage, associated infrastructure and grid connection (the 'Proposed Development'), on land to the south-west of the village of Camblesforth and to the north of the village of Hirst Courtney in North Yorkshire (the 'Site'), as illustrated on **Figure 1.1 Order Limits Location Plan**.

1.1.2 This report provides detailed methodologies and results of both manual and automatic bat activity surveys completed to establish baseline conditions with regards to bat species on Site. Baseline information presented within should be read with reference to the Chapter 8 Biodiversity of the Environmental Statement to be submitted in support of the application for development consent.

1.1.3 During consultation with statutory consultees (see 'Consultation' section within Chapter 8 Biodiversity of the Environmental Statement), it was agreed with North Yorkshire Council (NYC) that, as hedgerows are to be almost entirely retained, bat activity surveys for impact assessment are unnecessary. NYC further advised that establishing a baseline of activity would be beneficial in demonstrating the positives of the Proposed Development to bat activity. The NYC Ecologist advised that a 'light touch' to surveys would be appropriate. As such, bat activity surveys, comprising manual (walked transect) and automated (static detector) bat activity surveys have been undertaken seasonally at the Site between Autumn 2022 and Summer 2023. The primary aim of these surveys was to add context and enable future monitoring. The NYC Ecologist also advised there is likely to be a need for tree (bat roost) surveys if any trees are to be removed as part of the Proposed Development. As no trees are to be felled as a result of the Proposed Development, preliminary ground level roost assessments of trees within and directly bounding the Site was not undertaken.

1.1.4 Only common names of bat species are used within this report; with scientific names provided in **Annex 1**.

1.2 Site Overview

1.2.1 The Site extends to 475 hectares (ha) in size and is set in a wider landscape of agricultural land, mainly arable and interspersed with occasional small blocks of woodland, with scattered small settlements, dominated in the East by Drax power station. The Site also includes a proposed underground cable corridor to the grid connection along the A645 and through a small section of golf course. The dominant habitat consists of arable fields bounded by a network of hedgerows, drainage ditches and tree lines. Scattered woodland parcels are situated within and directly adjacent to the Site.

1.2.2 The Site's location is provided in **Figure 1.1 Order Limits Location Plan**.

2 LEGISLATION

2.1.1 All species of British bat are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Bats are further protected under the Conservation of Habitats and Species Regulations

2017 (as amended) and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. The Act and Regulations make it an offence to:

- Kill, injure, or take any wild bat;
- Damage, destroy or obstruct access to any place that a wild bat uses for shelter or protection; and,
- Intentionally or recklessly disturb any wild bat while it is occupying a structure or place that it uses for shelter or protection.

2.1.2 Seven bat species in the UK are also listed as Species of Principal Importance under Section 41 of the Natural Environment and Rural Communities Act (NERC) Act 2006[1], whilst all species are listed as priority species under Selby Local Biodiversity Action Plan[2] and are therefore a material consideration within the planning process.

[1] The Natural Environment and Rural Communities Act 2006. Available at: https://www.legislation.gov.uk/ukpga/2006/16/contents
[2] Available at: https://www.northyorks.gov.uk/sites/default/files/2023-05/Selby%20Biodiversity%20Action%20Plan%20Aug%202004.pdf (accessed 26th February 2024)

3 METHODOLOGY

3.1.1 The approach to baseline information gathering with regards to bats has been undertaken with reference to Bat Conservation Trust (BCT) Survey Guidelines (Collins, 2016[3]) applicable at the time of surveys, and the Bat Workers Manual (Mitchell-Jones, A. J. & McLeish, A. P, 2004[4]).

3.1.2 Additional pieces of guidance and peer reviewed literature have also been consulted and are referenced where relevant.

3.2 Desk Study

3.2.1 A desk study, which included an assessment of available baseline data in relation to bats, was undertaken to inform the approach to the field surveys and provide context for the subsequent assessment.

3.2.2 The desk study has included:

- Aerial imagery and Ordnance Survey (OS) maps to identify any features of potential value to bats;
- A review of the Multi-Agency Geographic Information for the Countryside ('MAGIC')[5] website to identify the proximity of the Site to any national or internationally designated sites for nature conservation, designated for bat species.
- A review of existing bat records within 2km of the Site, obtained from the following key sources:
  - Records request to North & East Yorkshire Ecological Data Centre ('NEYEDC')[6];
  - A review of Magic Map for EPS licence records relating to bat species.
- A review of the Sites location in relation to species known ranges in England, with reference to;
  - the most recent UK Habitats Directive[7] Article 17 Report; and
  - Mathews *et al*. (2018)[8].

3.2.3 Only recent records dated from 2005 onwards were used unless historic records (pre-2005) were received from within (or within close proximity to) the Site and/or historic records were considered otherwise pertinent to the Proposed Development.

3.3 Field Surveys

3.3.1 The purpose of the baseline field surveys for bats has been to establish the bat species assemblage present, the spatial and temporal distribution of bat activity and the location and extent of commuting and foraging habitat used by bats.

3.3.2 The following surveys relating to baseline bat activity have been completed:

---

[3] Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.
[4] Mitchell-Jones, A. J. & McLeish, A. P. (2004). *Bat Workers Manual*. 3rd Edition. Joint Nature Conservation Committee, Peterborough.
[5] Available at: https://magic.defra.gov.uk/magicmap.aspx (accessed 29th February 2024)
[6] Non-statutory designated sites are all provided by the North & East Yorkshire Ecological Data Centre https://www.neyedc.org.uk/
[7] https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-species/
[8] Mathews, F., Kubasiewicz, L.M., Gurnell, J., Harrower, C.A., McDonald, R.A. and Shore, R.F. (2018). *A Review of the Population and Conservation Status of British Mammals: Technical Summary*. the Mammal Society, Peterborough. https://www.mammal.org.uk/wp-content/uploads/2021/06/MAMMALS-Technical-Summary-FINALNE-Verision-FM3290621.pdf

- Habitat Suitability Assessment;
- Manual Bat Activity Surveys; and,
- Automated Bat Activity Surveys.

3.3.3 Bat activity survey effort was determined following consultation with NYC and also in reference to BCT guidance (Collins, 2016) applicable at the time of survey. As the NYC Ecologist advised that a 'light touch' to surveys would be appropriate, survey effort was consistent with methodology for **Low** habitat suitability, although habitat suitability was assessed as **Moderate** overall.

3.3.4 Consequently, bat activity surveys, comprising walked transect surveys and static monitoring surveys, were undertaken seasonally between autumn 2022 and summer 2023: during autumn 2022 (September-October), spring 2023 (April-June) and summer 2023 (July-August).

3.3.5 Methodologies relating to each specific bat activity survey are described below.

Habitat Suitability Assessment

3.3.6 A habitat suitability assessment (HSA) of the Site was undertaken in reference to criteria detailed in **Table 4.1** of BCT guidance (Collins, 2016), which provided an appraisal of the potential value of habitats located within the Site relative to foraging and commuting potential.

Manual Activity Surveys

3.3.7 Due to the large size of the Site, a total of six transects routes (i.e., Transects 1-6) were designed and implemented. Transects were designed to cover the recommended transect length (e.g., 3-5km) outlined in BCT guidance relevant at the time of survey (Collins, 2016).

3.3.8 However, following Site boundary changes implemented in 2023, individual transect routes were amended between Autumn 2023 and Spring 2023 visits; amendments to transect routes are discussed further in **Section 3.2 Limitations,** and outlined in **Figure 8.33**. Autumn 2022 transect routes are subsequently presented separately from Spring/Summer 2023 transect routes, as shown in **Figure 8.34** and **Figure 8.35,** respectively.

3.3.9 Whilst individual transect routes showed some variation relative to their location, each aimed to cover a representative range of habitats considered to be ecologically important for bats, and which might be impacted by the Proposed Development.

3.3.10 Manual activity surveys were undertaken by a team of ecologists and assistant ecologists, each suitably qualified and experienced in relation to bat activity surveys; specifically, each transect was surveyed via a pair of surveyors per season, in line with both good practice guidance and health and safety protocol.

3.3.11 Transects were walked at a constant pace by survey teams utilising either a Wildlife Acoustics Touch 2 Pro or Wildlife Acoustics EM3 bat detector. Transects followed pre-defined routes (tested during prior daytime walkovers) and consisted of 10 Listening Points (LPs) connected by walked segments (Ws). Listening Points are illustrated in **Figures 8.34 – 8.35**, whilst walked sections are also illustrated in **Figures 8.36 - 8.38** where relevant in conjunction with **Section 4 Results**. On some occasions, starting LPs were randomised, or LP order reversed to reduce sampling bias.

3.3.12 Bat passes at each listening point were recorded for approximately 5 minutes before continuing along the walked segment towards the subsequent listening point. Additional metrics recorded included the maximum number of bats observed, the species identified, and any other contextual data such as flight direction, social calling or feeding buzzes relative to a specific area of the transect route.

3.3.13 Surveys commenced at sunset and ended approximately two to three hours after sunset, and undertaken in weather conditions conducive for bat activity, i.e., mild and dry, with relatively low wind speeds (see **Table 3.1** below).

Table 3.1: *A Summary of Manual Activity Survey Effort.*

Transect ID	Survey Date	Sunset Time	Start Time	End Time	Survey Conditions
Transect 1	21/09/2022	19:05	19:04	21:01	Temp: 16°C; Rain: Dry; Wind*: Light Air; Cloud: 3/8
	26/04/2023	20:25	20:33	22:55	Temp: 9°C; Rain: Dry; Wind*: Calm; Cloud: 0/8
	21/08/2023	20:20	20:21	22:40	Temp: 20°C; Rain: Drizzle; Wind*: Light Breeze; Cloud: 7/8
Transect 2	21/09/2022	19:05	19:17	21:41	Temp: 9°C; Rain: Dry; Wind*: Calm; Cloud: 0/8
	26/04/2023	20:25	20:30	23:05	Temp: 16°C; Rain: Dry; Wind*: Light Air; Cloud: 3/8
	21/08/2023	20:20	20:21	22:27	Temp: 20°C; Rain: Drizzle; Wind*: Light Breeze; Cloud: 7/8
Transect 3	21/09/2022	19:05	19:25	21:25	Temp: 16°C; Rain: Dry; Wind*: Light Air; Cloud: 3/8
	26/04/2023	20:25	20:52	23:00	Temp: 9°C; Rain: Dry; Wind*: Calm; Cloud: 0/8
	21/08/2023	20:20	20:30	22:30	Temp: 20°C; Rain: Drizzle; Wind*: Light Breeze; Cloud: 7/8
Transect 4	21/09/2022	19:05	19:06	22:18	Temp: 16°C; Rain: Dry; Wind*: Light Air; Cloud: 3/8
	26/04/2023	20:25	20:25	23:09	Temp: 9°C; Rain: Dry; Wind*: Calm; Cloud: 0/8
	21/08/2023	20:20	20:30	22:37	Temp: 20°C; Rain: Drizzle; Wind*: Light Breeze; Cloud: 7/8
Transect 5	21/09/2022	19:05	19:06	21:16	Temp: 16°C; Rain: Dry; Wind*: Light Air; Cloud: 3/8
	26/04/2023	20:25	20:26	22:40	Temp: 9°C; Rain: Dry; Wind*: Calm; Cloud: 0/8
	21/08/2023	20:20	2011	22:47	Temp: 20°C; Rain: Drizzle; Wind*: Light Breeze; Cloud: 7/8
Transect 6	21/09/2022	19:05	18:59	21:19	Temp: 16°C; Rain: Dry; Wind*: Light Air; Cloud: 3/8
	26/04/2023	20:25	20:38	22:53	Temp: 9°C; Rain: Dry; Wind*: Calm; Cloud: 0/8
	21/08/2023	20:20	20:23	23:10	Temp: 20°C; Rain: Drizzle; Wind*: Light Breeze; Cloud: 7/8

****Beaufort Wind Scale***

Automatic Activity Surveys

3.3.14 Seven automated monitoring stations (MSs) were deployed within the Site boundary, with a minimum of one MS placed per transect. MS locations were chosen to sample activity from a representative range of habitats considered to be ecologically important for bats present within the Site.

3.3.15 A summary of MS deployment locations is detailed in **Table 3.2** below, whilst MS locations relative to the Site (and bat transects) are presented in **Figure 8.34-8.35** (per season).

Table 3.2: *A Summary of Static Monitoring Station (MS) Deployment.*

Monitoring Station	Grid Reference	Habitat
MS2	SE 64670 25409	Edge habitat: placed on boundary between cereal crop and off-Site woodland parcel.
MS3	SE 61407 28127	Linear feature: placed at junction between species-poor hedgerow and line of trees; both features present within wider open cereal crop habitat.
MS4	SE 63129 26710	Linear feature: placed along line of trees (noted for possible BRP) and narrow strip of other neutral grassland, and adjacent to a road. Present within wider open cereal crop habitat. Connecting feature between local woodland parcels.
MS5	SE 61462 24877	Edge habitat: placed on boundary between small off-site woodland parcel/linear hedgerow with trees, and on-Site open cereal crop habitat.
MS6	SE 62823 25157	Linear feature: placed along wet ditch with scattered tress, surrounded by open cereal crop habitat. Connecting feature between off Site woodland parcels.
MS7	SE 62618 28103	Edge habitat; placed on boundary between non-cereal crop and off-Site woodland edge.
MS8	SE 61829 27525	Open habitat; placed on individual tree within cereal crop.
MS8a	SE 61942 27603	Edge habitat: placed on boundary between cereal crop and off-Site woodland edge, connected to on-Site strip of broadleaved plantation woodland directly north.

3.3.16 MS detector types deployed during each automatic activity survey varied, consisting of either a full spectrum SM2 or SM Mini detector attached to a 1m high stake or suitable on-Site feature. Monitoring was undertaken between time periods spanning approximately thirty minutes before sunset to thirty minutes after sunrise, with detectors set to record simultaneously.

3.3.17 Where possible, bat activity was sampled for a minimum of five consecutive nights of suitable weather over the course of three seasonal recording periods (e.g., spring, summer and autumn).

3.3.18 Key metrics for each MS deployed throughout automatic activity surveys are detailed in **Table 3.3.**

Table 3.3: *A Summary of Automated Activity Survey Effort.*

Monitoring Station	Survey Season	Recording Period Start Date	Recording Period End Date	No. Nights Surveyed
MS2	Spring	25/05/2023	06/06/2023	12
	Summer	26/07/2023	04/08/2023	9
	Autumn	21/09/2022	12/10/2022	21
MS3	Spring	25/05/2023	06/06/2023	12
	Summer	26/07/2023	03/08/2023	8

Monitoring Station	Survey Season	Recording Period Start Date	Recording Period End Date	No. Nights Surveyed
	Autumn	21/09/2022	10/10/2022	19
MS4	Spring	25/05/2023	06/06/2023	12
	Summer	26/07/2023	04/08/2023	9
	Autumn	21/09/2022	02/10/2022	11
MS5	Spring*	26/04/2023	03/05/2023	8
	Summer	26/07/2023	02/08/2023	7
	Autumn	21/09/2022	12/10/2022	21
MS6	Spring	25/05/2023	06/06/2023	12
	Summer	26/07/2023	04/08/2023	9
	Autumn	21/09/2022	12/10/2022	21
MS7	Spring	25/05/2023	06/06/2023	12
	Summer	26/07/2023	04/08/2023	9
	Autumn	21/09/2022	12/10/2022	21
MS8	Spring	25/05/2023	06/06/2023	12
	Summer	n/a	n/a	n/a
	Autumn	21/09/2022	11/10/2022	20
MS8a	Spring	n/a	n/a	n/a
	Summer	26/07/2023	04/08/2023	9
	Autumn	n/a	n/a	n/a

***** *Data recorded during the original spring deployment period (April – early May) used in this instance as a substitute for the re-deployed spring period (May - early June) (see paragraph 3.4.4 under Limitations for additional information).*

3.3.19 Weather conditions, taken from World Weather Online website[9] are presented in **Annex 2.**

Data Analysis and Assumptions of Bat Activity

3.3.20 Data analysis and interpretation of results followed the principles presented in the BCT guidance (Collins, 2016). Bat sound analysis has been undertaken suitably qualified and experienced ecologists.

3.3.21 Bat detectors recorded data onto digital media for subsequent analysis using Kaleidoscope Pro (Wildlife Acoustics) software. All data was processed through Kaleidoscope Pro in order to separate associated noise files. The remaining sonograms were then automatically identified by the software.

[9] https://www.worldweatheronline.com

A selection of sonograms from each species or species group was manually checked with particular attention given to non-pipistrelle species.

3.3.22 Bat species were identified using characteristic features associated with species echolocation calls. Diagnostic features used in this analysis include characteristic frequency, slope, call duration, time between calls, minimum length of the body of the call and smoothness.

3.3.23 Bat detectors record the passage of echolocating bats during surveys, enabling an estimation of relative bat activity levels for assessment. It is recognised, however, that there are limitations to the use of this method for determining bat activity levels.

3.3.24 An individual bat can pass a particular feature on several occasions while foraging and therefore it was not possible to estimate the number of individual bats or to allow a fair comparison where survey time differs. As such, bat activity is recorded as an index. The Bat Activity Index (BAI), based on BCT guidance (Collins, 2016), is defined as follows:

BAI (per hour) = Total number of bat 'registered calls' / number of hours of recording

3.3.25 For analysis purposes, bat activity was recorded as the number of 'bat registered calls' (a sequence of echolocation calls consisting of two or more call notes (pulse of frequency) from one bat, not separated by more than one second (White and Gehrt, 2001[10] & Gannon *et al*., 2003[11]) with a minimum call note length of >= two milliseconds (Weller *et al*., 2009[12]) from which the activity index is calculated.

3.4 Limitations

Field Surveys

Transect Amendments

3.4.1 Original transect routes designed and surveyed during autumn 2022 were subsequently subject to amendment due to Site boundary changes implemented during the project design process. Consequently, spring and summer transect routes deviated from those surveyed previously; transect route amendments varied individually, wherein some areas previously surveyed were omitted completely, transects sections deviated, or new areas surveyed. Moreover, in some instances LPs covered by specific transects were omitted and covered by adjacent transect routes, reflective of red line boundary changes. The full scope of amendments, and a comparative view of transect changes can be seen in **Figures 8.33-8.35.**

3.4.2 As such, whilst transects were designed to sample a representative range of habitats considered to be ecologically important for bats (e.g., woodland edges and linear features), and which might be impacted by the proposed development, a direct comparison between autumn transects and spring/summer transects cannot be made. However, habitats sampled are still considered to be representative of suitable habitats present within the wider area as a whole, and still broadly comparable in terms of the habitats covered, and baseline activity recorded. Consequently, whilst

[10] White, E. & Gehrt, S. (2001). *Effects of recording media on echolocation data from broadband bat detectors*. Wildlife Society Bulletin 29: 974-978
[11] Gannon, W., Sherwin, R. & Haymond, S. (2003). *On the importance of articulating assumptions when conducting acoustic studies of habitat use by bats*. Wildlife Society Bulletin 31: 45-61
[12] Weller, T., Cryan, P. & O'Shea, T. (2009). *Broadening the focus of bat conservation and research in the USA for the 21st century. Endangered Species Research*. 8: 129-145

broad comparisons have been made between transects, autumn transects results have been presented separately.

Monitoring Stations

3.4.3 Most monitoring station deployment locations were unimpacted by Site boundary changes; however, a single monitoring station (MS1) was omitted from the Site boundary following amendments and has consequently been omitted from further survey and analysis.

3.4.4 Additionally, due to both disturbance and/or technical failures incurred at some monitoring stations during an original spring deployment period (April), monitoring stations were re-deployed during May - early June to account for the spring recording period. However, MS5 was noted to have later incurred a technical failure during May deployment; consequently, April data collected at MS5 was utilised in lieu. Whilst guidance recommends that monitoring stations should record simultaneously, and that recording periods should be continuous, it was judged that data collected during April should be utilised to help inform baseline activity.

3.4.5 Furthermore, during the summer recording period MS8 was deployed at an adjacent field margin, separate from the location previously utilised during autumn and spring recording periods. Consequently, this has been designated as MS8a during this period. As the locations and features present at each differed, a direct comparison cannot be made between MS8 and MS8a between seasons, although baselines conditions relative their broad location can still be interpreted.

Seasonal Recording Periods

3.4.6 BCT guidance applicable at the time of survey (Collins, 2016) instructs that automated static surveys are required during spring (April-May), summer (June – August) and autumn (September – October) periods in order to inform baseline activity.

3.4.7 Whilst the majority of automatic activity survey dates were undertaken within the recommended seasonal timeframe, during the spring recording perioding nights which fell within June were included within spring data analysis (i.e., 25th May – June 6th 2023).

3.4.8 Whilst definitive seasonal periods are designated within guidance applicable at the time of survey, it is thought that activity recorded in early-June is likely to be indicative of conditions and activity experienced in late-May. As such, dates sampled in both May and June have been treated as part of a combined 'spring' recording period, and subsequently analysed as such.

Weather Conditions

3.4.9 BCT guidance (Collins, 2016) recommends activity surveys be carried out in the following conditions: temperature above 10°C at sunset, no rain or strong wind. For the purpose of this assessment, strong wind is considered to be anything above 5m/s.

3.4.10 During spring (26/04/23) and summer (21/08/23) manual activity visits, some unsuitable conditions were experienced such as slightly below recommended temperatures (i.e., 9°C) or temporary light rainfall, respectively. In the case of the former, temperature was not considered to be significantly impactful to activity, given the time of year. Likewise, rainfall experienced during summer was brief and light, whilst activity was still noted to be relatively high compared to previous transects, despite drizzle.

3.4.11 During automatic activity surveys, the weather was deemed unsuitable on 11 out of a total of 50 nights. However, apart from 6 nights, bat activity was recorded throughout the remaining dates (i.e., 44 nights); consequently, all nights that recorded bats have been included within the analysis.

Sonogram Analysis

3.4.12 Analysing bat sonograms using Kaleidoscope can often clearly identify certain species. However, some genus groups (such as *Myotis spp and Nyctalus spp*) can be difficult to determine the specific species due to their similar styles of calls. In addition, it can be difficult to determine species or even genus in some circumstances, due to partial calls being heard or due to distortion from, for example passing cars, rain or wind. In cases when it is not possible to identify a bat call to genus, it is labelled as an unknown bat. If the genus can be identified but not the species, the call is labelled by the genus group only.

3.4.13 The detectability of some bat species, such as brown long-eared bat, is lower than that of, for example, noctule and pipistrelle species. The echolocation calls of brown long-eared bats are comparatively more difficult to detect with bat detectors, and their particular hunting strategies take them into less open habitats, where survey transect routes may not venture. Careful interpretation has been applied when comparing survey results across species.

3.4.14 It should also be noted that physical and environmental factors as well as a bat's age, sex or behaviour can all influence the echolocation calls (e.g., a social call of a soprano pipistrelle has been known to display similar characteristics to a low clarity noctule call).

3.4.15 Therefore, professional judgement has been used and in some cases it is not possible to safely assign an individual bat call to a species. In cases when it is not possible to identify a bat call to genus, it is labelled as an unknown bat. If the genus can be identified but not the species, the call is labelled by the genus group only. The identification of those calls assigned to individual species is done so on the basis of judgement and experience.

4 RESULTS

4.1 Desk Study

Designated Sites

4.1.1 No statutory designated sites which include bats as qualifying features are located within a 10km of the Site.

4.1.2 Additionally, no non-statutory designated sites within 2km of the Site, for which citations are currently available, note bats as specific features of interest.

4.1.3 No internationally statutory designated sites designated for the presence of bats within 30km of the Site.

Species Records

4.1.4 NEYEDC returned 30 recent bat records and six historical records within 2km of the Site. However, no bat records were returned within the Site itself, with records predominantly located north-west of the neighbouring Drax Power Station in the adjacent Skylark Centre and Nature Reserve.

4.1.5 Bat species returned since 2005 include Daubenton's bat (two records), noctule (four records), Leisler's bat (one record), common pipistrelle (fourteen records), soprano pipistrelle (four records) and an unknown Myotis bat species (five records). Historical records also include six unknown pipistrelle species records.

4.1.6 No recent records include roost locations; however, all six historical records involve roosting bats, with the closest record returned in urban habitat approximately 200m north-west of the underground cable corridor to the grid connection, in the north-eastern part of the Site.

4.1.1 A review of MAGIC identified four EPS mitigation licences granted for bat roosts within 2km of the Site:

- 2019-41922-EPS-MIT; destruction of a brown long-eared bat and common pipistrelle resting site between 2019 to 2020. Located c. 735m south-west of the Site.
- 2014-3615-EPS-MIT; destruction of a common pipistrelle, whiskered bat Brandt's bat and Natterer's bat resting site between 2014 to 2019. Located c. 745m north-east of the Site.
- 2019-42236-EPS-MIT; destruction of a common pipistrel resting site between 2019 to 2025. Located c. 900m south-east of the Site.
- 2020-45385-EPS-MIT; destruction of a brown long-eared bat and common pipistrelle resting site, with impact of a breeding site between 2020 and 2023. Located c. 1.05km south-east of the Site.

UK Bat Species Range

4.1.2 In review of the UK Habitats Directive Article 17 Report *'Habitats Directive Report 2019: Species Conservation Status Assessments 2019'*, the Site is located within the known UK distribution range for the following bat species:

- Common pipistrelle;
- Soprano pipistelle;
- Noctule;
- Daubenton's bat;
- Brandt's bat;
- Whiskered bat; and,

- Brown long-eared bat;
- Natterer's bat.

4.1.3 Additionally, the Site is noted to be on the edge of the traditionally established range of both Nathusius' and Lieser's bats, in reference to the distribution ranges presented in the UK Habitats Directive Article 17 Report.

4.2 Habitat Suitability Assessment

4.2.1 The dominant habitats consist of intensively managed agricultural land, the majority of which is used for arable purposes. Open arable farmland offers very little foraging and commuting potential for bats, and habitat opportunities are considered likely to be concentrated along boundary features such as hedgerows and ditch networks.

4.2.2 Additionally, current farming practices, particularly the use of herbicides and pesticides, also mean that low flying invertebrate prey species will be absent or rare across much of the Site; this reduces the potential for bat species to forage within this type of habitat and it can therefore be reasonably concluded that most of the Site is unimportant for foraging bats due to land management practices.

4.2.3 Therefore, the predominantly arable habitats throughout the Site and beyond provide little suitability for bats. However, the network of hedges, ditches, tree lines, watercourses, ponds, and occasional woodlands do provide opportunities for commuting and foraging. Consequently, in reference to BCT guidance (Collins, 2016), the Site is considered to have **Moderate** overall commuting and foraging value for bat species.

4.2.4 However, as mentioned in **Section 3.3**, subsequent bat activity survey effort followed a seasonal survey plan, following consultation with NYC.

4.3 Manual Activity Surveys

Autumn 2022 Transect Summary

4.3.1 The total number of call registrations recorded per species for each manual transect undertaken in autumn is presented in **Table 4.1**; a percentage summary of activity is also presented in **Table 4.2**

4.3.2 A minimum of five bat species were recorded during autumn transect surveys. Only common pipistrelle was noted to have been recorded uniformly at all six transects, whilst species diversity was noted to be highest at Transect 5 (i.e., where all five species were detected).

4.3.3 Individual species activity levels also showed variation between the transects during the autumn survey window, with overall bat activity noted to be highest at Transect 1 (e.g., 200 bat passes) accounting for 43.7% of overall bat activity recorded between autumn transects. Common pipistrelle was the most abundantly recorded species (i.e., 412 total passes) accounting 90% of total call registrations overall.

4.3.4 The highest overall number of registrations (i.e., 62 passes by common pipistrelle) throughout the autumn survey were recorded during the walked section between LP5-LP6 (i.e., W5) at Transect 1, which accounted for 13.5% of overall autumn activity. These calls were recorded in association with edge habitats and wooded linear features (e.g., woodland edges, hedge and treelines, and ditches) (**Figure 8.36**).

4.3.5 Regarding observed behaviour, foraging and commuting behaviour was observed for common pipistrelle (i.e., Transect 1, 3, 5, 6) and noctule bats (i.e., Transect 4 and 6), largely associated with edge habitats and linear features. Foraging and commuting flight line activity within the Site during autumn surveys is shown in **Figure 8.36**.

Table 4.1: *Summary of autumn transect call registrations (per species, per transect).*

Species	Number of Passes per Transect Route ID						Total
	T1	T2	T3	T4	T5	T6	
Common pipistrelle	187	27	28	56	70	44	412
Soprano pipistrelle	11	3	2	0	1	4	21
Myotis spp.	1	4	0	0	4	0	9
Noctule	1	5	0	5	2	2	15
Brown long-eared	0	0	0	0	1	0	1
Total	200	39	30	61	78	50	458

Table 4.2: *Summary of autumn transect survey percentage call registrations (per species, per transect).*

Species	Percentage Passes per Transect Route (%)						Total
	T1	T2	T3	T4	T5	T6	
Common pipistrelle	93.5	69.2	93.3	91.8	89.7	88.0	89.96
Soprano pipistrelle	5.5	7.7	6.7	0.0	1.3	8.0	4.59
Myotis spp.	0.5	10.3	0.0	0.0	5.1	0.0	1.97
Noctule	0.5	12.8	0.0	8.2	2.6	4.0	3.28
Brown long-eared	0	0.0	0.0	0.0	1.3	0.0	0.22
Total	43.7	8.5	6.6	13.3	17.0	10.9	100.00

Spring and Summer 2023 Transect Summary

4.3.6 A summary of call registrations recorded per species for each manual transect undertaken in spring is presented in **Table 4.3**; a percentage summary of activity is also presented in **Table 4.4.**

4.3.7 A minimum of five bat species were recorded during spring transect surveys. No individual species was detected uniformly between transects, nor where all five potential species detected uniformly within any single given transect. However, species diversity was noted to be highest throughout Transect 3 (i.e., where three species were detected overall).

4.3.8 Individual species activity levels also showed variation between spring transects, with overall bat activity noted to be highest at Transect 6 (25 bat passes) accounting for 40.3% of overall bat activity recorded. Again, common pipistrelle was the most abundantly recorded species (54 total passes) accounting 87.1% of total call registrations.

4.3.9 The highest overall number of registrations (12 and 14 passes by common pipistrelle) recorded during the spring transects were recorded during walked sections between LP3-LP4 (W3) at Transect 4, and LP5-LP6 (W5) at Transect 6, respectively. These recordings accounted for 19.4% and 22.6% of recorded activity and were recorded in association with woodland edge and ditch habitats regarding the former and wooded linear features in regard to the latter (**Figure 8.37**).

4.3.10 Regarding observed behaviour, foraging and commuting behaviour was observed for common pipistrelle (Transect 1, 3, 4, 6) and Myotis (Transect 3), with activity again largely associated with edge habitats and linear features. Observed activity within the Site during spring surveys is shown in **Figure 8.37**.

Table 4.3: *Summary of spring transect survey call registrations (per species, per transect).*

Species	No. Passes per Transect Route						Total
	T1	T2	T3	T4	T5	T6	
Common pipistrelle	8	0	2	20	0	24	54
Soprano pipistrelle	0	0	0	0	2	0	2
Myotis spp.	0	0	1	1	0	0	2
Noctule	2	0	0	0	0	1	3
Brown long-eared	0	0	1	0	0	0	1
Total	10	0	4	21	2	25	62

Table 4.4: *Summary of spring transect survey percentage call registrations (per species, per transect).*

Species	Percentage Passes per Transect Route (%)						Total
	T1	T2	T3	T4	T5	T6	
Common pipistrelle	80.0	0	50.0	95.2	0.0	96.0	87.1
Soprano pipistrelle	0.0	0	0.0	0.0	100.0	0.0	3.2
Myotis spp.	0.0	0	25.0	4.8	0.0	0.0	3.2
Noctule	20.0	0	0.0	0.0	0.0	4.0	4.8
Brown long-eared	0.0	0	25.0	0.0	0.0	0.0	1.6
Total	16.1	0.0	6.5	33.9	3.2	40.3	100.0

4.3.11 A summary of call registrations recorded per species for each manual transect undertaken in summer is presented in **Table 4.5**; a percentage summary of activity is also presented in **Table 4.6.**

4.3.12 A minimum of five bat species were also recorded during summer transect surveys. Of species recorded, only common pipistrelle was detected uniformly between transects. However, species diversity was noted to be highest throughout Transect 1 (where all five species were detected).

4.3.13 Individual species activity levels showed variation between summer transects, with overall bat activity noted to be highest at Transect 2 (97 bat passes) accounting for 29.5% of overall bat activity recorded.

Again, common pipistrelle was the most abundantly recorded species (273 total passes) accounting 83% of total call registrations.

4.3.14 Peak activity per location was more evenly distributed across the Site during summer; peak registrations (15-20 passes by common pipistrelle, accounting for 4.6% – 6.1% of overall activity) throughout summer surveys was generally recorded between walked sections between listening points, such as at Transect 1 (W6), Transect 2 (W4 and W6), and Transect 6 (W5), with the exception Transect 5 (LP2) and Transect 4 (LP6). These areas were generally found in association with edge habitat and linear features (e.g., wooded linear features and ditches), as seen in **Figure 8.38**.

4.3.15 Regarding observed behaviour, foraging and commuting behaviour was observed for common pipistrelle (i.e., Transect 1, 2, 4, 5) and soprano pipistrelle (i.e., Transect 2), with activity again largely associated with edge habitats and linear features. Observed activity within the Site during spring surveys is shown in **Figure 8.38**.

Table 4.5: *Summary of summer transect survey call registrations (per species, per transect).*

Species	No. Passes per Transect Route						Total
	T1	T2	T3	T4	T5	T6	
Common pipistrelle	45	64	5	59	54	46	273
Soprano pipistrelle	7	10	0	0	4	2	23
Myotis spp.	2	3	0	0	0	3	8
Noctule	1	17	0	4	0	0	22
Brown long-eared	0	3	0	0	0	0	3
Total	55	97	5	63	58	51	329

Table 4.6: *Summary of summer transect survey percentage call registrations (per species, per transect).*

Species	Percentage Passes per Transect Route (%)						Total
	T1	T2	T3	T4	T5	T6	
Common pipistrelle	81.8	66.0	100.0	93.7	93.1	90.2	83.0
Soprano pipistrelle	12.7	10.3	0.0	0.0	6.9	3.9	7.0
Myotis spp.	3.6	3.1	0.0	0.0	0.0	5.9	2.4
Noctule	1.8	17.5	0.0	6.3	0.0	0.0	6.7
Brown long-eared	0.0	3.1	0.0	0.0	0.0	0.0	0.9
Total	16.7	29.5	1.5	19.1	17.6	15.5	100.0

4.4 Automatic Activity Surveys

Species Assemblage Overview

4.4.1 Bats were detected on 50 nights (over a total sample period of 46 nights) during autumn (2022), spring and summer (2023) recording periods, using seven static bat detectors during each survey period. Static locations per survey period are presented in **Figures 8.34-8.35**.

4.4.2 Throughout this period, bat calls indicative of a minimum of six species/genus were recorded. **Table 4.7** summarises the overall number of passes recorded (per species) throughout the combined survey periods, as well as the percentage of overall activity attributed to each species.

4.4.3 Common pipistrelle was the most frequently recorded species detected on-Site throughout the overall survey period (23647 passes), accounting for 90.02% of total call registrations.

Table 4.7: *Total number of passes recorded per-species*[13]***.***

Species	Total No. Passes	Percentage of total (%)
Common pipistrelle	23647	90.02%
Soprano pipistrelle	800	3.05%
Myotis spp.	1460	5.56%
Noctule	291	1.11%
Brown long-eared	53	0.20%
Nathusius' pipistrelle	19	0.07%
Total	**26270**	**100%**

4.4.4 **Table 4.8** below summarises the total number of passes (per species) recorded at each individual monitoring station throughout the combined survey periods.

4.4.5 Of the monitoring stations deployed, MS3 featured the highest number of call registrations (13916 bat passes), accounting for 52.97% of total bat passes recorded on-Site.

4.4.6 Of the six species/genus recorded during the activity surveys, the majority were detected across each monitoring station, apart from brown long-eared bat (not recorded at MS2 and MS8a) and Nathusius' pipistrelle (not recorded at MS4, MS7 and MS8a). However, species presence/absence showed seasonal variation between monitoring locations, as shown in **Table 4.8**.

Table 4.8: *Total number of passes per monitoring station (per species).*

Species	Monitoring Stations								Total No. (Per Species)
	MS2	MS3	MS4	MS5	MS6	MS7	MS8	MS8a	
Common pipistrelle	1109	13102	593	2482	1777	1437	317	2830	23647
Soprano pipistrelle	20	28	259	14	272	159	26	22	800

[13] The 'total' percentage may be slightly above 100% due to rounding of the percentages per species.

Myotis spp.	34	721	41	144	154	62	65	239	1460
Noctule	20	47	52	15	34	47	36	40	291
Brown long-eared	0	9	3	1	30	4	6	0	53
Nathusius' pipistrelle	1	9	0	3	4	0	2	0	19
Total No. (Per MS)	1184	13916	948	2659	2271	1709	452	3131	26270

4.4.7 **Table 4.9** below summarises the BAI (passes per hour) for individual bat species recorded across monitoring stations, in addition to the overall BAI for each monitoring station, and the overall Site.

4.4.8 Combined bat activity was noted to be highest at MS8a and MS3 accounting for a BAI of 38.30 and 32.59 passes per hour over the combined survey period, respectively.

Table 4.9: *Total BAI per monitoring station (per species).*

Species	**Monitoring Stations**								**Total BAI. (Per Species)**
	MS2	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS8a**	
Common pipistrelle	2.39	30.68	1.82	5.85	3.83	3.10	0.86	34.62	7.83
Soprano pipistrelle	0.04	0.07	0.79	0.03	0.59	0.34	0.07	0.27	0.26
Myotis spp.	0.07	1.69	0.13	0.34	0.33	0.13	0.18	2.92	0.48
Noctule	0.04	0.11	0.16	0.04	0.07	0.10	0.10	0.49	0.10
Brown long-eared	0.00	0.02	0.01	<0.01	0.06	0.01	0.02	0.00	0.02
Nathusius' pipistrelle	<0.01	0.02	0.00	0.01	0.01	0.00	0.01	0.00	0.01
Total BAI (Per MS)	2.55	32.59	2.91	6.26	4.90	3.69	1.23	38.30	8.70

4.4.9 **Table 4.10** presents the total number of passes (per species) recorded per detector during each recording period.

4.4.10 The highest number of overall call registrations were recorded during the summer recording period (10920 passes) accounting for 41.57% of call registrations recorded on-Site, closely followed by autumn (9823 passes; 37.39%), whilst spring accounted for smallest number of passes (5527 passes; 21.04%).

4.4.11 All six species/genus were detected on-Site during each seasonal recording period. However, peak count per individual species showed some variation between seasons (**Table 4.10**).

Table 4.10: *Total number of passes per season (per species).*

Monitoring Station	**Recording Period**			**Total No. (Per Location)**
	Spring	**Summer**	**Autumn**	
Common pipistrelle	5044	10114	8489	23647
Soprano pipistrelle	189	285	326	800
Myotis spp.	233	398	829	1460
Noctule	33	120	138	291

Brown long-eared	12	2	39	53
Nathusius' pipistrelle	16	1	2	19
Total No. (Per Recording Period)	5527	10920	9823	26270

4.4.12 **Table 4.11** below presents the overall BAI (per species and species combined) across recording periods.

4.4.13 Overall, bat activity was noted to be highest during the summer recording period, accounting for a BAI of 13.79 passes per hour across Site, closely followed by the spring recording period (12.65 passes per hour), whilst autumn featured the lowest overall BAI (5.49 passes per hour).

4.4.14 However, overall BAI per individual species showed some variation between seasons, as shown in **Table 4.11**.

Table 4.11: *Total BAI per recording period (per species).*

Monitoring Station	Recording Period			Total BAI (Per Location)
	Spring	Summer	Autumn	
Common pipistrelle	11.54	12.77	4.74	**7.83**
Soprano pipistrelle	0.43	0.36	0.18	**0.26**
Myotis spp.	0.53	0.50	0.46	**0.48**
Noctule	0.08	0.15	0.08	**0.10**
Brown long-eared	0.03	< 0.01	0.02	**0.02**
Nathusius' pipistrelle	0.04	<0.01	<0.01	**0.01**
Total BAI. (Per Recording Period)	**12.65**	**13.79**	**5.49**	**8.70**

Common pipistrelle

4.4.15 Common pipistrelle was the most frequently recorded species on-Site, accounting for 90.02% of total call registrations (and reflected by an overall BAI of 7.83 passes throughout the combined survey period). A BAI summary of common pipistrelle calls (i.e., registered passes per hour) for individual monitoring stations across Site, is presented in **Table 4.12**.

4.4.16 Activity was noted to be highest at MS3 and MS8a (although the latter included only a single monitoring period), accounting for a total BAI of 30.68 passes per hour and 34.62 passes per hour, respectively. Activity at MS8 and MS5 was also relatively highe in comparison to other detectors, both accounting for an overall BAI of > 5 passes per hour. Conversely, activity at the remaining detectors all accounted for an overall BAI of < 4 passes per hour, being lowest at MS4 (BAI: 1.82 passes per hour).

4.4.17 Seasonally, activity was also noted to be highest for common pipistrelle during the summer recording period (total BAI: 12.77 passes per hour), and was notable highest at MS3 (45.45 passes per hour). Common pipistrelle activity was further noted to be lowest in autumn (BAI: 4.74 passes per hour), most notably at MS8 (BAI: 0.19 passes per hour).

Table 4.12: *A summary of common pipistrelle BAI (passes per hour) for each recording period.*

Monitoring Station	Monitoring Period			BAI (per MS)
	Spring	Summer	Autumn	
MS2	3.60	8.40	0.21	2.39
MS3	29.37	45.45	26.99	30.68
MS4	1.35	4.39	0.68	1.82
MS5	0.30	28.16	2.41	5.85
MS6	9.88	4.94	1.34	3.83
MS7	3.00	9.27	1.34	3.10
MS8	2.63	-	0.19	8.55
MS8a	-	34.62	-	34.62
BAI (per Month)	11.54	12.77	4.74	7.83

Soprano pipistrelle

4.4.18 Soprano pipistrelle was the third most recorded species detected on-Site, accounting for 3.05% of total call registrations (and an overall BAI of 0.26 passes per hour throughout the combined survey period). A BAI summary of soprano pipistrelle calls for individual monitoring stations across Site, and during individual recording periods, is presented in **Table 4.13.**

4.4.19 Soprano pipistrelle activity was noted to be highest at MS4, accounting for a total BAI of 0.79 passes per hour. However, activity between the remaining detectors was noted to be relatively similar, each accounting for an overall BAI of < 0.6 passes per hour, being lowest at MS2 and MS5 (BAI: 0.04 and 0.03 passes per hour, respectively).

4.4.20 Seasonally, activity was noted to be highest for soprano pipistrelle during the spring recording period (total BAI: 0.43 passes per hour), although activity was noted to be greatest at MS4 during the summer recording period (BAI: 2.15 passes per hour). Conversely, activity was noted to be lowest in autumn (overall BAI: 0.1 passes per hour), most notably at MS2 (BAI: 0.01 passes per hour).

Table 4.13: *A summary of soprano pipistrelle BAI (passes per hour) for each recording period.*

Monitoring Station	Monitoring Period			BAI (per MS)
	Spring	Summer	Autumn	
MS2	0.13	0.05	0.01	0.04
MS3	0.05	0.10	0.06	0.07
MS4	0.07	2.15	0.53	0.79
MS5	0.03	0.06	0.03	0.03
MS6	1.17	0.73	0.33	0.59
MS7	0.37	0.15	0.39	0.34
MS8	0.07	-	0.07	0.13
MS8a	-	0.27	-	0.27
BAI (per Month)	0.43	0.36	0.18	0.26

Nathusius' pipistrelle

4.4.21 Nathusius' pipistrelle was the least frequently recorded species detected on-Site, accounting for 0.07% of total call registrations (and an overall BAI of 0.01 passes per hour throughout the combined survey period). A BAI summary of Nathusius' pipistrelle calls for individual monitoring stations across Site, and during individual recording periods, is presented in **Table 4.14**.

4.4.22 Nathusius' pipistrelle activity was noted to be highest at MS3 accounting for a total BAI of 0.02 passes per hour. However, activity between remaining detectors was noted to be relatively similar, with an

overall BAI of 0.01 passes per hour at MS5, MS6 and MS8, or <0.01 passes per hour (MS2). No bat activity was recorded at MS4, MS7 or MS8a.

4.4.23 Seasonally, overall activity was noted to be highest during the spring recording period (total BAI: 0.04 passes per hour), being highest at MS3 (BAI: 0.09 passes per hour). Activity during summer and autumn periods was found to be even (BAI: 0.001 passes per hour). Notably, activity was not registered uniformly across seasons at any given detector.

Table 4.14: *A summary of Nathusius' pipistrelle BAI (calls per hour) for each recording period.*

Monitoring Station	Monitoring Period			BAI (per MS)
	Spring	Summer	Autumn	
MS2	0.01	0.00	0.00	<0.01
MS3	0.09	0.00	0.00	0.02
MS4	0.00	0.00	0.00	0.00
MS5	0.00	0.02	0.01	0.01
MS6	0.04	0.00	0.00	0.01
MS7	0.00	0.00	0.00	0.00
MS8	0.02	-	0.00	0.01
MS8a	-	0.00	-	0.00
BAI (per Month)	0.04	0.001	0.001	0.01

Noctule

4.4.24 Noctule was the fourth most frequently recorded species detected on-Site, accounting for 1.11% of total call registrations (and an overall BAI of 0.1 passes per hour throughout the combined survey period). A BAI summary of noctule calls for individual monitoring stations across Site, and during individual recording periods, is presented in **Table 4.15**.

4.4.25 Noctule activity was noted to be highest at MS8 and MS8a, accounting for a total BAI of 0.21 and 0.49 passes per hour, respectively (although former limited to spring and autumn recording periods, and the latter the summer recording period only). However, activity between remaining detector was noted to be relatively similar, each accounting for an overall BAI of ≤ 0.16 passes per hour, being lowest at MS2 and MS5 (BAI: 0.04 passes per hour).

4.4.26 Seasonally, overall activity was noted to be highest during the summer recording period (total BAI: 0.15 passes per hour), being highest at MS8a (BAI: 0.49 passes per hour). Activity during spring and autumn periods was found to be even (BAI: 0.08 passes per hour). Notably, activity was not registered uniformly across seasons at any given detector. Notably, noctule activity went unrecorded at MS3 and MS7 during spring recording periods.

Table 4.15: *A summary of combined Noctule species BAI (calls per hour) for each recording period.*

Monitoring Station	Monitoring Period			BAI (per MS)
	Spring	Summer	Autumn	
MS2	0.12	0.06	0.01	0.04
MS3	0.00	0.29	0.10	0.11
MS4	0.08	0.21	0.19	0.16
MS5	0.04	0.02	0.04	0.04
MS6	0.06	0.23	0.03	0.07
MS7	0.00	0.21	0.11	0.10
MS8	0.04	-	0.12	0.21
MS8a	-	0.49	-	0.49
BAI (per Month)	0.08	0.15	0.08	0.10

Brown long-eared bat

4.4.27 Brown long-eared bat was the second least frequently recorded species detected on-Site, accounting for 0.20% of total call registrations (and an overall BAI of 0.02 passes per hour throughout the combined survey period). A BAI summary of brown long-eared bat calls for individual monitoring stations across Site, and during individual recording periods, is presented in **Table 4.16**.

4.4.28 Brown long-eared activity was noted to be highest at MS6, accounting for a total BAI of 0.06, being highest during the autumn recording period (BAI: 0.06 passes per hour). However, activity between remaining detectors was noted to be relatively similar, each accounting for an overall BAI of ≤ 0.02 passes per hour. Activity was notably absent at MS2 and MS8a.

4.4.29 Seasonally, overall activity was noted to be highest during the spring recording period (total BAI: 0.03 calls per hour), being highest at MS6 (BAI: 0.1 passes per hour). Activity during summer and autumn periods was found to be lower (BAI: <0.01 and 0.02 passes per hour, respectively). Notably, activity was only registered across all three seasons at MS6.

Table 4.16: *A summary of brown long-eared bat BAI (calls per hour) for each recording period.*

Monitoring Station	Monitoring Period			BAI (per MS)
	Spring	Summer	Autumn	
MS2	0.00	0.00	0.00	0.00
MS3	0.00	0.00	0.04	0.02
MS4	0.00	0.00	0.02	0.01
MS5	0.00	0.00	<0.01	<0.01
MS6	0.10	0.02	0.06	0.06
MS7	0.00	0.00	0.01	0.01
MS8	0.02	-	0.01	0.02
MS8a	-	0.00	-	0.00
BAI (per Month)	0.03	<0.01	0.02	0.02

Myotis spp.

4.4.30 Myotis bats were the second most frequently recorded species detected on-Site, accounting for 5.56% of total call registrations (and an overall BAI of 0.48 passes per hour throughout the combined survey period). A BAI summary of Myotis calls for individual monitoring stations across Site, and during individual recording periods, is presented in **Table 4.17**.

4.4.31 Brown long-eared activity was noted to be highest at MS3 and MS8a, accounting for a total BAI of 1.69 and 2.92 passes per hour, respectively (although the latter accounts for a single summer recording period only). Specially, activity was noted to be highest during autumn at MS3 (BAI: 2.36 passes per hour) and summer at MS8a (2.92 passes per hour). Activity was noted to account for < 1 pass per hour between remaining detectors, being lowest at MS2 (BAI: 0.07 passes per hour).

4.4.32 Seasonally, overall activity was noted to be highest during the spring recording period (total BAI: 0.53 passes per hour), although overall activity during summer and autumn was comparable, accounting for 0.5 and 0.46 passes per hour, respectively. Notably, Myotis bats were recorded consistently at each detector between all three seasons.

Table 4.17: *A summary of Myotis specie BAI (calls per hour) for each recording period.*

Monitoring Station	Monitoring Period			BAI (per MS)
	Spring	Summer	Autumn	
MS2	0.17	0.04	0.05	0.07
MS3	1.06	0.19	2.36	1.69
MS4	0.10	0.28	0.06	0.13
MS5	0.04	1.41	0.18	0.34
MS6	0.41	0.29	0.32	0.33
MS7	0.03	0.07	0.19	0.13
MS8	0.52	-	0.05	0.83
MS8a	-	2.92	-	2.92
BAI (per Month)	0.53	0.50	0.46	0.48

Potential Roost Emergence Activity

4.4.33 Static monitoring data was cross-referenced with species specific emergence times outlined in current BCT guidance (Collins, 2023[14]) to identify any calls detected within an accepted potential emergence window which might indicate the possible presence of roosts within the vicinity of each MS.

4.4.34 Data analysis showed that activity was recorded within the species-specific emergence times at eight MS locations relative to five species overall, as detailed in **Table 4.18**.

Table 4.18: *Summary of earliest call registration per species, per recording period.*

Detector ID	Species / Genus	Nights Recorded Within Accepted Potential Emergence Window	Peak Count of Bat Calls	Month of Peak Count
MS2	Common Pipistrelle	6	2	Summer
	Myotis[15]	2	1	Spring
	Noctule	2	1	Summer/Autumn
MS3	Common Pipistrelle	22	102	Autumn
	Soprano Pipistrelle	27	149	Autumn
	Myotis	11	15	Autumn
	Noctule	4	4	Autumn
MS4	Common Pipistrelle	8	33	Spring
	Soprano Pipistrelle	10	27	Autumn
	Myotis	3	1	Spring/Summer/Autumn
	Noctule	3	1	Autumn
MS5	Common Pipistrelle	24	77	Summer
	Soprano Pipistrelle	28	132	Summer
	Myotis	9	5	Autumn
	Noctule	5	1	Autumn
	Common Pipistrelle	28	47	Spring
	Soprano Pipistrelle	21	4	Spring

[14] Collins, J. (ed.) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4rd edn). The Bat Conservation Trust, London.
[15] Myotis genus emergence windows differ between species, with 94 minutes after sunset quoted as the maximum range (i.e., Daubenton's bat). In line with ID level, 94 minutes used as a precautionary approach to Myotis species calls.

Detector ID	Species / Genus	Nights Recorded Within Accepted Potential Emergence Window	Peak Count of Bat Calls	Month of Peak Count
MS6	Myotis	7	6	Autumn
	Noctule	3	7	Summer
	BLE	3	1	Autumn
MS7	Common Pipistrelle	15	36	Summer
	Soprano Pipistrelle	12	3	Spring/Autumn
	Myotis	1	2	Spring
	Noctule	8	8	Autumn
MS8	Soprano Pipistrelle	1	1	Autumn
	Myotis	1	1	Autumn
	Noctule	9	2	Autumn
	BLE	2	1	Spring
MS8a	Common Pipistrelle	2	4	Summer
	Soprano Pipistrelle	3	7	Summer
	Myotis	7	5	Summer
	Noctule	2	2	Summer

5 SUMMARY

5.1 Manual Activity Transects

5.1.1 Bat activity was recorded across all six surveyed transects, each subject to a manual activity survey undertaken during spring (April), summer (August) and autumn (September).

5.1.2 A minimum of five species were recorded during manual activity surveys including common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat and Myotis species. Observed activity was limited to pipistrelle, noctule and Myotis bats, which included both foraging and commuting behaviour.

5.1.3 Bat activity per species varied both between transects, and between seasons. However, overall recorded activity was noted to be highest at Transect 1 (265 total passes), accounting for 31.2% of overall activity distributed across Site. Specifically, habitats present across Transect 1 predominantly include open cereal crop, although edge habitats including hedgerows and treelines, and some areas of wet ditch are also present. However, the area also features numerous areas of woodland (found adjacent to the Site boundary), relative to other areas surveyed, which may represent increased habitat opportunities. MS3 and MS8a, located along wooded linear features and woodland edge habitat within Transect 1, was also noted to have recorded the most activity relative to other static detectors deployed (i.e., 13916 and 3131 passes, respectively).

5.1.4 Seasonal activity was noted to be highest during autumn (458 total passes), accounting for 54% of seasonal activity.

5.1.5 Common pipistrelle was noted to be the most frequently recorded species across the Site during activity transects (739 passes) accounting for 87% of recorded activity. Common pipistrelle activity was also noted to be consistently higher in comparison to other species during each seasonal period (per transect).

5.1.6 Notably, recorded activity and observation were predominantly recorded in association with edge habitat, wooded linear features or water sources. As such, transects activity would suggest that boundary features and linear habitats present on-Site function as both foraging opportunities and commuting corridors within the Site, and relative to the local landscape, for local bat assemblages.

5.2 Automatic Activity Surveys

5.2.1 A total of seven monitoring stations were deployed on-Site during spring (May-June), summer (July-August) and autumn (September-October), across a representative range of habitats considered to be ecologically important for bats.

5.2.2 A minimum of six species were recorded on-Site during automatic activity surveys, which included common, soprano and Nathusius' pipistrelle, noctule, brown long-eared bat and Myotis species.

5.2.3 The majority of species recorded were noted to be active across the Site, being detected at each MS distributed within the development area; however, Nathusius' pipistrelle went unrecorded at MS4, MS7 and MS8b, whilst brown long-eared bat went unrecorded at MS2 and MS8b. Likewise, all six species recorded were noted to be present on-Site during each seasonal recording period, although seasonal presence per detector varied for noctule, Nathusius' pipistrelle and brown long-eared bat was not uniform.

5.2.4 Collective bat activity across the Site accounted for 26270 bat passes, equating to an overall BAI of 8.70 calls per hour over the combined survey period. Of monitoring station locations, combined activity was noted to be greatest at MS3 (BAI: 32.59 passes per hour) and MS8a (BAI: 38.30 passes per hour), whilst combined seasonal bat activity was highest during summer (BAI: 13.79 passes per hour).

5.2.5 Relative to other species, common pipistrelle activity was noted to be highest overall (BAI: 7.83 passes per hour), whilst overall BAI for the remaining species accounted for <1 pass per hour on average. Similarly, common pipistrelle activity noted to be consistently higher at each individual monitoring location across the Site, and further noted to be higher per season, relative to other species recorded.

5.2.6 Locations sampled are primarily indicative of edge habitats (e.g., woodland edge) or linear features (e.g., treelines, hedgerows, or wet ditches); bat activity recorded indicates that these habitats function as both foraging and commuting opportunities for bats. Notably, the locations which featured the highest overall activity (MS3 and MS8a) are found in association with woodland and/or wooded linear features and are functionally linked to multiple woodland parcels within the north of the Site.

Figure 8.33: Manual Bat Activity Plan Amendments

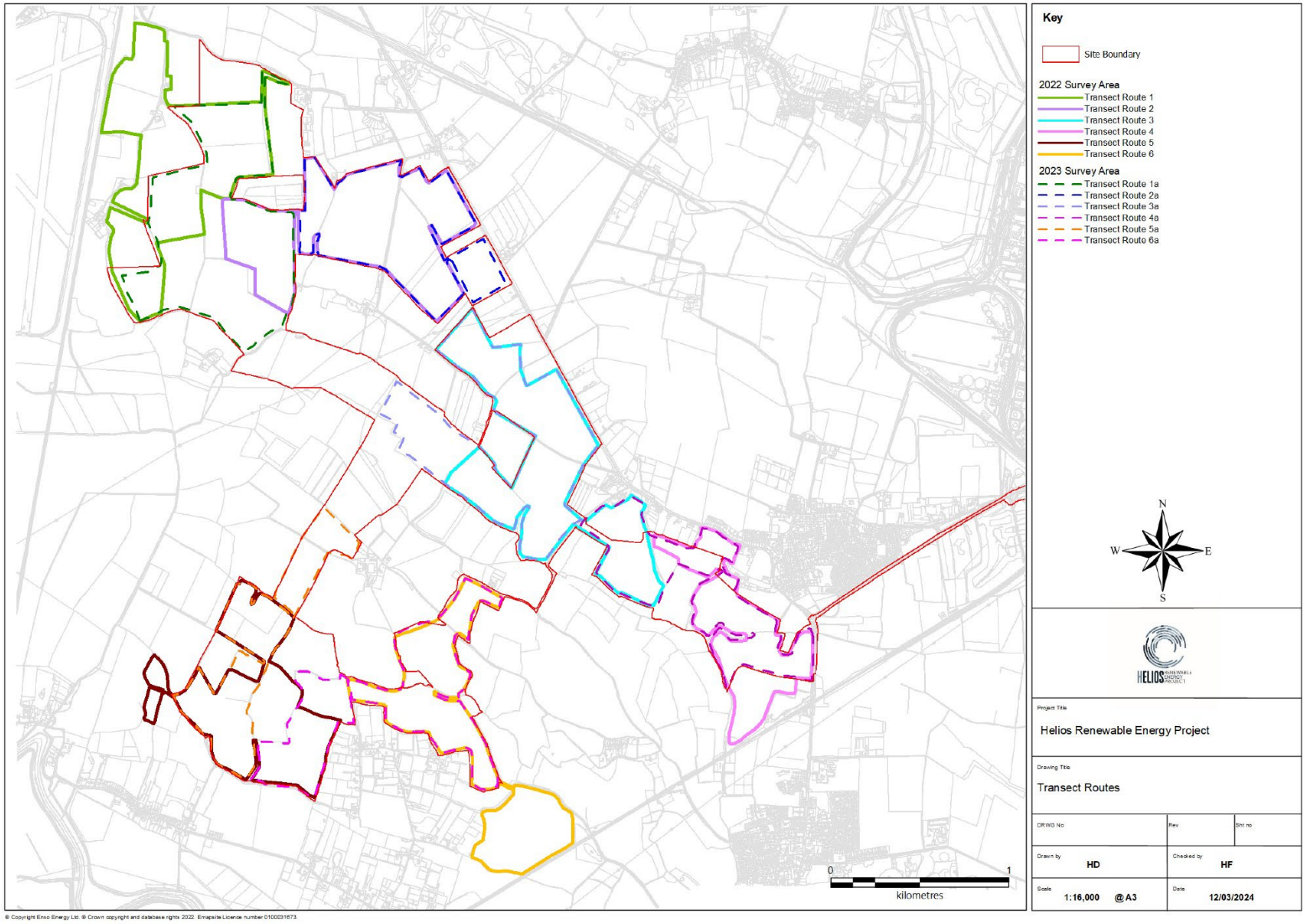


Figure 8.34: Manual and Automatic Bat Activity Survey Plan (Autumn 2022)

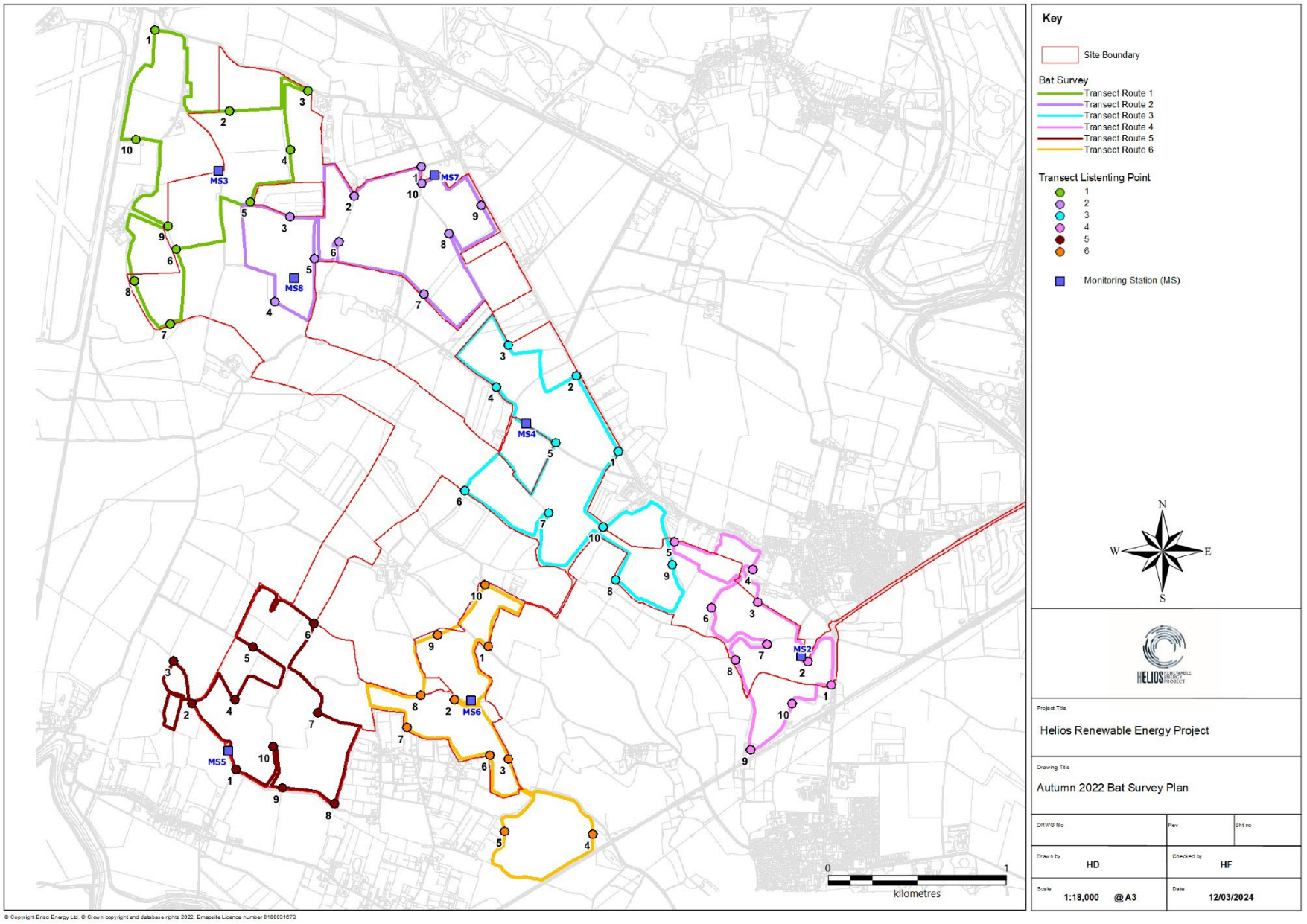


Figure 8.35: Manual and Automatic Bat Activity Survey Plan (Spring and Summer 2023)

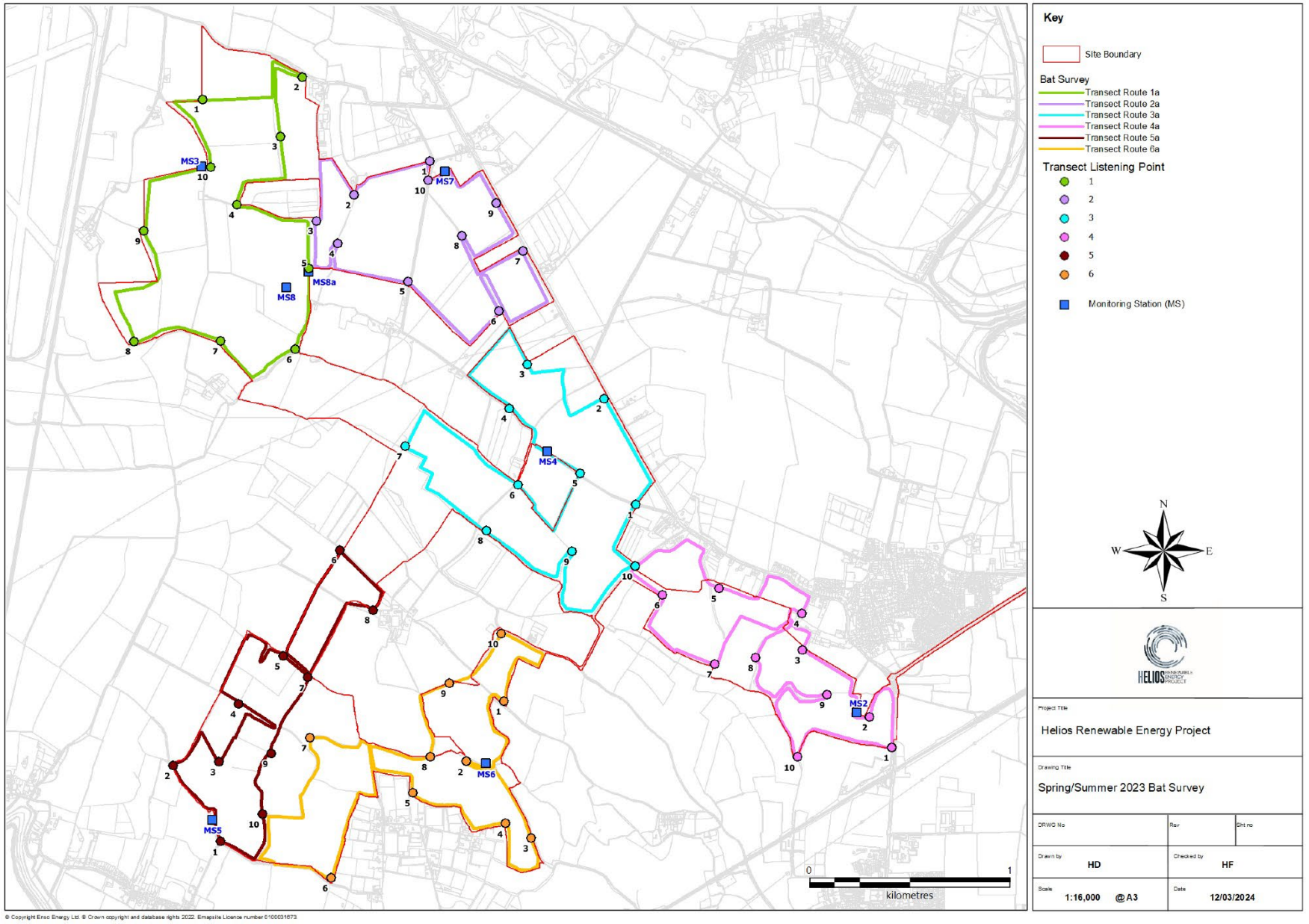


Figure 8.36: Manual Bat Activity Survey Results (Autumn 2022)

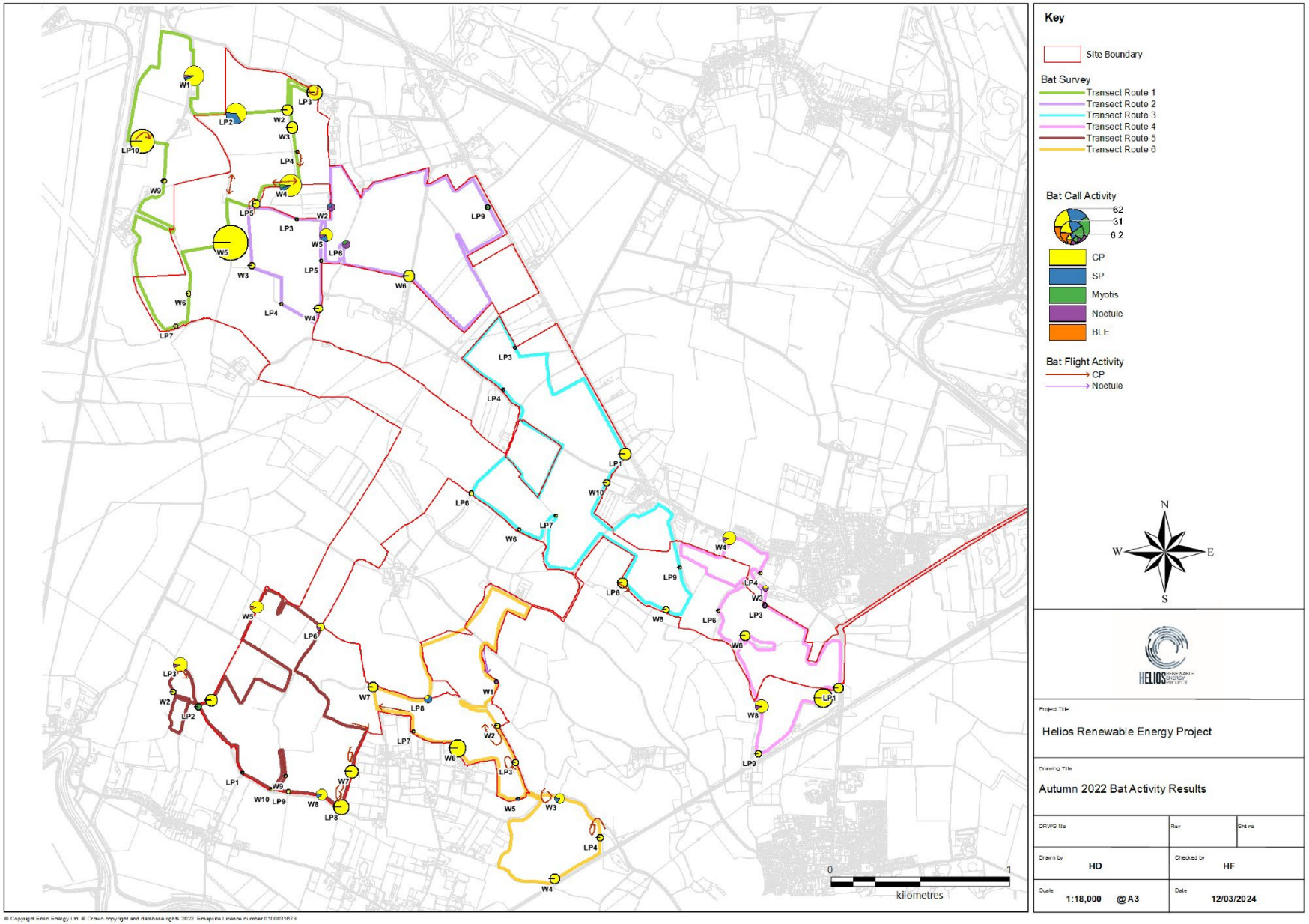


Figure 8.37: Manual Bat Activity Survey Results (Spring 2023)

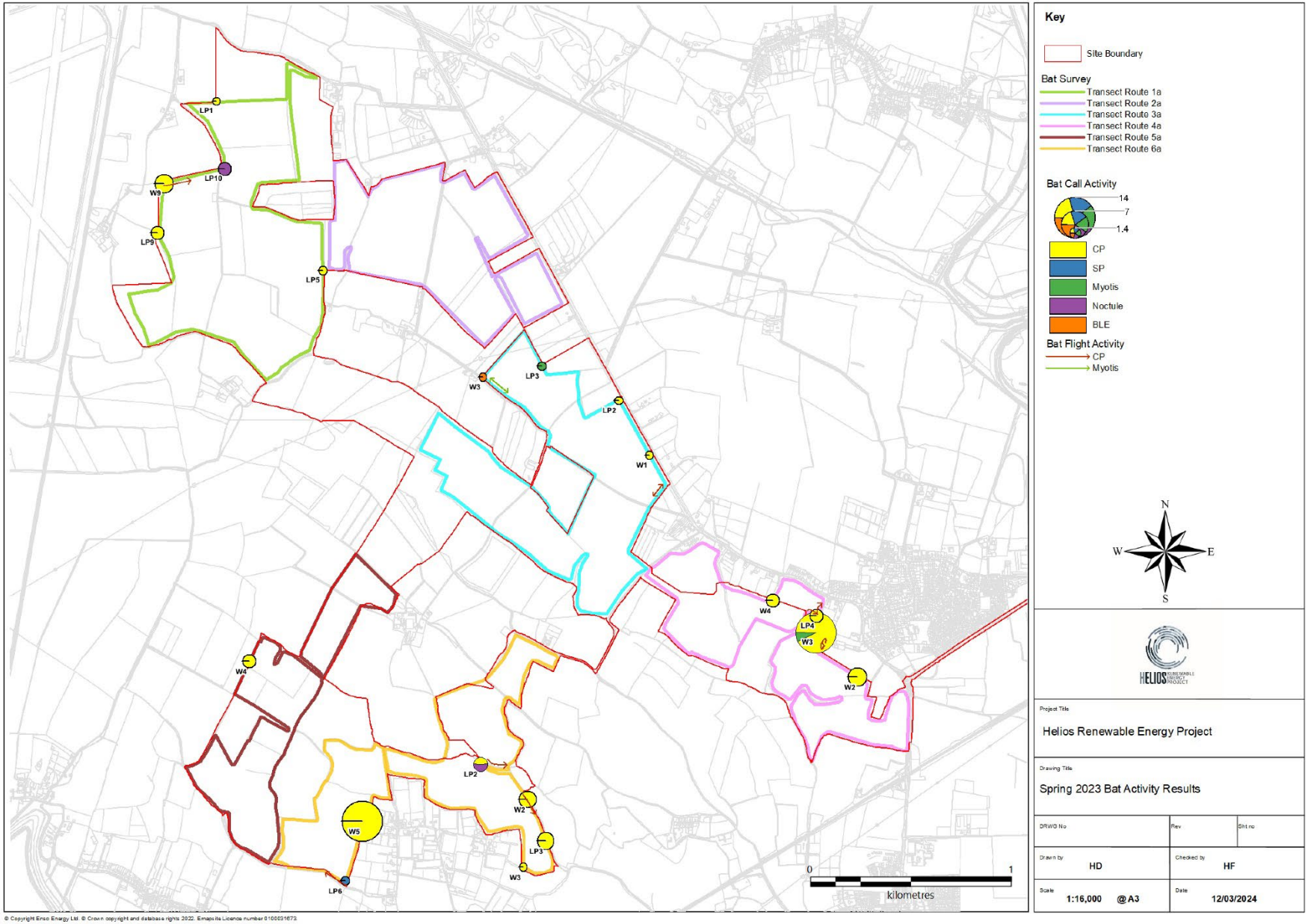
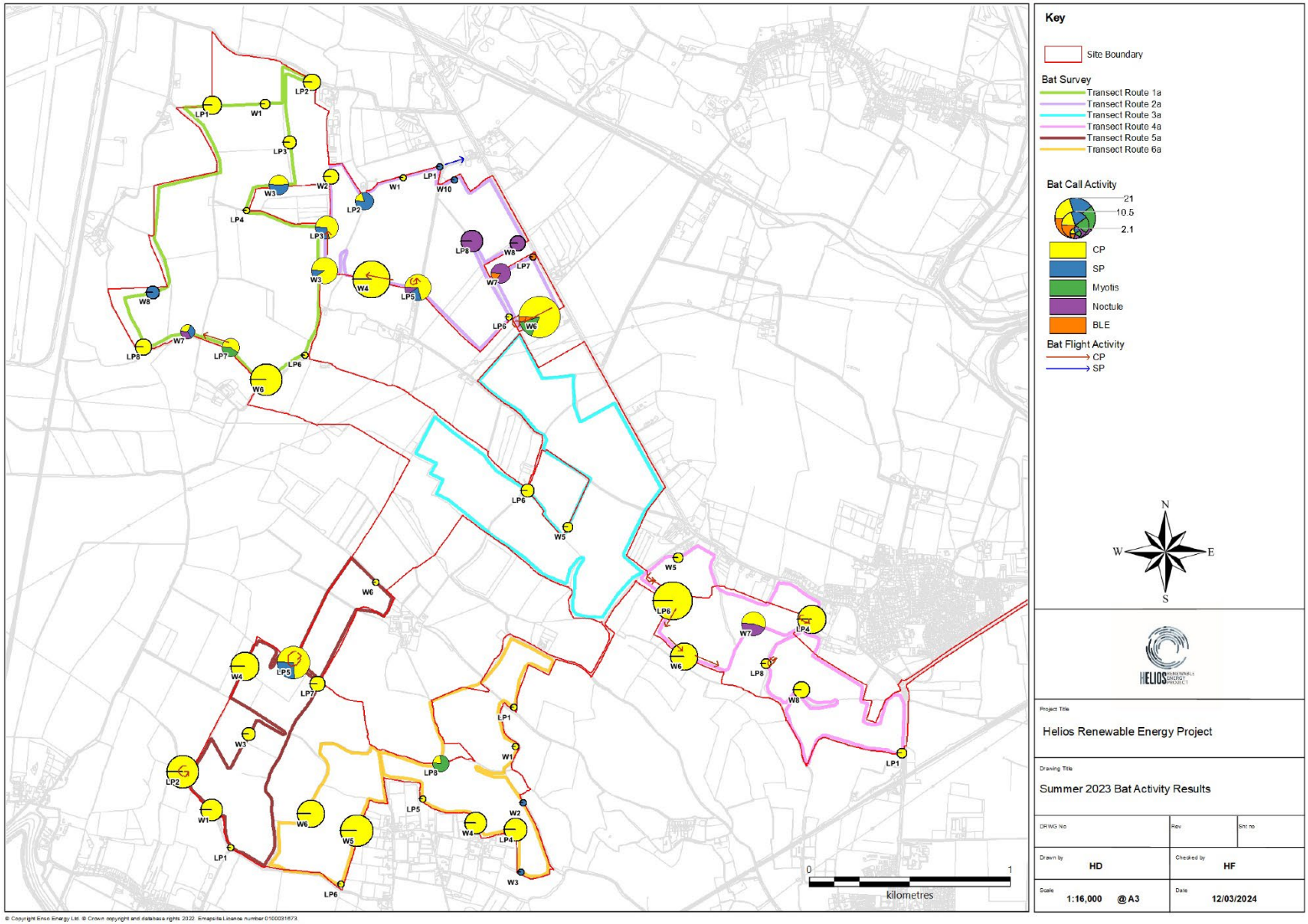


Figure 8.38: Manual Bat Activity Survey Results (Summer 2023)



ANNEX 1: SCIENTIFIC NAMES

Table A1.1 provides scientific names of bat species mentioned within the report.

Table A1.1: *Bat Species Scientific Names.*

Common Name	Scientific Name
Common pipistrelle	*Pipistrellus pipistrellus*
Soprano pipistrelle	*Pipistrellus pygmaeus*
Nathusius' pipistrelle	*Pipistrellus nathusii*
Noctule	*Nyctalus noctula*
Liesler's bat	*Nyctalus leisleri*
Brown long-eared bat	*Plecotus auritus*
Whiskered bat	*Myotis mystacinus*
Natterer's bat	*Myotis nattererii*
Brandt's bat	*Myotis brandtii*
Daubenton's bat	*Myotis daubentonii*

ANNEX 2: WEATHER CONDITIONS

Table A2.1 below provides weather conditions for Bat Activity Survey periods during automatic Activity Surveys. Text in **red** highlights unsuitable weather.

Table A2.1: *A summary of weather conditions applicable during automatic activity surveys.*

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)[16]
21/09/2022	15	0	2.78
22/09/2022	16	0.7	2.78
23/09/2022	14	0	3.06
24/09/2022	13	0	5.00
25/09/2022	14	0	**6.11**
26/09/2022	11	0.1	4.72
27/09/2022	10	0	5.00
28/09/2022	11	0.2	4.72
29/09/2022	13	0	1.94
30/09/2022	12	0.2	**6.11**
01/10/2022	13	0	**6.11**
02/10/2022	13	0	3.06
03/10/2022	16	0	3.61
04/10/2022	18	0	4.72
05/10/2022	12	0	**8.33**
06/10/2022	15	0	**6.39**
07/10/2022	13	0	**5.83**
08/10/2022	13	0	1.94
09/10/2022	15	0	**7.50**
10/10/2022	10	0	3.06
11/10/2022	10	0	3.06
25/04/2023	**4**	8	**5.56**
26/04/2023	**4**	0.8	4.17
27/04/2023	**9**	0	5.00
28/04/2023	14	0	3.33
29/04/2023	12	0.1	5.00
30/04/2023	13	0.2	3.89
01/05/2023	14	0	3.89
02/05/2023	11	0	4.44
25/05/2023	12	0	2.50

[16] Converted from km/h

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)[16]
26/05/2023	12	0	3.33
27/05/2023	15	0	2.50
28/05/2023	10	0	3.33
29/05/2023	10	0	2.78
30/05/2023	11	0	4.17
31/05/2023	10	0	2.78
01/06/2023	10	0	4.44
02/06/2023	10	0	3.33
03/06/2023	10	0	2.50
04/06/2023	10	0	2.78
05/06/2023	11	0	2.78
26/07/2023	15	1.4	4.72
27/07/2023	17	0	3.06
28/07/2023	18	0	3.61
29/07/2023	15	0	**5.28**
30/07/2023	14	0.6	1.67
31/07/2023	14	0.2	2.78
01/08/2023	15	0	0.56
02/08/2023	14	0	**5.56**
03/08/2023	15	8	2.22