BAT SURVEY TECHNICAL REPORT TO INFORM THE PROPOSED KELLYSTOWN WIND FARM, CO. LOUTH

Results of the 2022, 2023, and 2024 bat activity and habitat suitability assessments

Report prepared by Woodrow Sustainable Solutions Ltd part of the APEM Group

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STATEMENT OF AUTHORITY

Bat surveys conducted at the proposed Kellystown Wind Farm site (hereafter referred to as the proposed site) in 2022 and 2023 were undertaken by appropriately experienced staff from Woodrow APEM Group (Woodrow). Surveys and static deployments were supervised and undertaken by specialist bat surveyors including:

Maeve Maher-McWilliams – Associate Director

This report has been reviewed and approved by Maeve Maher-McWilliams, Associate Director with Woodrow. Maeve is an experienced ecologist and has worked for over ten years on complex environmental impact assessments and mitigation strategies for development projects across Ireland, Northern Ireland, and Scotland. Maeve has been involved in projects across several sectors such as renewable energy; linear infrastructure; flood relief schemes and port developments; tourism and recreation; residential, pharmaceutical and data centre developments. She is proficient in Ecological Impact Assessment and Appropriate Assessment.

Qualifications:

BSc (Hons) Biological Sciences. Queen's University Belfast 2008.

MSc Evolutionary and Behavioural Ecology. University of Exeter 2010.

Oisín O Sullivan – Ecologist & Technical Lead on bat surveys

Oisín O'Sullivan is an Ecologist with Woodrow, he co-authored this report and undertook surveys for the project. Oisín has completed a B.Sc. in Ecology and Environmental Biology at University College Cork. His final year thesis involved bat surveys of urban habitats in Cork City. His work as a graduate ecologist with Woodrow was focused on bat data analysis including bat call identification and bat roost/habitat suitability surveys. Oisín has developed a high level of proficiency with Kaleidoscope, Ecobat and BatExplorer, all of which are analysis software used to assess bat calls and activity Since joining Woodrow, Oisín current work involves coordinating, surveying, analysing data, and writing

summary bat activity reports for all onshore wind developments that Woodrow has worked on in the 2021 and 2022 survey seasons. This also involves the use of R to provide data on bat activity relative to weather conditions with the goal of informing curtailment as a mitigation measure. During 2022 Woodrow began undertaking offshore bat surveys including Oisín as a technical lead on these projects. These surveys involve the long-term recording of activity on islands and headlands to record migration events. Oisín is a Qualifying member of CIEEM and holds a license to survey bat roosts from the Department of Culture Heritage and the Gaeltacht DER-BAT-2023-77 and a handling license (C231/2023) issued by NPWS.

Qualifications:

BSc (Hons) Ecology and Environmental Biology. University College Cork 2020.

Frederico Hintze – Ecologist

Frederico Hintze (FH) is an Ecologist with Woodrow, he undertook surveys for the project, and co-authored this report. FH has also authored over 15 scientific publications and sampling event datasets, showcasing his extensive experience and expertise in bat ecology. He holds a B.Sc. in Biology-Geology and an M.Sc. in Ecology from the University of Minho (Portugal), as well as a Ph.D. in Animal Biology from the Federal University of Pernambuco (Brazil). FH's experience with bats began during his undergraduate thesis in 2009. For his master's thesis, he focused on assessing the impact of agricultural dams on bat populations in Northeastern Portugal. During his PhD, FH utilized bioacoustics and species distribution modelling to enhance understanding of the distribution of Neotropical bat species. Subsequently, FH's post-doctoral work led him to the world's largest iron ore mine in Carajás, Pará, Brazil, where he aimed to characterize the vocalizations of Amazonian bats and assess the impacts of mining on bat populations. He also served as the coordinator of the Bioacoustics Committee at the Brazilian Bat Research Society. Throughout his career, FH has actively participated in more than 10 Environmental Impact Assessment (EIA) projects in Portugal, covering various topics such as dams, wind farms, roads, and transmission lines. He specializes and possesses advanced proficiency in bat data analysis, encompassing bat call identification, bat roost/habitat suitability surveys, and report writing and QA. FH holds a license to survey bat roosts from the Department of Culture Heritage and the Gaeltacht (DER-BAT-2023-76) and a handling license (C229/2023) issued by NPWS.

Qualifications:

BSc in Biology-Geology. University of Minho - Portugal 2011.

MSc in Ecology. University of Minho - Portugal 2014.

PhD in Animal Biology. Federal University of Pernambuco – Brazil 2020.

Patrick Power – Assistant Ecologist & Bat equipment lead.

Patrick Power is an Assistant Ecologist with Woodrow, undertook surveys for the project, assisted with data analysis for this project, and co-authored the report. Patrick has completed a BSc in Forestry, BSc (Hons) in land management in Forestry with Waterford Institute of Technology. He is currently doing an MSc in Wildlife Biology and Conservation with Edinburgh Napier University.

His work as a graduate ecologist with Woodrow is focused on bat data analysis including bat call identification and bat roost/habitat suitability surveys. Patrick has developed a high level of

proficiency with Kaleidoscope and BatExplorer, the analysis software used to assess bat calls and activity. Patrick also possesses Reptile, mammal, and habitat surveying skills. Patrick is a student member of CIEEM and currently has a training licence to survey bat roosts from the Department of Culture Heritage and the Gaeltacht DER/BAT 2023-131.

Qualifications:

BSc in Forestry. Waterford Institute of Technology 2014.

BSc (Hons) in Land Management in Forestry. Waterford Institute of Technology 2016.

MSc in Wildlife Biology and Conservation. Edinburgh Napier University. 2021-Present.

Kevin O'Reilly – Graduate Ecologist

Kevin O'Reilly (KOR) is a Graduate Ecologist with Woodrow and undertook surveys for this report. KOR obtained First Class Honours in Business and Law at University College Dublin before training and qualifying as a Solicitor with the Law Society of Ireland. He is currently completing a Masters in Environmental Management and GIS with Ulster University. KOR has also undertaken a number of volunteer projects to gain valuable experience in habitat surveying techniques and knowledge of environmental management and the flora and fauna of protected species in Ireland and abroad. Since joining Woodrow, Kevin has taken part in several bat surveys including static detector deployment and roost surveys. KOR holds a license to survey bat roosts from the Department of Culture Heritage and the Gaeltacht DER-BAT-2023-100.

Qualifications:

BBL. Bachelor of Business and Law, University College Dublin, 2016.

Professional Practice Course I & II, The Law Society of Ireland, 2019.

PgDip, Environmental Management with GIS, Ulster University, 2022.

Meadhbh Costigan – Assistant ecologist

Meadhbh Costigan is an Assistant Ecologist with Woodrow and undertook surveys for this project. She graduated with a BA in Natural Science from Trinity College Dublin (2009) and an MSc in Ethnobotany from the University of Kent (2010). She has worked on conservation projects in Honduras, Canada, Switzerland, and Nepal (2010-2016). She has also spent time working on organic farms in the west of Ireland (2017-2020) and more recently working for a tree planting charity (2021-2022) where she used the Biodiversity Metric to provide recommendations on habitat restoration as part of a local agri-environmental scheme. Since joining Woodrow Sustainable Solutions, Meadhbh has gained experience in mapping (using ArcPro and QGIS), assisting in specialised marsh fritillary surveys, habitat identification (according to Fossitt 2000), carrying out desk studies and contributing to AA's, HRA's, EIA's, and EcIA's and Local Biodiversity Action Plan's. She is a qualifying member of CIEEM and is an elected member of the CIEEM Irish Section Committee.

Qualifications:

BA in Natural Science from Trinity College Dublin. 2009.

MSc in Ethnobotany from the University of Kent. 2010.

Róisín O Connell – Assistant Ecologist

Róisín O'Connell is an Assistant Ecologist with Woodrow and undertook surveys for this report. Róisín has completed a B.Sc. in Environmental Science at Atlantic Technological University in Sligo. Her final year thesis involved carrying out aquatic macrophyte surveys of lough Doon in County Leitrim. Her work as a graduate ecologist with Woodrow is focused on bat data analysis including bat call identification and bat roost/habitat suitability surveys. Róisín has developed a high level of proficiency with Kaleidoscope and BatExplorer, the analysis software used to assess bat calls and activity. Róisín also possess marine and freshwater habitat survey skills from her time studying at ATU. Since joining Woodrow, Róisín has authored multiple bat activity reports and coordinated the bat surveys conducted at Woodrow in 2022. Róisín is a Qualifying member of CIEEM and holds a license to survey bat roosts from the Department of Culture Housing. Local Government and Heritage DER/BAT 2022-167.

Qualifications:

BSc (Hons) Environmental Science. Atlantic Technical University Sligo 2020.

Louise Gannon - Graduate Ecologist

Louise Gannon is a Graduate Ecologist with Woodrow and assisted with data analysis for this project. Louise has completed a B.Sc. in Environmental Science. Her main experience lies in carrying out emergence/re-entry bat survey and activity transect surveys for bats, deployment of static bat detectors and reporting on the same. She also carries out bat call analysis using Kaleidoscope and BatExplorer, the analysis software used to assess bat calls and activity. Louise was also developing expertise in conducting roost searches of buildings, bridges, and trees under the supervision of licenced members of Woodrow staff.

Qualifications:

BSc (Hons) Environmental Science. Atlantic Technical University Sligo 2020.

Bruno Mels - Graduate Ecologist

Bruno Mels (BM) is a Graduate Ecologist at Woodrow since September 2022 and assisted with GIS and data analysis for the project. He obtained a MSc in Conservation Biology at the University of Antwerp and worked for several conservation organisations in South-Africa and Seychelles after his studies. His main duties there were to monitor the breeding success of shorebirds and the ensure the protection of endangered species such as the green turtle and the Aldabra giant tortoise. Besides being a biologist, BM is also a self-taught digital illustrator. He can create infographics and animations and, among others, has designed several information boards for UNESCO world heritages sites in the Seychelles.

Qualifications:

BSc in Biology. University of Gent – Belgium 2013.

MSc in Biology: Biodiversity: Conservation & Restoration. University of Antwerp – Belgium 2015.

CONTENTS

1 INTRODUCTION

1.1 The proposed site

The proposed site at Kellystown Wind Farm is located *c.* 1 km west of Kellystown village and *c.* 9 km west of Clogherhead, Co. Louth. Kilsaran Gallstown Quarry is located immediately north of the proposed site. Habitats within the lands mainly comprise scrub (hawthorn and gorse spp.), mixed commercial coniferous forestry (larch and spruce), and grassland habitats, acidic grassland, and improved grassland. There is a linear area of mature woodland, mainly beech, in the southern portion of the proposed site and a waterbody, Drumshallon Lough, in the central portion of the site with a small stream, Drumshallon Lough Stream, flowing east-southeast from it.

1.2 Protected status of bats in Ireland

Bats are protected by law in the Republic of Ireland under the Wildlife Act 1976 and subsequent amendments (2000 and 2010). Under the Wildlife Act, it is an offence to intentionally disturb, injure or kill a bat or disturb its resting place.

NPWS (2021a & 2021b) guidelines outline the further legal protection afforded to species listed on Annex IV of the of the Habitats Directive (92/43/EEC), as required by Articles 12, 13 and 16. The Habitats Directive is transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations, 2011-2021 (Habitats Regulations) and this legislates for requirements in relation to Strict Protection of animals listed on Annex IV of the Habitats Directive, which are set out in Regulation 51, with Regulation 54 pertaining to derogation licences, including Regulation 54 A when the Minister is applying for a derogation.

All species of bat are listed on Annex IV of the EU Habitats Directive (1992). The system of Strict Protection is applied across the entire natural range of Annex IV species, even outside of protected sites. As set out in Regulation 51, carrying out of any work with the potential to capture or kill any specimen of a Strictly Protected species, or to disturb these species, and for which a derogation licence has not been granted, may constitute an offence under Regulation 51 of the Habitats

Regulations. Furthermore, any action resulting in damage to, or destruction of, a breeding or resting place of an animal may constitute an offence unless a derogation licence has been granted. This action does not need to be deliberate, i.e., places onus on demonstrating due diligence. Breeding and resting places are protected even when the animals are not using them, once there is a high probability that they will return. Planning authorities may refuse planning permission solely on grounds of the predicted impact on protected species like bats.

Ireland has ratified two international conventions, which afford protection to bats amongst other species. These are known as the 'Bern' and 'Bonn' Conventions. The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982) exists to conserve all species and their habitats, including bats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries, which covers certain species of bat.

1.3 Outline of the scope of works

In order to comply with the requirements of the EU Habitats Directive 1992 and the EC Habitats Regulations 2011, wind farm applications in Ireland need to be assessed as to their potential impact on bat populations. To inform the impact assessment at the proposed site a range of bat surveys were undertaken including a desk-based study and field surveys. The appropriate methodological approach for assessing bat population on proposed wind farm sites is Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (Scottish Natural Heritage (SNH) *et al.*, 2019, as updated NatureScot *et al.*, 2021). Hereafter these guidelines will be referenced as NatureScot *et al.* (2021).

This report was written to serve as a technical results report to be included as an appendix of an Environmental Impact Assessment Report (EIAR) for the proposed Kellystown Wind Farm development. It provides details of methodologies and survey effort for the suite of bat surveys conducted for the proposed development, including tabulated results, maps and charts, as well as reports from roost suitability surveys, bat activity surveys and seasonal static bat detector surveys. These surveys highlight baseline bat populations and habitat suitability of the proposed development.

In summary, bat surveys undertaken are in compliance with NatureScot *et al.* (2021) guidelines. Static bat recording equipment was deployed three times at selected locations representative of the proposed turbine layout for the proposed site. The three deployments each lasting a minimum of 10 nights and covered the spring (April 13th – April 26th 2022), summer (June 15th – 30th 2022) and autumn (August 24th – September 7th 2022) active seasons for bats and were undertaken in conjunction with continuous monitoring of climatic conditions on the site to ensure recording windows were inline within compliant weather parameters. Upon notification of the proposed substation location at the site, a supplementary static bat recording equipment was deployed from August 16th to October 10th 2023, and strategically positioned at the specified location. Due to the single prolonged deployment of this static detector, it is referred to as a permanent detector deployment throughout the report. In addition, informed by an assessment of potential bat roost features within the proposed wind farm site, manual roost emergence/re-entry surveys and bat activity transects were undertaken in 2022. Subsequently, prompted by significant findings in 2022 at the tree line within the southeastern sector of the wind farm site, a series of four dusk/dawn

swarming surveys were completed between August 16th and October 10th 2023, specifically timed to coincide with the bat swarming season. All observations recorded during surveys undertaken in 2022 and 2023 contextualise how bats utilise the proposed wind farm site.

1.3.1 Proposed layout

The proposed development assessed within this technical appendix comprises of five turbines (6-8MW each) in the wind farm located within the administrative area of County Louth (hereafter referred to as the 'Site'), approximately 1 km west of Kellystown village and 9 km west of Clogherhead. Habitats within the lands mainly comprise scrub (hawthorn and gorse species), mixed commercial coniferous forestry (larch and spruce), and grassland habitats including acidic grassland, and improved grassland. There is a linear area of mature woodland, mainly beech, in the southern portion of the proposed site and a waterbody, Drumshallon Lough, in the central portion of the site with a small stream, Drumshallon Stream that flows east-southeast from the lake (Figure 1). Kilsaran Gallstown Quarry is located immediately north of the proposed site.

In summary, the proposed development comprises the following main components:

- Five wind turbines with an overall tip height of 180 m, and all associated ancillary infrastructure;
- Construction of a 110 kV electricity substation and installation of underground electricity line between the proposed substation and the existing overhead electricity line; and
- Comprehensive site development, excavation, construction, and landscaping works, including the provision of site drainage infrastructure, along with any associated and ancillary tasks.

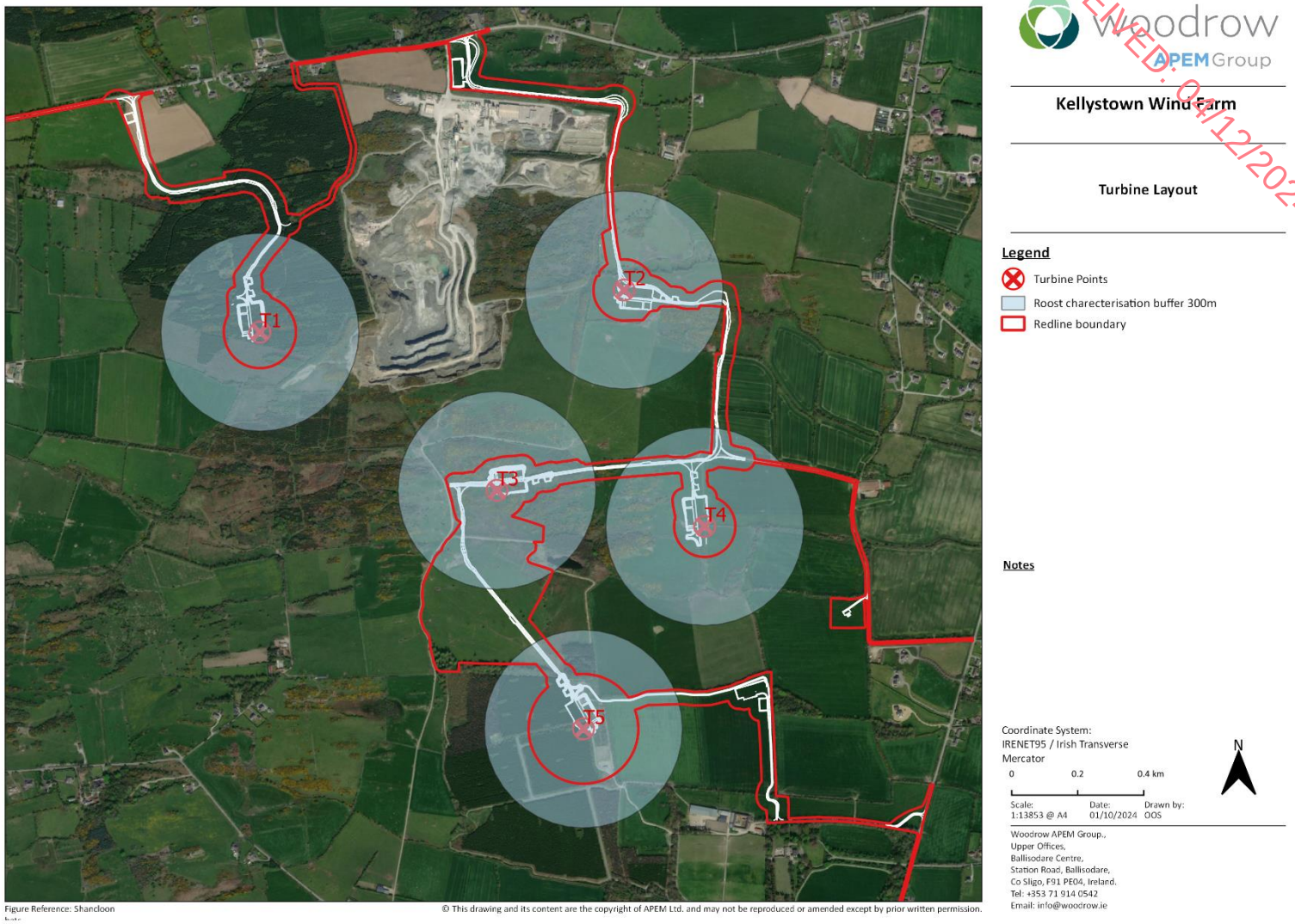

Figure 1. Proposed turbine locations and 300 m roost characterisation buffer.

2 METHODOLOGY

Baseline surveys for bats at the proposed Kellystown Wind Farm site aim to identify the species occurring within the proposed development area, and to provide an understanding of how local bat populations utilise the area in terms of density of use for foraging, roosting (maternity and hibernation), social interactions and commuting.

Bat surveys were conducted by Woodrow APEM group at Kellystown Wind Farm over the 2022 active bat season and 2023 swarming season to ensure compliance with the most recently published guidelines pertaining to bat surveying, impact assessment and mitigation for bats at onshore wind turbines (NatureScot *et al.*, 2021). This guidance document supersedes some aspects of the previous guidelines (Collins, 2016 updating Hundt, 2012 & Bat Conservation Ireland (BCI), 2012) and requires a site-by-site approach to survey design, with the only prescriptive element being the positioning, number and duration of static bat detector deployments, as well as the strongly recommended continual monitoring of site-specific weather data on rainfall, temperature and wind speeds.

As a minimum, the latest NatureScot *et al.* (2021) guidelines require three deployments of static detectors aimed at covering spring (April to May), summer (June to mid-August) and autumn (mid-August to October), each with a minimum deployment period of 10 nights (within compliant weather parameters). Seasonal deployments of static detectors are set out at all potential turbine locations for proposals comprising ten or less turbines, with a third of any additional locations also covered up to a maximum of 40 detectors. Compliant weather conditions are defined as temperatures at $\geq$ 8°C at dusk, maximum ground level wind speed of 5 m/s and no, or only very light, periodic rainfall.

Additional requirements of the NatureScot *et al.* (2021) guidelines include swarming surveys, and winter roost inspections if potential hibernation roosts are identified. Transect and/or vantage point surveys are seen as methods used to complement the static detector surveys, with applicability being discretionary, based on professional judgement, and on a case-by-case site-specific basis.

While Collins (2023) represent the latest publication of the BCT guidelines, it was released during the final phase of the 2023 surveys. Consequently, consistency was maintained by following Collins' (2016) framework.

2.1 Desk study

A desk-based review of habitat availability in the environs of the proposed development, and the available bat data was used to inform the scope of the bat surveys required. As recommended by both BCI (2012) and NatureScot *et al.* (2021) the area covered by the desk-based review was extended to 10 km surrounding the wind farm site. The desk-based study included:

- Examining aerial imagery and 6-inch maps to identify potential bat foraging and roosting habitats.
- Lundy *et al.* (2011) provides a high-level assessment of potential habitat suitability for different species of bat occurring in Ireland.

- Review of data received from BCI within 10 km of the wind farm site and the results of Biodiversity Maps report for the 10 km squares covering the site, including species recorded and known roosting sites (NBDC, 2023).

2.2 Roost assessment surveys

The most recent guidelines (NatureScot *et al.*, 2021) recommend that:

"(…) features that could support maternity roosts and significant hibernation and/or swarming sites (both of which may attract bats from numerous colonies from a large catchment) within 200 m plus rotor radius of the boundary of the proposed development should be subject to further investigation".

Turbine specification, as well as locations are regularly altered during the design phase of projects, and as a precaution Woodrow conduct roost assessment surveys within 300 m of the potential build area. Features along the access tracks between turbines (within *c.* 30 m) were also assessed for roost features. Wide reaching roost and foraging habitat assessment of the wind farm site were undertaken during March 2020, as part of a scoping exercise.

Since the new BCT guidance by Collins (2023) was published after the conceptualization and execution of the works described in this report, certain essential assumptions and information needed for implementing the updated assessment criteria were unavailable. Consequently, consistency was maintained assessment criteria described in Collins (2016), which provides guidelines for assessing potential suitability of habitat features as bat roosts and for foraging bats. Collins (2016) allows surveyors to assign Potential Roost Features (PRFs) as negligible, low, moderate, or high status in terms of their potential for bats, see Table 1.

Table 1. Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape, to be applied using professional judgement (Collins, 2016).

Suitability	Description Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	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[a] 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[b]). A tree of sufficient size and age to contain PRFs but with none seen from the	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, *i.e.* not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such

Suitability	Description Roosting Habitats	Commuting and Foraging Habitats
	ground or features seen with only very limited roosting potential[c].	as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[a] 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).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland, or water.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, treelined watercourses and grazed parkland. Site is close to and connected to known roosts

[a] for example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.

[b] Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten *et al.*, 2015). This phenomenon requires some research in the UK but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.

[c] This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Based on the features present and the location of the trees or other structures, the potential use of the feature can also be considered, and classified (as in Hundt, 2012):

- Maternity (breeding roost);
- Summer/transitional (to include transitional, occasional, satellite, night and day roosts); and,
- Hibernation roost.

Surveyors initially employed non-invasive external and internal inspection techniques for any building encountered, and trees were assessed from the ground.

Based on the findings of the roost assessment surveys features classed as having moderate to high suitability for bats and/or demonstrating likely occupancy, (e.g., dropping found) were targeted for further bat activity surveys, including dusk emergence/dawn re-entry surveys (Table 2).

Table 2. Potential roost features on site as shown in Figure 5.

PRF ID	Feature	Roost Potential
R01	Building	Moderate
R02	Tree	Low
R03	Multiple veteran trees	Moderate
R04	Tree	Moderate
R05	Tree	Moderate
R06	Tree	High
R07	Tree	Moderate
R08	Tree	Moderate
R09	Building	Low
R10	Tree	Moderate
R11	Tree	Moderate

2.3 Roost emergence/re-entry surveys

There were five dusk emergence and three dawn re-entry surveys completed in 2022. These were typically carried out on the same date as and prior to transect surveys of the site. Dusk bat emergence surveys commenced 30 minutes prior to sunset and concluded 1.5 hours thereafter, while dawn re-entry surveys began 1.5 hours before sunrise and concluded 30 minutes later. Trained observers recorded the occurrence of dusk emergencies and dawn re-entries near potential roosting sites, using the ESRI Survey123 mobile app and hand-held Elekon Batlogger M bat detectors, which enabled the collection of geo-referenced records of bat activity.

Five emergence surveys were carried out at potential roost sites identified as having low to high PRF suitability set out in Collins (2016). Surveys were undertaken on 28th April, 15th June, 30th June, 7th September, and 14th October 2022. See survey details below in Table 3 and Table 4.

Table 3. Survey details of emergence surveys undertaken at the proposed site.

Survey date	Survey time	Location	Weather Conditions	PRF ref.	PRF suitability (Collins, 2016)
28th April 2022	20:35 – 22:20	53.782791, -6.355393	Wind speed: 0 m/s Cloud: 1 Oktas Dry Temp: 8°C	R09	Low suitability - portacabin office building near T07. O. O'Sullivan & P. Power.
15th June 2022	21:43 – 23:25	53.785535, -6.359822	Wind speed: 0 m/s Cloud: 0 oktas Dry Temp: 16°C	R06	High suitability - ash tree adjacent to T05. O. O'Sullivan & P. Power.
30th June 2022	22:01 – 22:31	53.79174, -6.360234	Wind speed: 1 m/s Cloud: 0 Oktas Dry Temp: 15°C	R02	Moderate suitability - ash tree located close to an access track and to a densely vegetated area of scrub and in vicinity to T03. Downgraded to Low. O. O'Sullivan & P. Power.
7th September 2022	19:50 – 21:35	53.785535, -6.359822	Wind speed: 5 m/s Cloud: 6 Oktas Dry Temp: 14°C	R02	High suitability - ash tree located in a mature treeline adjacent to T05. P. Power & T. Regan.
14th October 2022	18:20 – 20:05	53.785535, -6.359822	Wind speed: 1 m/s Cloud: 1 Oktas Dry Temp: 10°C	R02	High suitability - ash tree located in a mature treeline adjacent to T05. O. O'Sullivan & R O'Connell.

Three dawn re-entry surveys were carried out a potential roost sites on 29th April, 1st July and 15th October 2022. Re-entry surveys were undertaken PRFs identified as having low to high suitability set out in Collins, 2023.

Table 4. Survey details of re-entry surveys undertaken at the proposed site.

Survey date	Survey time	Location	Weather Conditions	PRF ref.	
29th April 2022	04:28 – 06:00	53.785535, -6.359822	Wind speed: 0 m/s	R02	Dawn Re-entry: High class potential Ash tree in

Survey date	Survey time	Location	Weather Conditions	PRF ref.	
			Cloud: 0 oktas Dry Temp: 3°C		mature treeline. Adjacent to T05. O. O'Sullivan & P. Power.
1st July 2022	03:30 – 05:15	53.782791, -6.355393	Wind speed: 1 m/s Cloud: 9 Oktas Dry Temp: 14°C	R09	Dawn Re-Entry: Portacabin office building near T07. O O'Sullivan & P. Power.
15th October 2022	06:18 – 08:05	53.785331, -6.358273	Wind speed: 1 m/s Cloud: 1 Oktas Dry Temp: 7°C	R08	Dawn Re-Entry: High class potential lightning struck beech tree. In mature treeline. O O'Sullivan & R O'Connell.

See Appendix 1: Roost survey locations which contains images of the features surveyed.

2.4 Winter roost inspections

SNH Guidelines (SNH *et al*., 2021) recommends that winter roost surveys should also be carried out for any potential hibernation roost within 200 m plus rotor radius of developable area. The survey was conducted on the 22nd February 2022 within the timeframe in which bats would still be hibernating. Surveys involved closer examination of roost potential, identifying signs of roosting and the use of endoscopes, under licence. The features that were inspected are shown on Table 16.

2.5 Bat activity transect surveys

The NatureScot *et al.* (2021) guidance considers the application of transect surveys to be discretionary, with survey requirements designed on a site-by-site basis. Transects are complementary to data collected from static bat detectors; and are important for identifying flight lines and for gaining understanding of bat activity within the survey area. Driven transects can provide useful information on the wider landscape in the vicinity of the proposed development site. If driven transects are undertaken, it is important that appropriate microphones are used and are directed above the vehicle. It is also important to remain at a constant low speed (< 10 km/h). Point counts (of a fixed duration) can be incorporated into transects to survey specific features to provide information on comparative density of use.

Four transects were completed in 2022, survey dates and weather conditions for transects conducted in 2022 are provided in Table 5 with the transect routes illustrated on Figure 6 for survey year 2022.

Field records were made of bat species encountered, number of bat passes, activity was known e.g., foraging, commuting, advertising, travelling direction and approximate height. Temperature and

wind speeds were measured at intervals throughout the survey. Batloggers recorded temperature throughout the surveys.

Table 5. Transect survey details 2022.

Date	Start time	End time	Weather Conditions	Survey type - coverage (surveyors)
28th April 2022	22:22	23:26	Wind speed: 2 m/s Cloud: 1 Oktas Dry Temp: 4°C	Dusk transects: Walked/driven transect coverage of turbine locations from T4 – T6 – T7 and then through the mature deciduous woodland that is adjacent to T5. (P. Power & O O'Sullivan).
15th June 2022	23:26	00:35	Wind speed: 2 m/s Cloud: 4 Oktas Dry Temp: 13°C	Dusk transects: Walked transects coverage of turbine locations from T5 to T7 and then coverage of the woodland where T2 is located. (P. Power & O O'Sullivan).
30th June 2022	23:30	00:43	Wind speed: 1 m/s Cloud: 4 Oktas Dry Temp: 16°C	Dusk transects walked transects coverage of turbine locations from T4 – T3 and then transect coverage of the woodland in the southern side of the site where T2 is located. (P. Power & O O'Sullivan).
7th September 2022	21:37	22:43	Wind speed: 3 m/s Cloud: 4 Oktas Dry Temp:14°C	Dusk transects: Walked transect coverage of the deciduous woodland where the swarming site was located and overage of T5 and T7. (P. Power & O O'Sullivan).

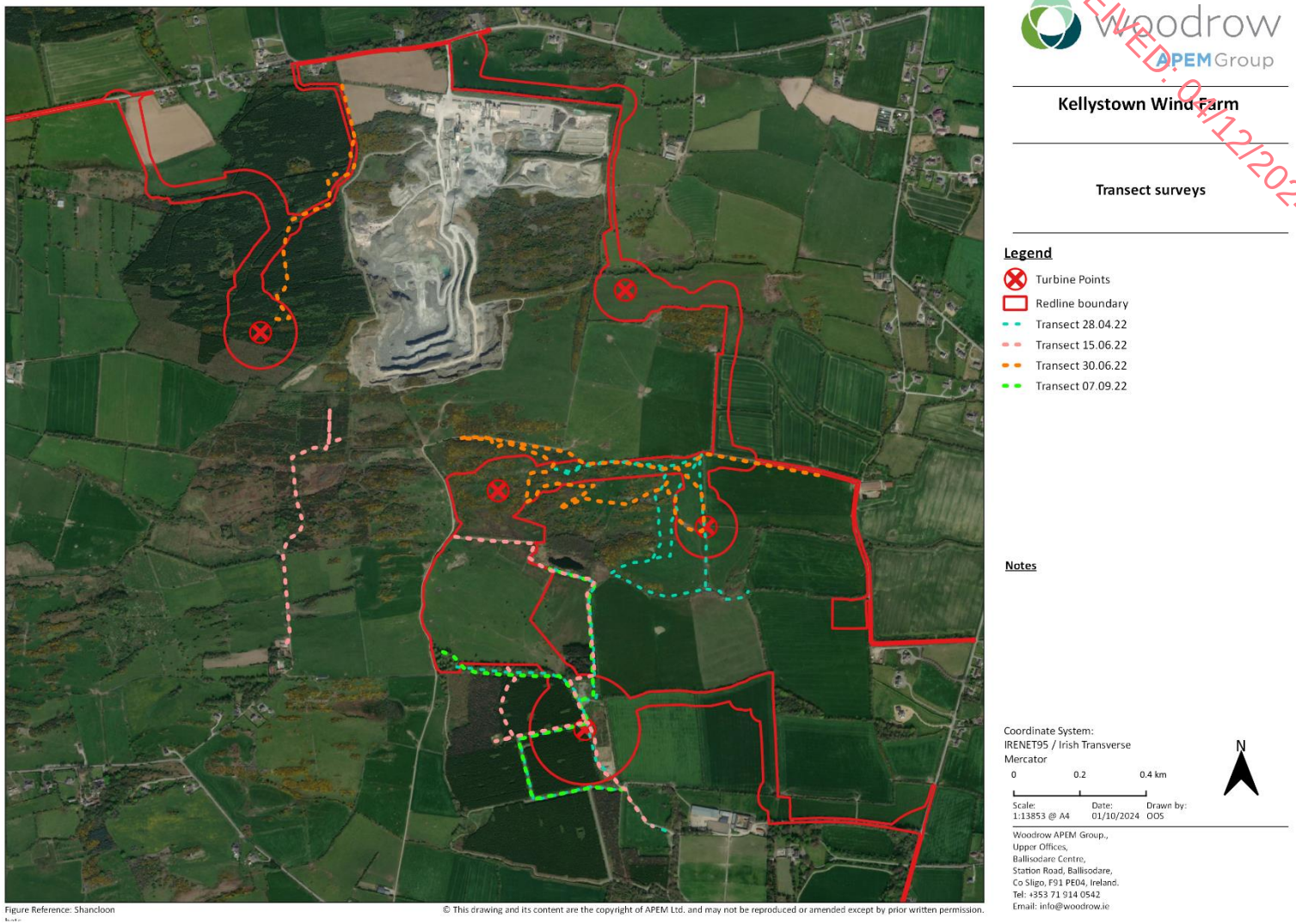

Figure 2. Kellystown transect coverage for 2022.

2.6 Static bat detector surveys

Static bat detectors were deployed to record the types of bat species present and to provide an overview of how bat activity is broadly distributed over the site and specifically at selected turbine locations.

In the 2022 survey year, Wildlife Acoustics Song Meter 4 (SM4BAT-FS) static detectors using SMM-U2 microphone were deployed for the three seasons as required by guidance (NatureScot *et al.*, 2021) within the wind farm site. The location of all static detectors for each deployment in 2022 is shown in The locations for the 2024 deployments are shown in Figure 4

Table 6. The summer deployment had two additional context detector and three context detectors in autumn. These detectors are used to sample specific habitat features rather than turbine locations. This provides further context to bat activity within the site to supplement and provide a comparison for the turbine locations, for example comparing bat activity along habitat features vs bat activity in open areas removed from features, emulating post-construction conditions around turbines. In compliance with NatureScot *et al.* (2021) guidelines, static bat detectors were deployed three times per season over the 2022 active seasons at or in areas adjacent to the proposed turbines and three context detectors at D.02, D.08, and D.09. Weather conditions during the three deployment periods were compliant with NatureScot *et al.* (2021) requirements, that is, 10 nights above thresholds for minimum dusk temperature (8°C), wind speeds below 5 m/s at ground level, and below thresholds for overnight for rainfall.

D.01 was situated in the northwest of the site in a mixed commercial coniferous woodland. D.02 was situated in a semi natural woodland (mixed species of Hawthorn *Crataegus spp.*, Ash *Fraxinus excelsior* and other scrub species) that is adjacent to a woodland that is made up of commercial forest species. Which consists of birch *Betula*, spruce *Picea* and larch *larix*. D.03 was situated in a habitat consisted of gorse *Ulex*. D.04 was situated on the edge of the scrub area in an area of acidic grassland. D.05 was situated on extensively grazed improved grassland. With some fragmented hawthorn trees on the grassland. D.06 was the corner of a tilled filed along the stretch of the stream that flows from Drumshallon lough. D.07 was situated along a break in a stand of mixed commercial forestry. D.08 was situated along the mature treeline that consists of beech *Fagus sylvatica*, ash and hawthorn. This detector is a context detector situated along the edge of the mature treeline that consists of high and moderate class potential. D.09 was another context detector situated adjacent to a track that runs through the woodland in the west part of the site. This context detector is situated on a hawthorn tree. The final detector D.10 was situated in the new location for T02, this is situated in a semi natural stand of tree and mixed scrub.

In the 2023 survey year, a Wildlife Acoustics Song Meter mini Bat (SMmini-Bat) static detector was deployed at the designated location for the proposed substation. This detector was deployed on the 16th August attached to an ash tree situated in the hedgerow between two improved agricultural grassland fields, one of which had undergone slurry spreading. It served as a permanent monitoring device and was in place until it was collected on the 10th October (Table 7).

In the 2024 survey year, four locations were surveyed using Wildlife Acoustics SM4BAT-FS detectors. Three deployments were carried out in spring, summer, and autumn each meeting a minimum recording time of 10 nights of compliant weather. Locations, run times, and unit numbers are shown in (Table 8). Three of the detectors were deployed to gather data on turbine movements (T2, T3,

and, T4). D.11 was situated in the northeast of the Site and was placed in an improved grassland approximately 40 m from the nearest hedgerow to the north. D.12 is placed in an area of gorse and hawthorn scrub in an of acidic grassland. D.13 is situated on a stone wall running between an open area adjacent to gorse and hawthorn and a tilled field. Sub.02 was deployed at an alternative substation location. It was placed along a hedgerow with yelled fields to the north and improved grassland to the south. There is a small stand of woodland 54 m south of this detector location.

See Appendix 3: Static Detector Locations 2022 and 2023 which contains images of the detector locations and **Error! Reference source not found.** for the locations on a map. The locations for the 2024 deployments are shown in Figure 4

Table 6. Static detector deployment locations 2022.

Location code	Longitude	Latitude	Spring deployment		Summer deployment		Autumn deployment	
			Unit number	Run Time (min)	Unit number	Run Time (min)	Unit number	Run Time (min)
D.01	-6.3685	53.79531	WSS052	8415	WSS033	7612	WSS027	10080
D.02	-6.3676	53.79219	WSS035	8415	WSS031	7612	WSS062	10080
D.03	-6.3611	53.79168	WSS038	8415	WSS053	7612	WSS064	10080
D.04	-6.3524	53.7905	WSS060	7910	WSS032	7612	WSS038	10080
D.05	-6.3597	53.78717	WSS037	8415	WSS037	7612	WSS025	n/a
D.06	-6.3489	53.78749	WSS053	8415	WSS029	7612	WSS035	7990
D.07	-6.3564	53.78334	WSS030	8415	WSS025	7612	WSS059	10080
D.08	-6.3603	53.78553	n/a	n/a	WSS027	7612	WSS060	10080
D.09	-6.3693	53.79067	n/a	n/a	WSS030	7612	WSS053	10080
D.10	-6.3719	53.79097	n/a	n/a	n/a	n/a	WSS061	10080

Table 7. Static detector deployment locations 2023.

Location code	Longitude	Latitude	Unit number	Run Time (min)
Sub.01	-6.3437	53.78167	WSS083	18943

Table 8 Static detector deployment locations 2024

Location code	Longitude	Latitude	Spring deployment		Summer deployment		Autumn deployment	
			Unit number	Run Time (min)	Unit number	Run Time (min)	Unit number	Run Time (min)
D.11	-6.35391	53.79574	WSS093	12833	WSS051	8220	WSS040	10399
D.12	-6.36014	53.79032	WSS103	12833	WSS081	8220	WSS070	10399
D.13	-6.35053	53.78932	WSS029	12833	WSS054	8220	WSS058	10399
Sub.02	-6.34783	53.78521	WSS040	12833	WSS082	8220	WSS078	10399

2.7 Swarming survey

According to the NatureScot *et al.* (2021) guidelines, the use of swarming surveys is discretionary and should be tailored to individual site characteristics. In response to significant foraging and social activity from the 2022 static detector survey and the identification of significant bat roosting features at the southern tree line (D.08), a sequence of four dusk (Table 9) and four dawn (Table 10) swarming surveys were conducted. These surveys were deliberately scheduled next to those roosting features between August and October 2023 to coincide with the bat swarming season. Dusk swarming surveys commenced 30 minutes prior to sunset and concluded 1.5 hours thereafter, while dawn surveys began 1.5 hours before sunrise and concluded 30 minutes later. These surveys were undertaken using Elekon Batlogger M bat detectors to collect geo-referenced records of bat activity, which were then analysed using BatExplorer. Additionally, an IR camera was placed to record possible bat emergences or re-entries and other important events next to the roosting features observed.

Table 9. Survey details of dusk swarming surveys undertaken at the proposed site.

Survey date	Start time	End time	Location	Weather Conditions
16th August 2023	20:40	22:25	53.78532, -6.35811	Wind speed: 0 m/s Cloud: 5 Oktas Dry Temp: 17°C
12th September 2023	19:40	21:25	53.785465, -6.359645	Wind speed: 1 m/s Cloud: 2 oktas Dry Temp: 15°C
02nd October 2023	18:45	20:30	53.785518, -6.359665	Wind speed: 0 m/s

Survey date	Start time	End time	Location	Weather Conditions
				Cloud: 7 Oktas Dry Temp: 14°C
09th October 2023	18:30	20:15	53.785522, -6.359791	Wind speed: 0 m/s Cloud: 3 Oktas Dry Temp: 17-19°C

Table 10. Survey details of dawn swarming surveys undertaken at the proposed site.

Survey date	Start time	End time	Location	Weather Conditions
17th August 2023	04:29	06:15	53.78557, -6.359863	Wind speed: 1 m/s Cloud: 0 Oktas Dry Temp: 12°C
13th September 2023	05:20	07:10	53.785325, -6.358123	Wind speed: 2 m/s Cloud: 0 oktas Dry Temp: 10°C
03rd October 2023	05:59	07:44	53.785335, -6.358169	Wind speed: 4 m/s Cloud: 0 Oktas, mist Dry Temp: 10°C
10th October 2023	06:15	08:00	53.785362, -6.358048	Wind speed: 3 m/s Cloud: Oktas Dry Temp: 16°C

2.8 Monitoring climatic of conditions

Monitoring climatic of conditions was undertaken through the deployment of an on-site fully automated weather station with 3G connectivity. See Appendix 2: Weather Data.

The Davis Vantage Vue wireless integrated sensor suite weather station deployed, provided data on a real-time basis. This allows weather station functionality to be checked daily during the survey season and for action to be taken if a station fails or there are concerns regarding the data. This obviates the need for a second (backup) weather station. The weather station collected the full range of weather data, including temperature, wind speed and rainfall, which allows surveyors to

determine whether deployments nights were compliant with the prescribed weather parameters (≥ 8°C at dusk, max. ground level wind speed of 5 m/s and minimal rainfall) (NatureScot *et al.*, 2021).

Deployment periods can then be adjusted to ensure 10 nights of compliant data are captured. In addition, site specific weather data can be useful for investigating the recorded patterns of site usage by bats, for instance exposed, open sites can receive an influx of foraging bats during nights that are warm and relatively still, especially towards the end of the summer and into the autumn, as bats disperse from maternity roosts (Woodrow per. obs.).

2.9 Calibration and testing of recording equipment.

Calibration and testing of recording equipment is required by the NatureScot *et al.* (2021) guidelines, and as a standard operating procedure Woodrow have a stringent schedule of testing all bat recording equipment prior to and after deployment in the field. Checks are logged in excel, providing an audit trail to ensure that all data can be relied on and form a robust and defendable data set. Unique numbering of static detectors, SD cards and microphones allows for reverse checking, if any issues arise, e.g., following a microphone failure. Checks undertaken include pre-deployment device setting including battery charge levels and pre-/post-deployment microphone sensitivity tests.

2.10 Acoustic Analysis

For data collected using SM4BAT-FS and SMMini-Bat, analysis of sound recordings was undertaken using Kaleidoscope software to confirm species (or genus for Myotis species or Pipistrelle species social calls) and exact number of bats passes for each transect survey or deployment. For data collected using the Batloggers, analysis of sound recordings was undertaken using BatExplorer software. This analysis aimed to confirm species (or genus for Myotis species) and bat activity exact number of bat passes for each deployment and transect survey or deployment.

All sounds files were run through Kaleidoscope Pro's auto-identification, and then manual verification was undertaken by Woodrow operatives. Russ (2012) and Middleton *et al.* (2014) were used to aid in the species identification of bat calls during data analysis. Recordings of Common and Soprano Pipistrelles for which Kaleidoscope determined a match ratio of 100% (meaning every recorded call matched the known species call parameters) were deemed accurate to a degree that did not necessitate manual verification. Nevertheless, all other automatically identified bat species were subjected to manual check. Recordings automatically identified as noise were determined to fall outside of the recording parameters for the survey and were classified as noise.

Bat activity was measured by the number of bat passes recorded. Bat passes are commonly used as a metric for bat activity and determine species presence (Kerbiriou *et al*., 2019). Therefore, a bat pass was defined as the detection of one or more bat calls from a single species within a 15 second sound file. Recordings in which multiple species (or individuals) were recorded were split into separate bat passes. mean bat passes per hour were generated and visualised in R as boxplots.

Bat activity levels were assessed using an adaptation of the criteria applied by Matthews *et al.* 2016 in a study examined the risk of European bats to wind energy developments in the UK. The bat activity level scale used in this report (Table 11) has been adapted to be applied to mean bat passes per hour. This adaptation uses an average figure of 10 hours per night across the active bat season to determine the cut-off of 'high' activity.

Table 11. Activity level classification as per Mathews *et al.* 2016 adapted to hourly activity levels.

Classification	Bat passes per hour
Low	<2
Moderate	2 - 4
High	≥5

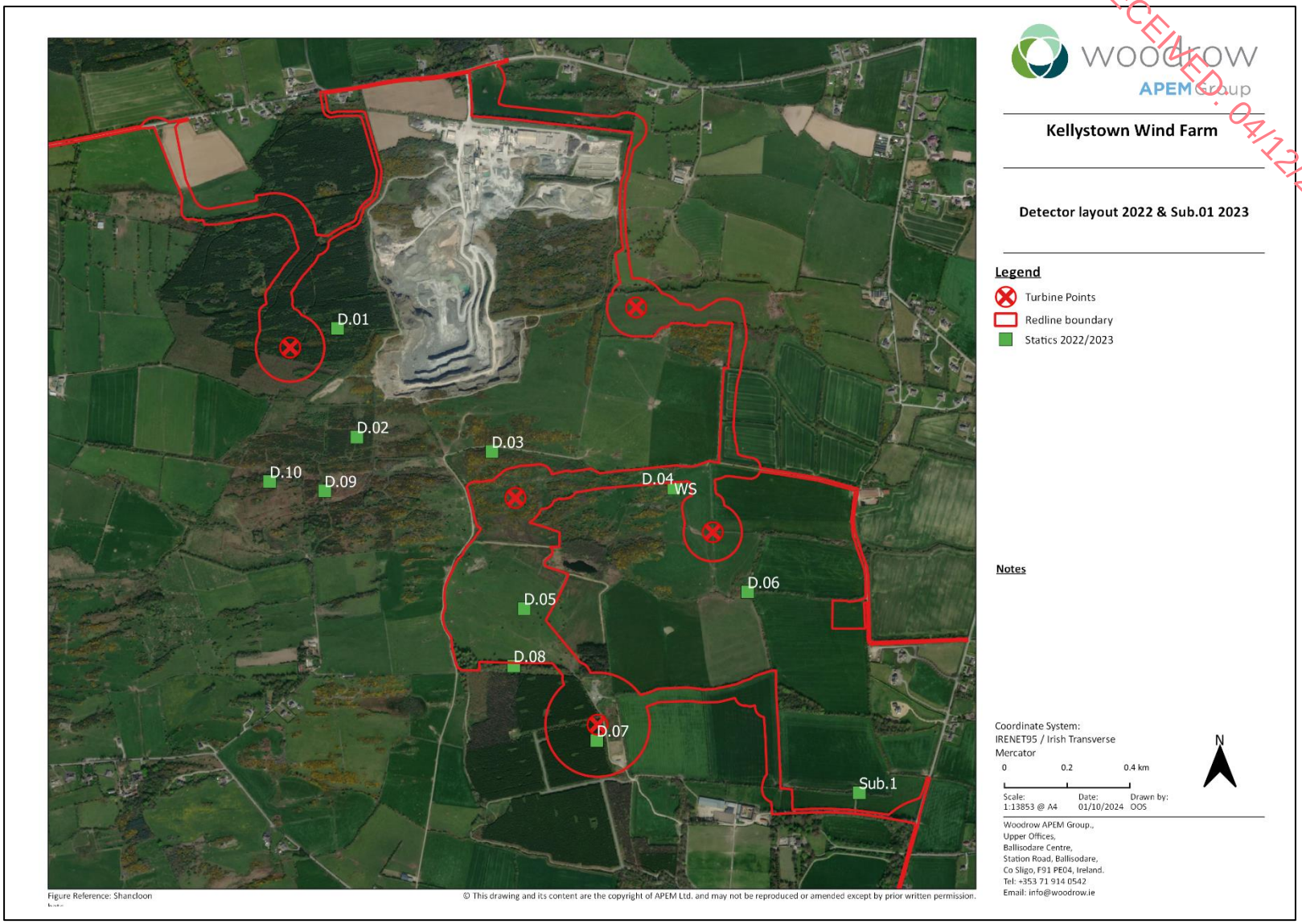

Figure 3. Kellystown detector locations 2022 and 2023 substation detector**.**

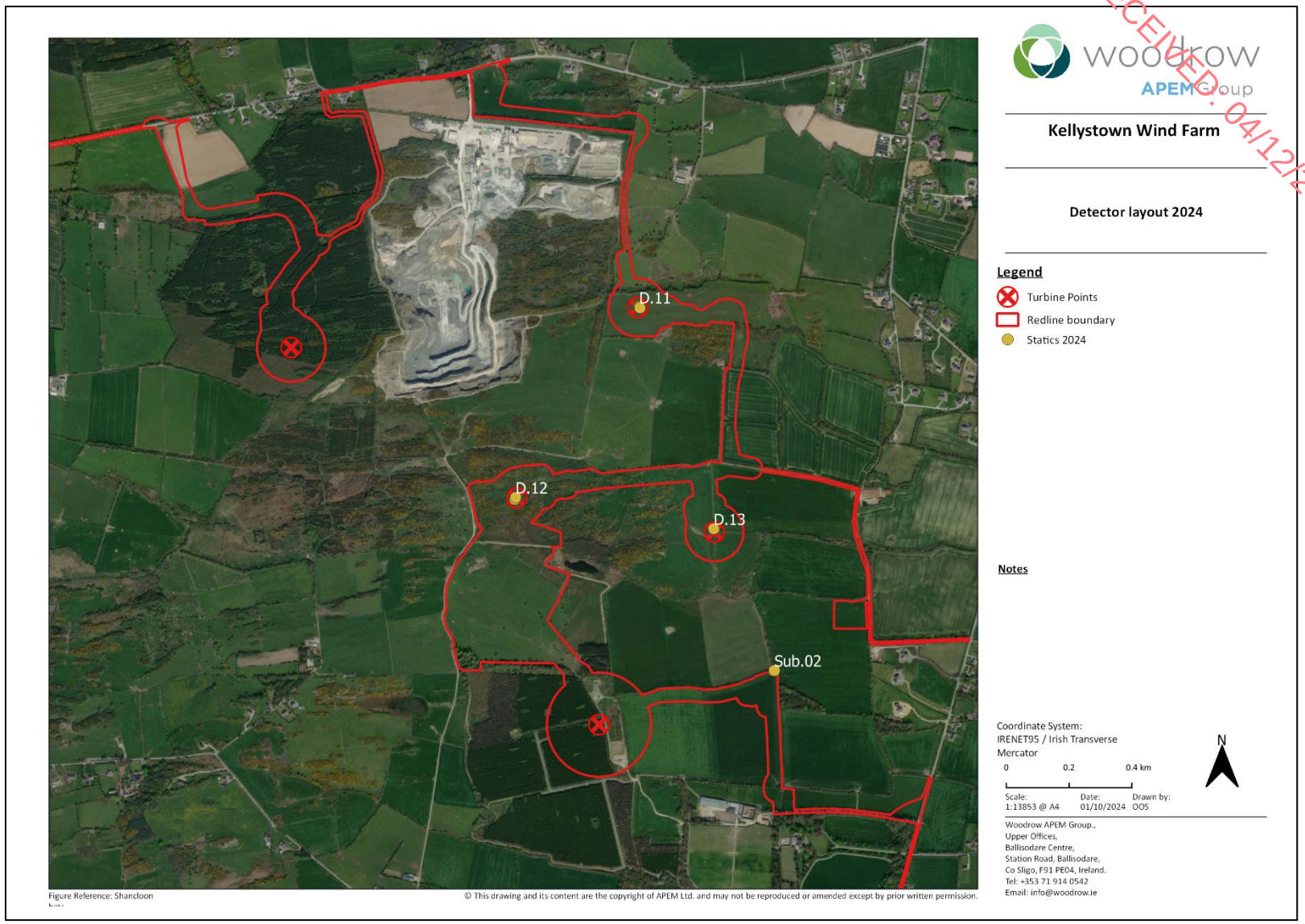

Figure 4 Detector locations 2024

2.11 Survey limitations

In the case of bat surveys, survey limitations often relate to weather conditions at the time of the surveying and equipment failing in the field, for example microphones can be damaged by livestock or can lose sensitivity when exposed to prolonged episodes of heavy rainfall. The following section provides details of any potential limitations to bat surveys conducted in 2022 and 2023.

2.11.1 Equipment

In the 2022 static deployment, one detector experienced a failure during the Autumn deployment at location D.05. This detector failed to record any data. Upon reviewing the detector post-deployment, it was highly probable that the failure stemmed from a faulty battery connection, which became loose when the device was mounted on the tree.

Despite these technical issues it is considered that that the 2022 data collected during this survey remains robust and compliant with NatureScot *et al.* (2021). For the summer and autumn deployment period there was two additional context detectors added to the deployment. One deployed at D.08 and one at D.09 (Figure 3).

During the 2023 static deployment, the permanent detector stationed at Sub.01 failed to record data from September 3rd to October 3rd. This issue likely arose from a faulty battery extension (Wildlife Acoustics SongMeter Mini Battery Lid) that suffered water infiltration, resulting in a failure to supply the required battery extension. Subsequently, internal batteries were replaced, and the detector continued operating in the field for an additional week.

2.11.2 Weather

The weather data for the spring deployment period (13th April – 26th April) was fully compliant with NatureScot *et al.* 2021 guidance.

The summer deployment (15th June – 30th June) was fully compliant with NatureScot *et al.* 2021 guidance for weather conditions. There was 3 days of non-compliance (25th, 26th and 28th June).

The Autumn deployment (24th August – 7th September) was fully compliant with NatureScot *et al.* 2021 guidance. There was 5 days of non-compliant weather (3rd, 4th, 5th, 6th, and 7th September). The 24th August and 26th August had low rainfall detected for a few hours in the recording nights. The wind and temperature were fully compliant. This minimal rainfall would not have affected bat activity, this has been verified against bat activity from the detectors. Bat activity was still detected during the periods that were outlined as having minimal rainfall.

2.11.3 Survey coverage

It is considered that static bat detector coverage of the proposed site for bat activity in 2022 was in line with the NatureScot *et al.* 2021 guidelines based on the proposed turbine layout provided at the time of surveys. Given that the data gathered in 2022 is valid for up to 3 years given no significant habitat changes on site (CIEEM guidance note 2019), The surveys in 2024 were smaller in scale. While they did not cover all turbine locations, they did meet the minimum number of compliant nights (10) recorded per season. Due to reasons relating to access and habitat structure, bat equipment could not always be setup at exact proposed turbine locations, e.g., when proposed turbine locations are in dense conifer plantations. While this was not considered to limit the

robustness of the data set, it is important to acknowledge the deployment locations in relation to the turbines, as this has implications for interpretation of bat activity. For instance, deploying units away from proposed turbine locations within plantations and along the edge of habitat features is likely to lead to more bats being registered, which may not be a true reflection of activity at a given turbine location.

3 SURVEY RESULTS

This section provides the detailed results for bat surveys conducted during the 2022 and 2023 survey periods.

3.1 Desk study

Examining the National Biodiversity Data Centre (NBDC) bat habitat suitability maps the 5x5 km grid square, containing the proposed site location, has been classed as moderate (Lundy *et al.*, 2011), see Table 12. The site suitability index score is based on the habitat suitability for the outlined species. This was rated from Very Low to High as outlined in the Suitability level score column.

Table 12. NBDC species specific habitat suitability index.

Bat species	Suitability Index	Suitability Level
All Bats	25.67	Moderate
Pipistrellus pipistrellus	40	High
Pipistrellus pygmaeus	39	High
Nyctalus leisleri	37	Moderate
Myotis nattereri	31	Moderate
Plecotus auritus	30	Moderate
Myotis daubentonii	25	Moderate
Myotis mystacinus	20	Low
Pipistrellus nathusii	9	Low
Rhinolophus hipposideros	0	Very Low

A data request was submitted to Bat Conservation Ireland (BCI) for known roost records within 10 km of the proposed site. A total of 96 bat records were provided of which 42 were bat roosts. The closest roost to the site is within 2.4 km of the proposed site. Included in Table 13 is a column for species core sustenance zones that may be impacted. A table extract from (Collins 2016) can be seen in Appendix 6: Species core sustenance zones. The species core sustenance zone confidence in zine size is rated on the table attached in the appendix outlined. The species that were present roosting were as follows:

- Common pipistrelle *Pipistrellus pipistrellus*
- Soprano pipistrelle *Pipistrellus pygmaeus*
- Leisler's bat *Nyctalus leisleri*
- Brown long-eared bat *Plecotus auritus*

- Whiskered bat *Myotis mystacinus*

The BCI data shown in Table 13 and Appendix 5: BCI data results. shows bat data recorded in transect and *ad hoc* surveys with distances from the proposed site provided, and indicates eight species have been recorded in the environs, including:

- Common pipistrelle *Pipistrellus pipistrellus*
- Soprano pipistrelle *Pipistrellus pygmaeus*
- Leisler's bat *Nyctalus leisleri*
- Brown long-eared bat *Plecotus auritus*
- Daubenton's bat *Myotis daubentonii*
- Natterer's bat *Myotis nattereri*
- Whiskered bat *Myotis mystacinus*
- Nathusius pipistrelle *Pipistrellus nathusii*

Table 13. Sample BCI Roost data within 10 km of the site.

Name	Distance from centre of site (km)	Species observed	Species core sustenance zones (Yes/No)
08MHOB10WC	8.689	*Pipistrellus* spp. (45 kHz/55 kHz)	No
08MHOB11WC	8.668	Unidentified bat	No
08MHOB13WC	8.673	Unidentified bat	No
08MHOB14WC	8.673	*Nyctalus leisleri*	No
08MHOB15WC	8.641	*Pipistrellus pygmaeus*	No
08MHOB16WC	8.641	Unidentified bat	No
08MHOB17WC	8.641	*Pipistrellus* spp. (45 kHz/55 kHz)	No
08MHOB18WC	8.636	Unidentified bat	No
08MHOB1WC	8.636	*Pipistrellus pygmaeus*	No
08MHOB2WC	8.477	Unidentified bat	No
08MHOB4WC	8.545	Unidentified bat	No
08MHOB5WC	8.569	Unidentified bat	No
08MHOB8WC	8.577	Unidentified bat	No
08MHOB9WC	8.677	*Pipistrellus* spp. (45 kHz/55 kHz)	No

Name	Distance from centre of site (km)	Species observed	Species core sustenance zones (Yes/No)
12LHD7WC	8.687	Unidentified bat	No
12LHD9WC	8.349	Unidentified bat	No
12LHP5WC	8.347	Unidentified bat	No
Private	8.349	*Pipistrellus pygmaeus*	No
Private	8.349	Unidentified bat	No
Private	4.689	*Pipistrellus pipistrellus*	No
Private	7.51	*Pipistrellus pygmaeus*	No
Private	8.54	*Plecotus auritus*	No
Private	8.54	*Pipistrellus pipistrellus*, Unidentified bat	No
Oldbridge Demense	2.458	*Pipistrellus pygmaeus*	Yes
Oldbridge Demense, Holm oak	9.539	*Pipistrellus pygmaeus*	No
Oldbridge Demense, Monterey Pine Roost	8.982	*Plecotus auritus, Pipistrellus pipistrellus*	No
Oldbridge Demense-Tree roost 5	8.982	*Nyctalus leisleri*	No
Oldbridge Demense-Tree roost 3	8.948	*Pipistrellus pygmaeus*	No
Oldbridge Demense-Tree roost 4	9.199	*Nyctalus leisleri*	No
Oldbridge Demense-Tree roost 6	8.948	*Pipistrellus pygmaeus*	No
Oldbridge Demense-Tree roost 7	9.199	*Pipistrellus pygmaeus, Nyctalus leisleri*	No

Name	Distance from centre of site (km)	Species observed	Species core sustenance zones (Yes/No)
Railway Lane Ash Tree Roost	9.074	*Pipistrellus pygmaeus*	No
Private	9.074	*Pipistrellus* spp. (45kHz/55kHz)	No
Private	4.91	*Pipistrellus pygmaeus*	No
Private	5.466	Unidentified bat	No
Private	8.54	Unidentified bat	No
Private	10.839	*Plecotus auritus*	No
Private	9.794	*Plecotus auritus*	No
Private	8.443	*Plecotus auritus, Myotis mystacinus*	No
Private	8.336	*Plecotus auritus, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Nyctalus leisleri*	No
Private	10.457	*Pipistrellus pipistrellus*	No
Private	6.812	*Pipistrellus pygmaeus*	No

3.2 Habitat and roost suitability assessment

The habitat within the proposed wind farm site is comprised of acidic grassland, improved grassland, tilled land (arable crops), scrub (gorse *Ulex* spp.), mixed commercial coniferous forestry (larch *Larix* sp. & spruce *Picea* sp.) and linear area of mature beech woodland (beech *Fagus sylvatica*, pine *Pinus* sp., ash *Fraxinus excelsior,* and hawthorn *Crataegus* spp.). For the basis of this habitat assessment data from the final autumn deployment which consisted of a deployment of 10 detectors across the site has been used.

Preliminary surveys of potential roost features found several structures of moderate to high potential roost features within the proposed site, some of which lie within the 300 m turbine Zone of Influence for bats. See Table 14 which shows the following roost features classed as moderate and higher within the proposed site and is displayed on Figure 5. The low potential ash tree noted in Table 14 was previously classified as moderate potential. After the roost survey it was decided a more appropriate classification for this tree was low. Table 15 shows the bat habitat and roost suitability based on the 2022 static detector layout, plus the permanent detector deployed in 2023.

Table 14. Potential roost features surveyed within the proposed site.

PRF ref.	Feature Description	Longitude	Latitude	PRF suitability (Collins, 2016)
R01	Standing dead tree, saw blue tit emerge from canker 5-7 entry points to hollow centre	-6.35982	53.7855	High
R02	Long deep canker in branch and trunk of standing dead ash	-6.36026	53.79172	Low
R03	Portacabin office building.	-6.355199	53.782717	Low
R04	Tree with several large cankers	-6.36192	53.78548	Moderate
R05	Tree with compression fork and weld	-6.36085	53.78552	Moderate
R06	Tree with 5 m deep fluting	-6.35902	53.7854	Moderate
R07	Tree with stress shear or lightning central deadwood	-6.35814	53.78537	Moderate
R08	High forage, mature veterans most trees 2-3 knot holes, pruning cuts, tear outs	-6.35227	53.78119	Moderate

PRF ref.	Feature Description	Longitude	Latitude	PRF suitability (Collins, 2016)
R09	Potential mod standing dead wood tree in horse field	-6.35248	53.78186	Moderate
R10	Lacking connectivity to wider landscape and roofing/2nd floor too derelict to hold a roost	-6.37005	53.78612	Moderate
R11	Multiple veteran trees with several knot holes, tear outs, compression forks and rotten branches	-6.36272	53.7854	Moderate

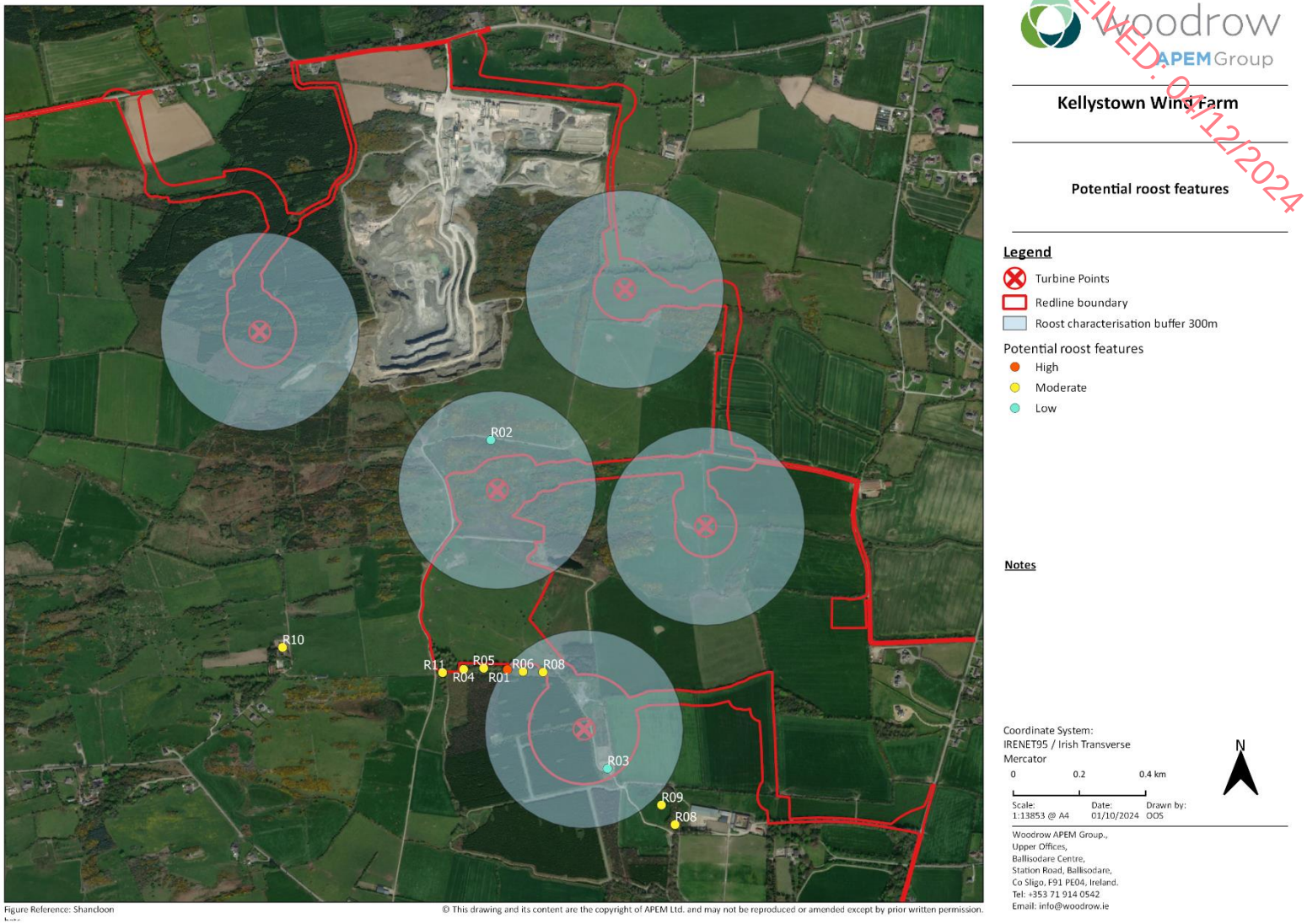

Figure 5. Kellystown potential roost feature locations.

Table 15. Summary of bat habitat and roost suitability based on the 2022 detector layout, plus the permanent detector in 2023.

Detector location	Foraging/commuting features required for detector locations/provisional turbine buffer (*c.* 100 m)	Roost potential within *c.* 300 m of detectors of moderate or higher suitability
D.01	Detector located in conifer plantation that is adjacent to an active quarry. This woodland consists of multiple breaks that contain fragmented patches of hawthorn and scrub species. These breaks have high foraging and commuting potential as was noted from the transect survey carried out here.	There is no roosting potential noted as within the vicinity of this detector location, there is high foraging and commuting noted for this area as there is good connectivity with the adjoining woodland to the south.
D.02	Located in a commercial conifer plantation, the detector is situated along a ride line in the forest. This ride line has high foraging and high commuting potential. As, there is good connectivity with the adjoining commercial conifer woodland.	There is no roosting potential noted as within the vicinity of this detector location, there is high foraging and commuting noted for this area as there is good connectivity with the adjoining forest to the north.
D.03	Located along the edge of an area that is covered densely with scrub species that consists of mainly gorse with some fragmented areas of hawthorn and other fragmented tree species. Adjacent to this scrub coverage is a track that provides access to the land to the north of this scrub. This track provides moderate foraging and commuting suitability for bats as it has connectivity to the adjoining woodlands to the west of the site.	The ash tree noted as moderate and changed to low potential after the roost survey is located within 300 m of this detector location.
D.04	This detector was situated along the edge of scrub where D.03 is located. To the north of this detector there is a treeline/hedgerow that consists of hawthorn or other mixed spp. This hedgerow provides moderate foraging and commuting for bats as it has connectivity to the adjoining scrub. The detector is situated in acidic grassland habitat that has some outcrops of rock. Situated to the south of this acidic grassland is a stream that flows from Drumshallon lough. This stream has moderate potential for foraging and commuting as although it is unvegetated it has good connectivity to the scrub and its source at Drumshallon lough.	There are no potential roost features classed as moderate or higher within 300 m of the proposed location associated with this detector.
D.05	This detector was located on a hawthorn tree in the middle of an improved grassland. The detector location has negligible foraging and commuting at the exact location the detector. But within the adjoining habitat 200 m to the south, it has very high foraging and	There is multiple moderate and high roost class potential trees within the mature treeline to the south of this detector.

Detector location	Foraging/commuting features required for detector locations/provisional turbine buffer (*c.* 100 m)	Roost potential within *c.* 300 m of detectors of moderate or higher suitability
	commuting within the mature mixed deciduous treeline. This was also the location of a swarming site of bats during the autumn period. This was witnessed by high bat activity and social calling by the surveyors during the roost survey on the 09/07/22. There is also high suitability foraging and commuting habitat at Drumshallon lough.	
D.06	This detector was located to the north of tilled arable crops. It is located within close vicinity to the steam that flows from Drumshallon lough. This stream has been noted as having moderate foraging and commuting habitat suitability. During the transect surveys it was noted as having bat species present foraging and commuting on it.	There are no potential roost features classed as moderate or higher within 300 m of the proposed turbine location associated with D.06.
D.07	Located along a ride line in a commercial conifer forest plantation. This ride line located within the forest offers high foraging and commuting habitat for bats. Located within 300 m of this detector is the mature treeline which has multiple moderate and high suitability PRF trees. To the southeast of this detector location is the low roost potential portacabin office building.	There is multiple moderate and high-class roost potential trees in the mature treeline (within 300 m). The portacabin building located 100-150 m to the southeast has low roost class potential.
D.08	This detector was a context detector located on a hawthorn tree along the mature treeline which consists of multiple high and moderate suitability PRF trees. The detector is located to the west of the high suitability PRF tree that was surveyed during the 2022 survey season. The detector was also located close to the location of the autumn swarming site as mentioned previously.	There is multiple high and moderate roost class potential trees located in the close vicinity of this detector location
D.09	This detector was a context detector located in the woodland to the west of the site. The detector is placed on a hawthorn tree along the edge of a track that goes through the woodland. This track is classed as high foraging and commuting habitat, as this track has good connectivity through the whole forest and to the forest in the north. This detector is located 25 m from a large break in the woodland. This break is a high foraging and commuting area for bats and has good connectivity to the adjoining scrub to the east.	There are no potential roost features within 300 m of this detector location.
D.10	This detector was in the west of the site. The detector is close to the location of the new	There are no potential roost features located within 300 m of this detector.

Detector location	Foraging/commuting features required for detector locations/provisional turbine buffer (*c.* 100 m)	Roost potential within *c.* 300 m of detectors of moderate or higher suitability
	T02 location. This detector was placed on an ash tree located in an area of semi natural woodland.	
Sub.01	This detector was a permanent detector deployed in 2023 in the designated location of the proposed substation. It was placed on an ash tree situated in a hedgerow between two improved grassland fields.	There are no potential roost features classed as moderate or higher within 300 m of the proposed substation location.

3.3 Roost emergence/re-entry surveys

Roost emergence/re-entry survey details can be viewed in Table 3 and Table 4. See the results of each survey below.

Emergence survey 1: 28th April 2022

This emergence survey was carried out on the portacabin office at 53.782791, -6.355393 (R09). There were two soprano pipistrelles noted foraging above the conifer plantation to the west of this portacabin. They were foraging above the canopy of the forest. There were no bats noted emerging from the portacabin.

Results: No emergence.

Re-entry survey 1: 29th April 2022

This re-entry survey was carried out on the high suitability PRF ash tree at -53.785535, -6.359822 (R02). There were no re-entries noted during this survey.

Results: No re-entry.

Emergence survey 2: 15th June 2022

This emergence survey was carried out on the high suitability PRF ash tree at 53.785535, -6.359822 (R06). Leisler's bats were noted foraging above the treeline and two common pipistrelles noted as foraging 20 metres above the treeline, however no emergence from the tree was noted.

Results: No emergence.

Emergence survey 3: 30th June 2022

This survey was carried out on the low suitability ash tree at -6.36026, 53.79172 (R02). There were Leisler's bats noted as heard but not seen. There was no emergence noted on this survey.

Results: No emergence.

Re-entry survey 3: 1st July 2022

This survey was carried out on the portacabin office building at 53.782791, -6.355393 (R09). There was Leisler's, soprano pipistrelle, and common pipistrelle recorded during the survey, but no re-entry was noted.

Results: No re-entry.

Emergence survey 4: 7th September 2022

This survey was carried out on the high suitability ash tree at 53.785535, -6.359822 (R02). Autumn swarming activity was noted during this survey. There were about 10 bats noted as swarming, the species noted were common pipistrelle, soprano pipistrelle, and Leisler's bat.

Results: Swarming activity noted. There was no emergence recorded.

Emergence survey 5: 14th October 2022

This survey was carried out at the high suitability ash tree at 53.785535, -6.359822 (R02). There were five pipistrelles noted as foraging and one Leisler's bat. There was a brown long-eared bat noted as heard but not seen.

Results: No emergence.

Re-entry survey 4: 15th October 2022

This survey was carried out on a moderate suitability beech tree at 53.785331, -6.358273 (R08). There was soprano pipistrelle activity noted and a bat that was foraging low through the canopy of the mature treeline, however no re-entry was recorded.

Results: No re-entry.

3.4 Winter roost inspections

On 22nd February 2023 hibernation surveys were carried out on all suitable trees in the mixed deciduous woodland where swarming activity was noted in September 2022. All trees of moderate or higher potential roost suitability that could be inspected using an endoscope from ladder access were inspected.

There was one building inspection carried out on a portacabin office building. This building could only be inspected externally as access was not gained to inspect internally. The portacabin building was classed as low potential for roost suitability. From external inspection of the building by endoscope there was no signs of bats noted.

Images of the features inspected can be seen in Appendix 4: Winter hibernation surveys

Table 16. Features inspected during hibernation.

Reference	Feature description	Roosting potential
H1	Butt rot, and cavity inside of tree. Inspected with endoscope	Moderate
H2	Beech tree, cavities in welding. Inspected with endoscope	Moderate
H3	Beech tree, small cavities present on tree with capacity to hold 1-2 bats. Not inspected.	Moderate
H4	Beech tree, cavity present from possible previous tear-out. Inspected with endoscope	Moderate

Reference	Feature description	Roosting potential
H5	Beech tree, cavity from previous tear-out inspected using an endoscope.	Moderate
H6	Beech tree, cavity from possible previous pruning wound. Inspected using an endoscope.	Moderate
H7	Ash tree, extensive butt rot, complete tree hollow. All features inspected.	High
H8	Beech tree, compression fork with a cavity present. Inspected using an endoscope	Moderate
H9	Beech tree, possible pruning cut wound cavity. Inspected using an endoscope.	Moderate
H10	Beech tree, possible compression fork cavity. Inspected using an endoscope.	Moderate
H11	Beech tree, compression fork cavities. Inspected using an endoscope.	Moderate
H12	Beech tree, extensive Butt rot present and interior of tree hollow. Small cavity inspected using a endoscope	Moderate
H13	Portacabin office, with some visible features present underneath guttering. Inspected using an endoscope.	Low

3.5 Bat activity transect surveys

The following section summarises the transect results recorded in the 2022 survey year. The distribution of bats recorded along transects are displayed in Figure 6, Figure 7, Figure 8, and Figure 9.

Transect 1: 28th April 2022

This transect survey covered the turbine locations of T04, T03 and T07. With the edge of mature woodland covered on the field boundary where T05 is located.

There was no species detected during this transect survey.

Transect 2: 15th June 2022

The transect survey covered the turbine locations of T07, T05, and T02.

The species detected during the transect were Leisler's bats, common pipistrelle, and soprano pipistrelle. The Leisler's were noted as foraging during the transects, one was noted foraging at approx. 15 m high. Common pipistrelles were noted as foraging and commuting between 5-7 m above ground. The soprano pipistrelles were noted as foraging between heights of 8 m to 15 m.

Transect 3: 30th June 2022

The transect survey covered the turbine locations of T04, T03 and T01.

The species detected during the transect were Leisler's bats, soprano pipistrelles, common pipistrelle and Myotis spp.. Leisler's, Myotis spp. and soprano pipistrelle were noted foraging, but an approximate height was not recorded. Common pipistrelle was noted as foraging between the heights of 8 m and 20 m.

Transect 4: 7th July 2022

The transect survey covered the turbine locations of T07 and T05. During the transect survey, swarming activity was noted at the high suitability ash tree located at -6.35982, 53.7855 (R01). During this survey, high activity of bats displaying social activity were noted. There was no emergence noted from any of the features on this tree. This was then followed by the transects which covered the turbine locations of T05 and T07. It was noted that as the two surveyors left the location of where the social behaviour was bat activity decreased considerably. Then as they approached the swarming area again from the other side of the woodland the bat activity increased again. This high level of activity was also noted on the detector (D.08) deployed on the hawthorn tree to the west of this tree during the autumn deployment (Figure 3). There was high social activity noted by pipistrelle species on the transect survey.

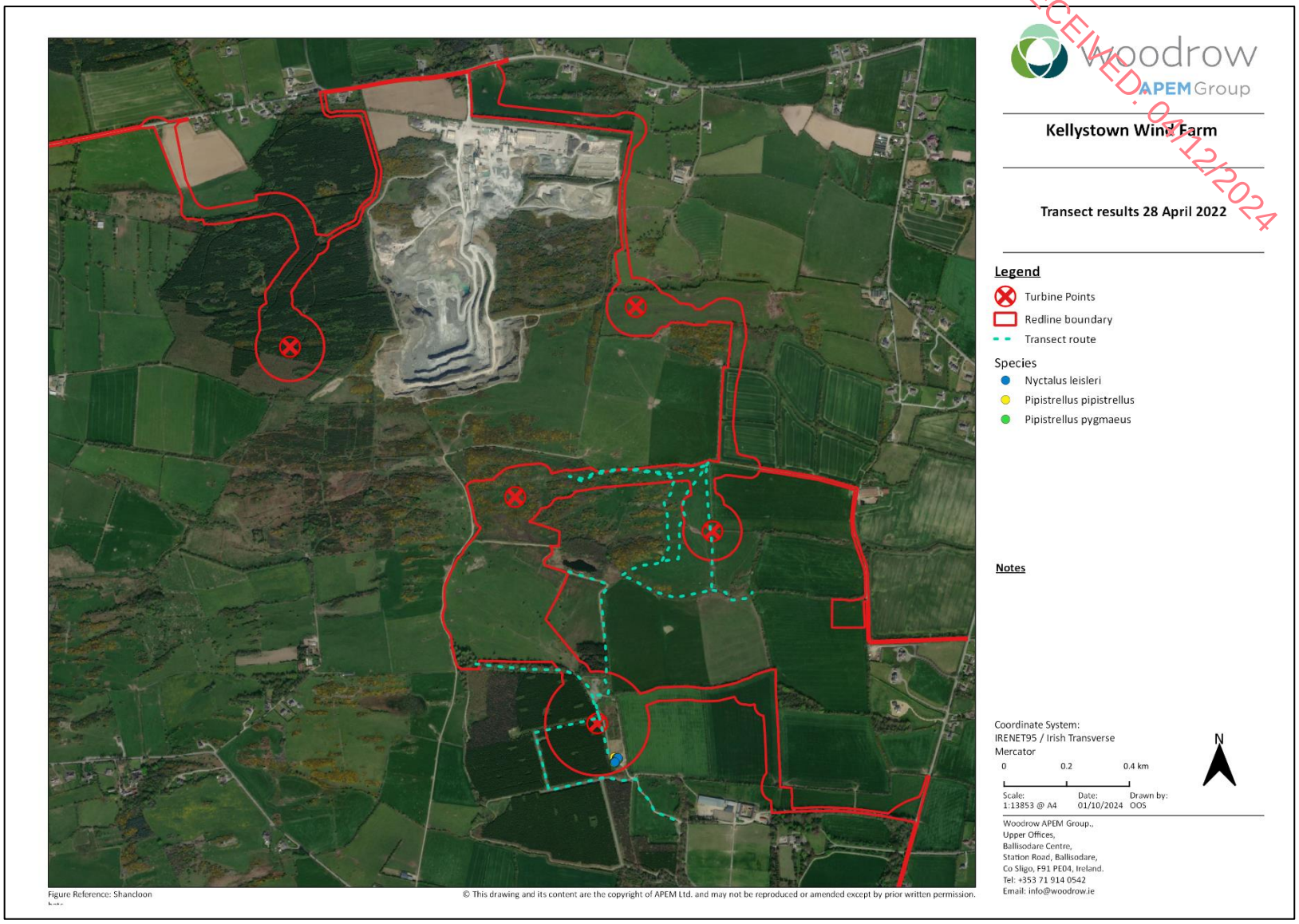

Figure 6. Kellystown transect results 28.04.22.

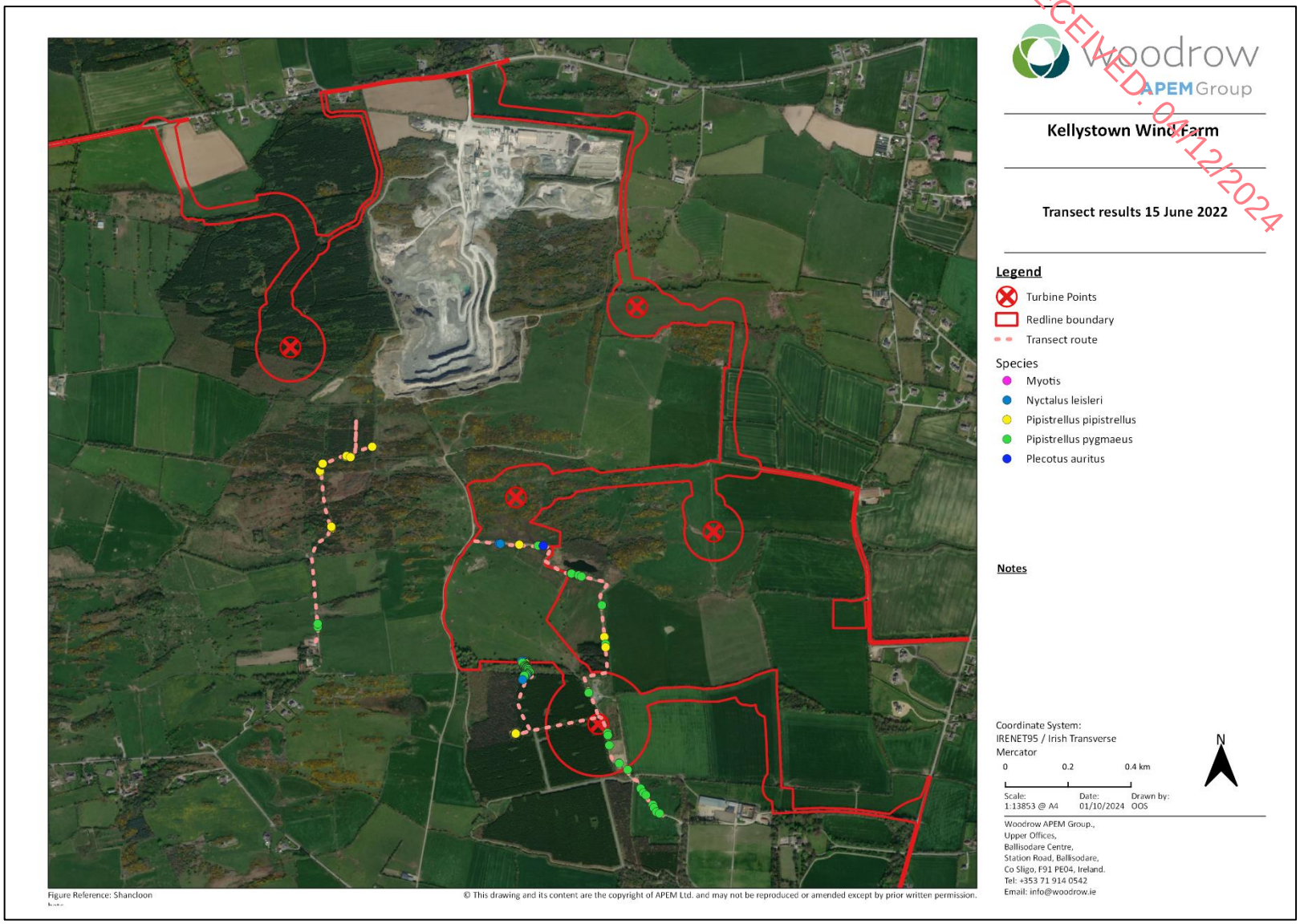

Figure 7. Kellystown transect results 15.06.22.

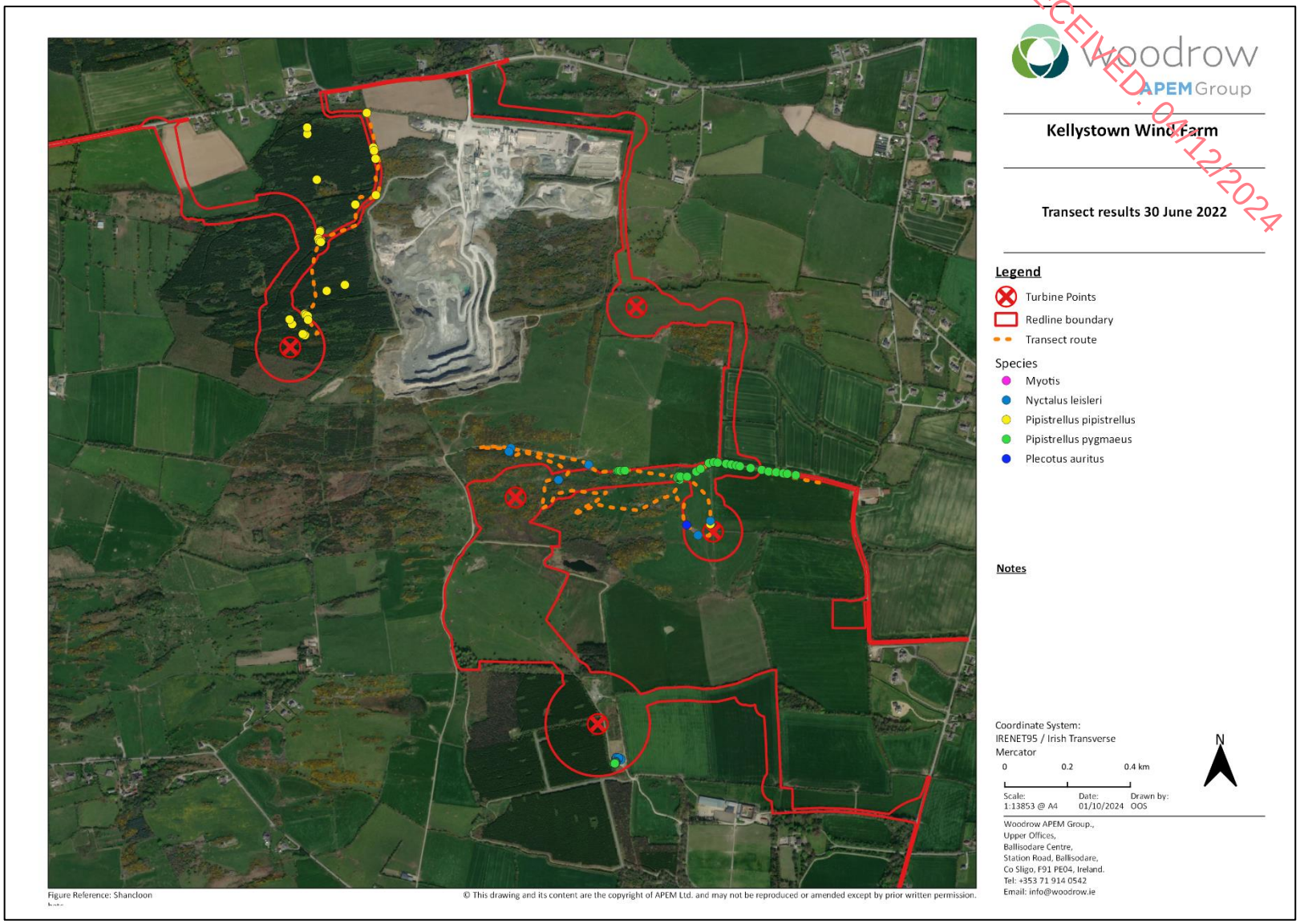

Figure 8. Kellystown transect results 30.06.22.

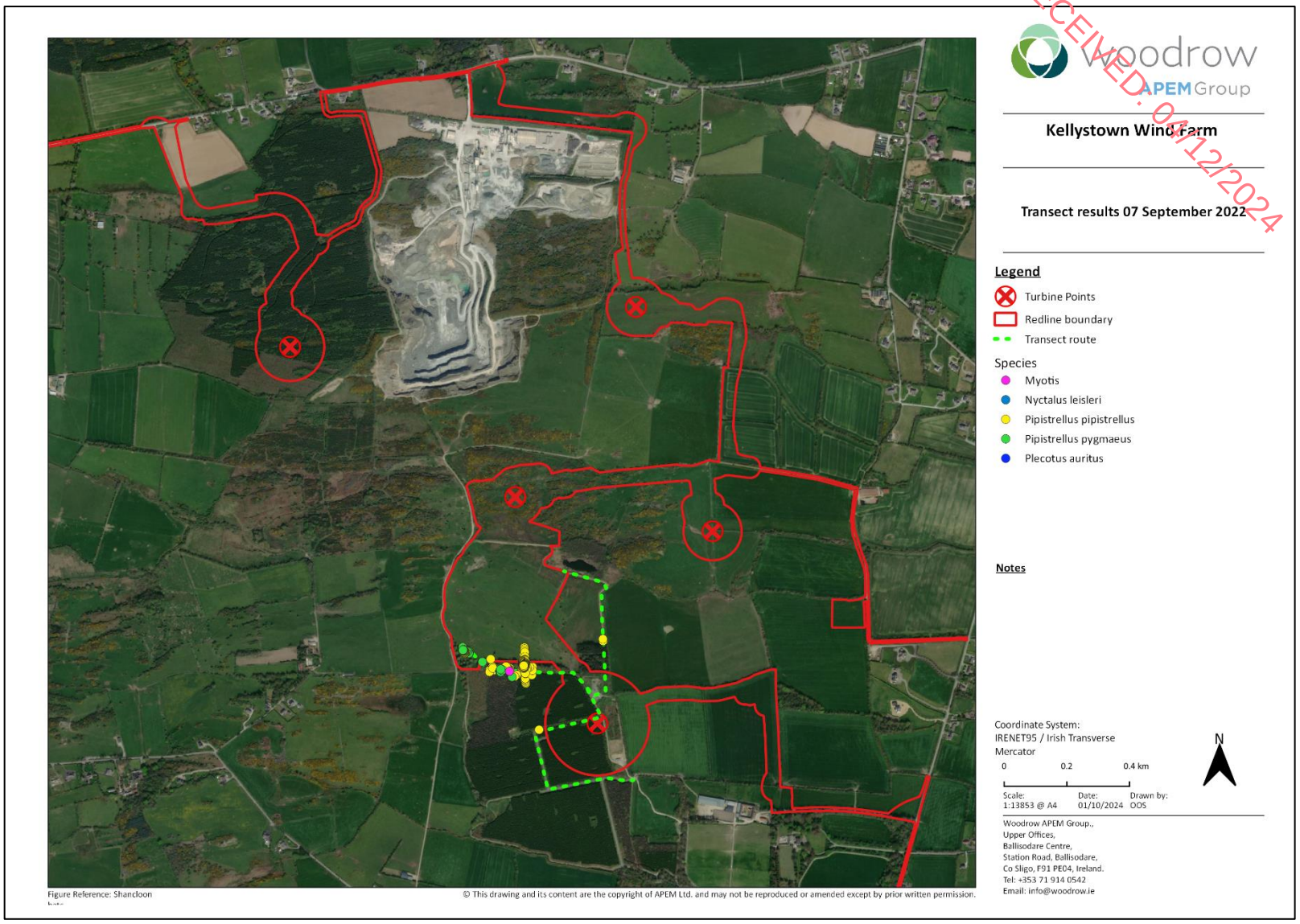

Figure 9. Kellystown transect results 07.09.22.

3.6 Static detector surveys

The following sections detail the results from static monitoring surveys for each of the three 2022 seasonal deployments, spring, summer, and autumn, and the 2023 permanent deployment at the proposed substation location (Figure 3). Figure 10 illustrates the 2022 overall bat passes per hour across all seasons. Furthermore, Figure 11 demonstrates the 2023 overall bat passes per hour across the permanent deployment at the proposed substation location.

Weather data for the three deployment periods in 2022 has been extracted and is shown graphically in Figure 13 at Appendix 2: Weather Data for spring, summer, and autumn deployments respectively. Figure 12 shows bp/h displayed on a graph with weather conditions wind speed (m/s) vs Temperature (°C). NatureScot *et al.* 2021 guidance outlines that compliant night-time weather conditions are not below 10°c, more wind that 5 m/s and minimal rainfall. Outlier data occurring outside of the complaint weather conditions show some interesting activity. This activity is primarily of *Pipistrellus* spp. and Leisler's bats where activity is noted at high temperature and high wind speeds. Interestingly, some outliers noted are records of brown long-eared bat observed outside of the compliant weather conditions. From personal observation from Woodrow bat surveyors, it is noted that the brown long-eared bats can take opportunity of gleaning insects at height on occasions and may be what is observed here. This information will be an important consideration at impact assessment stage.

3.6.1 Roost emergence windows recorded during static monitoring surveys

This section details bat activity in 2022 recorded at static monitoring locations during the roost emergence window, which could indicate there is a roost nearby. Activity is described per species and highlights where increased activity was recorded at emergence times at each of the detector locations, as shown in Appendix 7: Species recorded during the emergence window at each detector location.

3.6.1.1 Common pipistrelle

Common pipistrelle had the most amount of bat passes per hour within the emergence window at D.02, D.04, D.05, D.06, D.07, D.08, and D.09 over the full 2022 deployment period.

3.6.1.2 Soprano pipistrelle

Soprano pipistrelle had the most amount of bat passes per hour within the emergence window at D.02, D.03, D.04, D.05, D.06, D.07, D.08, and D.09.

3.6.1.3 Pipistrellus spp.

Pipistrellus not identified to species level were recorded within their emergence window at detectors D.04 where one bat pass was accounted for.

3.6.1.4 Leisler's bat

Leisler's bats had the most amount of bat passes per hour within the emergence window at detector locations D.04, D.06, D.08 and D.09.

3.6.1.5 Myotis spp.

Myotis species had the most amount of bat passes per hour within the emergence window at detector location D.06.

3.6.1.6 Brown long-eared bat

Brown long-eared bats had the most amount of bat passes per hour within the emergence window at detector location D.02 and D.09.

3.6.2 Static monitoring results for spring 2022 (13th April – 26th April)

Seven detectors were deployed at the seven proposed turbine locations (D.01 – D.07). There was full weather compliancy across all the deployment days for this spring period. With no non-compliant periods noted. Common pipistrelle and Leisler's bat were the most active species on site for the spring deployment period. The mean value in Table 17 represents the mean bat passes per hour. The standard deviation shows how dispersed the data is from the mean. A low standard deviation shows how the data is clustered around the mean. A high standard deviation shows how the data is more spread out from the mean. The interquartile range indicates the data that lies within the middle half of the data set.

3.6.2.1 Common pipistrelle

Common pipistrelle were noted at location D.03 as having a moderate activity levels at 3.12 bp/h (Table 17). At all other locations common pipistrelles had low activity levels A spatial representation of this species activity recorded during the 2022 spring season is available in Figure 25 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season. It can be seen in this figure that while mean activity levels were low there were several hours in which more than 100 passes were recorded.

3.6.2.2 Soprano pipistrelle

Soprano pipistrelles had low mean activity levels at all locations in spring (Table 17) A spatial representation of this species activity recorded during the 2022 spring season is available in Figure 26 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season. This figure shows occasional spikes in hourly activity at D.07.

3.6.2.3 Pipistrellus spp.

Pipistrellus species could only not be identified not identified to species level at one location, D.06. This constituted low activity. A spatial representation of this species group activity recorded during the 2022 spring season is available in Figure 27 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.2.4 Leisler's bat

Leisler's bats had low mean bat passes per hour values across all locations in spring (Table 17). A spatial representation of this species activity recorded during the 2022 spring season is available in Figure 29 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.2.5 *Myotis spp.*

Myotis spp. were noted as having low mean bat passes per hour value of one across the locations D.02, D.03, D.04, D.05 and D.06 (Table 17). The species was not present at the rest of the detectors for the spring deployment (Table 17). A spatial representation of this species group activity recorded during the 2022 spring season is available in Figure 28 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.2.6 *Brown long-eared bat*

Brown long-eared bat were noted as having a low mean activity at D.02 and D.05 (Table 17). This species was not recorded at the remaining detectors on site (Table 17). A spatial representation of this species activity recorded during the 2022 spring season is available in Figure 30 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

Table 17. Spring mean bat passes per hour (bp/h) values.

Species	Location	Mean	Std dev	IQR
***Myotis* spp.**	**D.01**	**0**	0	0
	D.02	**0.14**	0.37	0
	D.03	**0.04**	0.19	0
	D.04	**0.02**	0.12	0
	D.05	**0.09**	0.31	0
	D.06	**0.02**	0.15	0
	D.07	**0**	0	0
Leisler's bat	**D.01**	**0.07**	0.42	0
	D.02	**0.1**	0.56	0
	D.03	**0.22**	1.1	0
	D.04	**0.5**	2.07	0
	D.05	**0.29**	1.25	0
	D.06	**0.5**	1.99	0
	D.07	**0.02**	0.18	0
***Pipistrellus* spp.**	**D.01**	**0**	0	0
	D.02	**0**	0	0
	D.03	**0**	0	0
	D.04	**0**	0	0
	D.05	**0**	0	0
	D.06	**0.05**	0.25	0
	D.07	**0**	0	0
Common pipistrelle	**D.01**	**0.02**	0.12	0
	D.02	**0.06**	0.3	0
	D.03	**3.12**	17.16	0
	D.04	**0.08**	0.3	0
	D.05	**0.28**	0.8	0
	D.06	**0.63**	1.23	1
	D.07	**0.95**	6.73	0
Soprano pipistrelle	**D.01**	**0.02**	0.12	0

	D.02	0.05	0.31	0
	D.03	0.14	1.01	0
	D.04	0.16	0.46	0
	D.05	0.22	0.59	0
	D.06	0.8	1.58	1
	D.07	1.26	5.73	0
Brown long-eared bat	D.01	0	0	0
	D.02	0.02	0.12	0
	D.03	0	0	0
	D.04	0	0	0
	D.05	0.05	0.46	0
	D.06	0	0	0
	D.07	0	0	0

3.6.3 Static monitoring results for summer 2022 (15th June – 30th June)

There were nine detectors deployed for the summer deployment period. The two extra detectors covered one change of turbine location (a reduced setback) which was T02 and was detector D.09. The other additional detector was a context detector to show activity in the strip of mature deciduous woodland and was detector D.08. There was three non-compliant recording nights for the summer period. These nights were 25th, 26th, and 28th June. The 10 compliant nights were still achieved. Common pipistrelle and Leisler's bat were the most active species on site for the summer deployment (Table 18).

3.6.3.1 Common pipistrelle

Common pipistrelle were recorded as having high mean bat passes per hour values at locations D.05, D.06, D.08 and D.09. The activity at D.08 stood out from these as being exceptionally high (44.42 bp/h) There were moderate mean bat passes per hour values recorded at D.03 and D.04, (Table 18). For location D.01, D.02, and D.07 there was low mean bat passes per hour values recorded (Table 18). A spatial representation of this species activity recorded during the 2022 summer season is available in Figure 31 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.3.2 Soprano pipistrelle

Soprano pipistrelle was noted as having very high mean bat passes per hour (23.5 bp/h) at location D.08 (Table 18). There were moderate mean bat passes per hour values at D.03 and D.04 (Table 18). Low mean bat passes per hour values were noted at location D.01, D.02, D.03, D.04, D.07 and D.09 (Table 18). A spatial representation of this species activity recorded during the 2022 summer season is available in Figure 32 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.3.3 Pipistrellus spp.

Pipistrellus species which were not identified to species level were present at locations D.01, D.04, D.05 and D.08 (Table 18). They had low mean bat passes per hour values noted (Table 18). A spatial representation of this species group activity recorded during the 2022 summer season is available in Figure 33 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.3.4 Myotis spp.

Myotis spp. were present at all locations and had low mean bat passes per hour values at all the detector locations D.01 -D.09 (Table 18). A spatial representation of this species group activity recorded during the 2022 summer season is available in Figure 34 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.3.5 Leisler's bat

Leisler's bats had high mean bat passes per hour values at D.04, D.06, and D.08 (Table 18). There were moderate bat passes per hour values noted at the remaining locations at D.02, D.03, and D.09 with all other locations recording low bat activity (Table 18). A spatial representation of this species activity recorded during the 2022 summer season is available in Figure 35 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.3.6 Brown long-eared bat

Brown long-eared bats had low meann bat passes per hour values at locations at D.02, D.03, D.04, and D.09 (Table 18). It was not recorded at the remaining locations (Table 18). A spatial representation of this species activity recorded during the 2022 summer season is available in Figure 36 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

Table 18. Summer mean bat passes per hour (bp/h) values.

Species	Location	Mean	Std dev	IQR
***Myotis* spp.**	**D.01**	**0.02**	0.14	0
	D.02	**0.07**	0.29	0
	D.03	**0.01**	0.1	0
	D.04	**0.04**	0.19	0
	D.05	**0.08**	0.38	0
	D.06	**0.29**	1.2	0
	D.07	**0.01**	0.1	0
	D.08	**0.1**	0.41	0
	D.09	**0.1**	0.29	0
Leisler's bat	**D.01**	**1.02**	2.68	1
	D.02	**2.84**	5.52	2
	D.03	**2.93**	5.17	3
	D.04	**5.01**	9.46	6
	D.05	**1.84**	3.02	2
	D.06	**7.96**	16.04	5
	D.07	**0.01**	0.1	0

	D.08	**7.08**	9.9	8
	D.09	**2.66**	4.51	3
***Pipistrellus* spp.**	**D.01**	**0.01**	0.1	0
	D.02	**0**	0	0
	D.03	**0**	0	0
	D.04	**0.02**	0.14	0
	D.05	**0.06**	0.27	0
	D.06	**0**	0	0
	D.07	**0**	0	0
	D.08	**0.16**	0.72	0
	D.09	**0**	0	0
Common pipistrelle	**D.01**	**0.2**	0.59	0
	D.02	**0.93**	1.63	2
	D.03	**4.43**	10.51	3
	D.04	**4.06**	12.62	3
	D.05	**5.01**	9.94	3
	D.06	**7.72**	12.09	10
	D.07	**0.41**	1.1	0
	D.08	**44.42**	54.1	56
	D.09	**6.55**	9.72	6
Soprano pipistrelle	**D.01**	**0.01**	0.1	0
	D.02	**0.21**	0.45	0
	D.03	**1.46**	3.26	1
	D.04	**1.09**	2.14	1
	D.05	**2.59**	4.09	3
	D.06	**4.02**	7.57	3
	D.07	**0.27**	0.94	0
	D.08	**23.5**	39.87	23
	D.09	**0.93**	1.89	1
Brown long-eared bat	**D.01**	**0**	0	0
	D.02	**0.03**	0.17	0
	D.03	**0.01**	0.1	0
	D.04	**0.01**	0.1	0
	D.05	**0**	0	0
	D.06	**0**	0	0
	D.07	**0**	0	0
	D.08	**0**	0	0
	D.09	**0.04**	0.19	0

3.6.4 Static monitoring results for autumn 2022 (24th August – 7th September)

There were 10 detectors deployed for the autumn deployment period. Nine of these were the same from the summer deployment period with an extra detector added due to a further change of T02 turbine location. The new detector location was D.10, this was placed near the new turbine location. There was seven days of non-compliant weather accounted for during the deployment period from the 3rd to 7th September. The species with the highest mean values for the autumn deployment period were soprano pipistrelle D.08 and common pipistrelle D.08 (Table 19).

3.6.4.1 Common pipistrelle

Common pipistrelle had high mean bat passes per hour noted at D.03, D.08, and D.09 (Table 19). There were moderate mean bat passes per hour values noted at locations D.06 and D.10 (Table 19). All other locations recorded low activity levels (Table 19). A spatial representation of this species activity recorded during the 2022 autumn season is available in Figure 37 located in Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.4.2 Soprano pipistrelle

Soprano pipistrelle had high mean bat pass per hour values recorded at D.06 and D.08 (Table 19). There were moderate mean bat passes per hour values noted at locations D.03, D.09, and D.10 (Table 19). Low mean bat passes per hour values were recorded at D.01, D.02, D.04, and D.07 (Table 19). A spatial representation of this species activity recorded during the 2022 autumn season is available in Figure 38 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.4.3 Pipistrellus spp.

Pipistrellus species which were not identified to species level were noted as having low mean bat passes per hour values at locations D.03, D.06, D.08 and D.10 (Table 19). A spatial representation of this species group activity recorded during the 2022 autumn season is available in Figure 39 located in Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.4.4 Myotis spp.

Myotis species had low mean bat passes per hour values at locations D.02, D.03, D.04, D.06, D.08 and D.10 (Table 19). This species group was not recorded at D.01, D.07, or D.09. A spatial representation of this species group activity recorded during the 2022 autumn season is available in Figure 40 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.4.5 Leisler's bat

Leisler's bats had high mean bat passes per hour at D.04, D.06 and D.08. There had low mean bat passes per hour values at locations D.01, D.02, D.03, D.04. D.06 D.07, D.09, D.10 (Table 19). A spatial representation of this species activity recorded during the 2022 autumn season is available in Figure 41 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

3.6.4.6 Brown long-eared bat

Brown long-eared bats had low mean bat passes per hour values at locations D.02, D.03, D.04, D.06, and D.08 (Table 19). A spatial representation of this species activity recorded during the 2022 autumn season is available in Figure 42 located in the Appendix 8: Species spatial activity recorded during 2022 static surveys by season.

Table 19. Autumn mean bat passes per hour (bp/h) values.

Season/deployment	Species	Location	Mean	Std dev	IQR
2022 Autumn	*Myotis* spp.	D.01	0	0	0
		D.02	0.11	0.34	0
		D.03	0.04	0.2	0
		D.04	0.1	0.3	0
		D.06	0.04	0.19	0
		D.07	0	0	0
		D.08	0.04	0.2	0
		D.09	0	0	0
		D.10	0.01	0.12	0
	Leisler's bat	D.01	0.34	0.93	0
		D.02	0.74	1.52	1
		D.03	1.34	3.57	1
		D.04	5.75	12.27	5
		D.06	6.4	16.89	3
		D.07	0.64	1.33	1
		D.08	5.75	11.35	5
		D.09	0.6	1.39	1
		D.10	0.74	1.73	1
	Pipistrellus spp.	D.01	0	0	0
		D.02	0	0	0
		D.03	0.02	0.19	0
		D.04	0	0	0
		D.06	0.05	0.25	0
		D.07	0	0	0
		D.08	0.83	1.87	1
		D.09	0	0	0
		D.10	0.01	0.08	0
	Common pipistrelle	D.01	0.24	1.44	0
		D.02	1.15	2.07	2
		D.03	7.94	14.61	7
		D.04	1.87	4	2
		D.06	2.11	6.78	2
		D.07	0.3	0.76	0
		D.08	44.31	73.11	52
		D.09	5.66	9.62	6
		D.10	3.64	10.63	2

	Soprano pipistrelle	D.01	0.06	0.27	0
		D.02	0.7	1.36	1
		D.03	4.86	12.36	3
		D.04	0.59	1.05	1
		D.06	10.2	24.68	3
		D.07	0.16	0.48	0
		D.08	36.94	51.26	61.25
		D.09	3.08	6.04	3
		D.10	2.11	6.16	1
	Brown long-eared bat	D.01	0	0	0
		D.02	0.07	0.26	0
		D.03	0.04	0.2	0
		D.04	0.06	0.25	0
		D.06	0.06	0.31	0
		D.07	0	0	0
		D.08	0.03	0.21	0
		D.09	0	0	0
		D.10	0.09	0.33	0

3.6.5 Static monitoring results for the substation location 2023

The species with the highest mean values for this static deployment at an initial proposed substation location was Leisler's bat (Table 20). Particularly notable is the sole recording of Nathusius' pipistrelle observed at this location.

3.6.5.1 Common pipistrelle

Common pipistrelle had low mean bat passes per hour at the substation location (Table 20). A spatial representation of this species activity recorded during the 2023 substation static survey is available in Figure 43 located in the Appendix 9: Species spatial activity recorded during 2023 substation static survey.

3.6.5.2 Soprano pipistrelle

Soprano pipistrelle had low mean bat passes per hour at the substation location (Table 20). A spatial representation of this species activity recorded during the 2023 substation static survey is available in Figure 44 located in the Appendix 9: Species spatial activity recorded during 2023 substation static survey.

3.6.5.3 Pipistrellus spp.

Pipistrellus species which were not identified to species level were recorded as having low mean bat passes per hour at the substation location (Table 20). A spatial representation of this species group activity recorded during the 2023 substation static survey is available in Figure 45 located in the Appendix 9: Species spatial activity recorded during 2023 substation static survey.

3.6.5.4 *Myotis spp.*

Myotis species had low mean bat passes per hour values at the substation location (Table 20). A spatial representation of this species group activity recorded during the 2023 substation static survey is available in Figure 46 located in the Appendix 9: Species spatial activity recorded during 2023 substation static survey.

3.6.5.5 *Leisler's bat*

Leisler's bats had low mean bat passes per hour at the substation location (Table 20). A spatial representation of this species activity recorded during the 2023 substation static survey is available in Figure 47 located in the Appendix 9: Species spatial activity recorded during 2023 substation static survey.

3.6.5.6 *Brown long-eared bat*

Brown long-eared bats had low mean bat passes per hour at the substation location (Table 20). A spatial representation of this species activity recorded during the 2023 substation static survey is available in Figure 48 located in the Appendix 9: Species spatial activity recorded during 2023 substation static survey.

3.6.5.7 *Nathusius' pipistrelle*

Nathusius' pipistrelle bats had very low mean bat passes per hour (0.005) at the substation location consisting of a single bat pass (Table 20). This species was only detected once at the site during this particular survey. A spatial representation of this species activity recorded during the 2023 substation static survey is available in Figure 49 located in the Appendix 9: Species spatial activity recorded during 2023 substation static survey.

Table 20. Substation location static survey 2023 mean bat passes per hour (bp/h) values.

Season/deployment	Species	Location	Mean	Std dev	IQR
2023 substation survey	***Myotis* spp.**	Sub.01	**0.03**	0.17	0
	Leisler's bat		**1.25**	1.91	2
	Nathusius' pipistrelle		**0.005**	0.07	0
	Common pipistrelle		**1.21**	1.58	2
	Soprano pipistrelle		**1.23**	1.58	2
	***Pipistrellus* spp.**		**0.01**	0.1	0
	Brown long-eared bat		**0.05**	0.22	0

3.6.6 Static monitoring results for spring 2024

3.6.6.1 Common pipistrelle

Mean common pipistrelle activity was high at Sub.02. At all other locations common pipistrelle activity was recorded as low (**Table 21**).

3.6.6.2 Soprano pipistrelle

Soprano pipistrelles had moderate activity levels at Sub.02. At all other locations soprano pipistrelles had low activity levels (**Table 21**).

3.6.6.3 Pipistrellus spp.

The recordings for which species could not be determined of pipistrelles (primarily social activity) were only recorded at low levels at D.11 (**Table 21**).

3.6.6.4 Myotis spp.

Myotis species were present at all locations with low activity levels (**Table 21**).

3.6.6.5 Leisler's bat

Leisler's bats had moderate activity levels at D.12 and Sub.02. They had low activity levels at D.11 and D.13 (**Table 21**).

3.6.6.6 Brown long-eared bat

Brown long-eared bats had low activity at D.12, D.13, and Sub.02. They were not recorded at D.11 (**Table 21**).

Table 21 Spring bat passes per hour (bp/h) values.

Season/deployment	Species	Location	Mean	Std dev	IQR
2024 Spring	Myotis sp.	D.11	0.02	0.17	0
		D.12	0.02	0.12	0
		D.13	0.01	0.07	0
		Sub.02	0.02	0.12	0
	Leisler's bat	D.11	0.59	1.81	0
		D.12	1.14	3.14	1
		D.13	0.59	2.04	0
		Sub.02	1.74	5.23	1
	Pipistrellus spp.	D.11	0.01	0.07	0
		D.12	0.00	0.00	0
		D.13	0.00	0.00	0
		Sub.02	0.00	0.00	0
	Common pipistrelle	D.11	0.14	0.41	0
		D.12	0.78	2.93	0
		D.13	0.66	3.13	0
		Sub.02	5.75	19.60	2

	Soprano pipistrelle	D.11	0.07	0.25	0
		D.12	0.42	1.05	0
		D.13	0.83	4.35	0
		Sub.02	2.95	13.98	1
	Brown long-eared bat	D.11	0.00	0.00	0
		D.12	0.01	0.07	0
		D.13	0.01	0.07	0
		Sub.02	0.02	0.22	0

3.6.7 Static monitoring results for summer 2024

3.6.7.1 Common pipistrelle

Mean common pipistrelle activity was high at D.12, D.13, and particularly high at Sub.02 (27.90 bp/h). At D.11 common pipistrelle activity was recorded as low (**Table 22**).

3.6.7.2 Soprano pipistrelle

Soprano pipistrelles had moderate activity levels at D.12 and D.13. At D.11 locations soprano pipistrelles had low activity levels, while at Sub.02 soprano pipistrelle activity was recorded as high (**Table 22**).

3.6.7.3 Myotis spp.

Myotis species were present at all locations with low activity levels (**Table 22**).. This is the same activity levels result as spring recordings.

3.6.7.4 Leisler's bat

Leisler's bats had moderate activity levels at all locations (**Table 22**)..

3.6.7.5 Brown long-eared bat

Brown long-eared bats had low activity at D.12, D.13, and Sub.02. They were not recorded at D.11 (**Table 22**). This is the same result as was recorded in spring.

Table 22 Summer mean bat passes per hour (bp/h) values.

Season/deployment	Species	Location	Mean	Std dev	IQR
2024 Summer	Myotis sp.	D.11	0.01	0.09	0
		D.12	0.05	0.22	0
		D.13	0.01	0.12	0
		Sub.02	0.03	0.21	0
	Leisler's bat	D.11	1.12	3.05	1
		D.12	4.29	7.10	5
		D.13	2.03	3.38	3
		Sub.02	2.19	4.07	3
	Common pipistrelle	D.11	0.41	1.27	0

		D.12	7.08	13.48	9
		D.13	5.93	9.02	9
		Sub.02	27.90	41.87	36
	Soprano pipistrelle	D.11	0.11	0.33	0
		D.12	2.20	3.40	3
		D.13	3.62	6.11	5
		Sub.02	8.05	15.51	9
	Brown long-eared bat	D.11	0.00	0.00	0
		D.12	0.02	0.15	0
		D.13	0.007	0.09	0
		Sub.02	0.01	0.12	0

3.6.8 Static monitoring results for autumn 2024

3.6.8.1 Common pipistrelle

Mean common pipistrelle activity was high at D.12, D.13, and particularly high at Sub.02 (27.90 bp/h). At D.11 common pipistrelle activity was recorded as low (**Table 23**).

3.6.8.2 Soprano pipistrelle

Soprano pipistrelles had moderate activity levels at D.12, D.13, and Sub.02. At D.11 locations soprano pipistrelles had low activity levels (**Table 23**).

3.6.8.1 Pipistrellus spp.

The recordings for which species could not be determined of pipistrelles (primarily social activity) were at low levels at D.11 and D.13 (**Table 23**).

3.6.8.2 Myotis spp.

Myotis species were present at all locations with low activity levels (**Table 23**). This is the same activity levels result as both spring and summer recordings.

3.6.8.3 Leisler's bat

Leisler's bats had moderate activity levels at all locations with the exception of Sub.02 which had low activity levels (**Table 23**)..

3.6.8.4 Brown long-eared bat

Brown long-eared bats had low activity but were present at this level in all locations (**Table 23**).

Table 23 Autumn mean bat passes per hour (bp/h) values

Season/deployment	Species	Location	Mean	Std dev	IQR
2024 Autumn	Myotis sp.	D.11	0.06	0.28	0
		D.12	0.009	0.10	0
		D.13	0.06	0.26	0

		Sub.02	0.09	0.33	0
	Leisler's bat	D.11	1.79	4.16	2
		D.12	1.01	3.60	1
		D.13	1.53	4.24	1
		Sub.02	0.91	1.62	1
	Common pipistrelle	D.11	0.51	1.15	1
		D.12	3.56	8.32	4
		D.13	1.03	2.21	1
		Sub.02	25.13	53.29	19
	Soprano pipistrelle	D.11	0.23	0.55	0
		D.12	1.21	3.07	1
		D.13	1.58	4.79	1
		Sub.02	3.11	5.58	4
	Brown long-eared bat	D.11	0.03	0.19	0
		D.12	0.02	0.13	0
		D.13	0.04	0.19	0
		Sub.02	0.05	0.26	0
	Pipistrellus sp.	D.11	0.009	0.10	0
		D.12	0.00	0.00	0
		D.13	0.004	0.07	0
		Sub.02	0.00	0.00	0

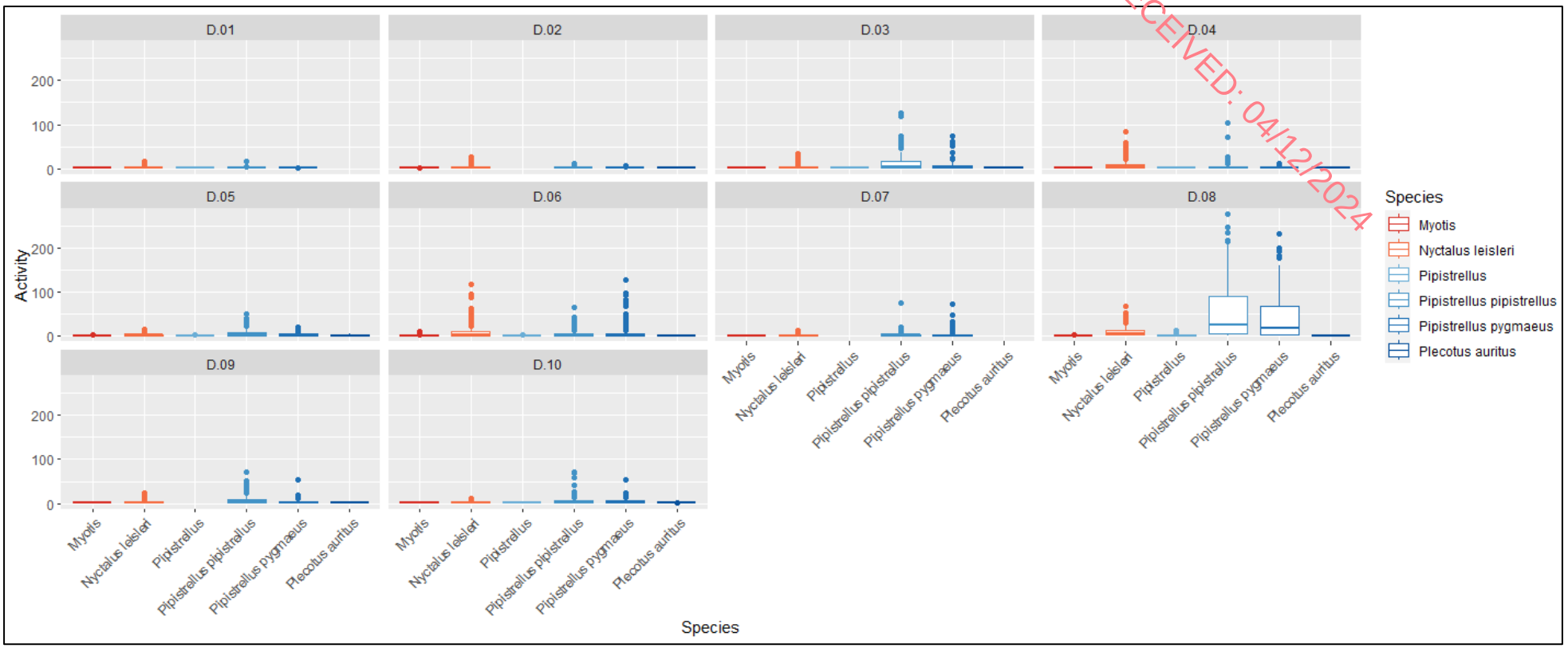

Figure 10. Bat passes of each species at detector locations across all seasons in 2022.

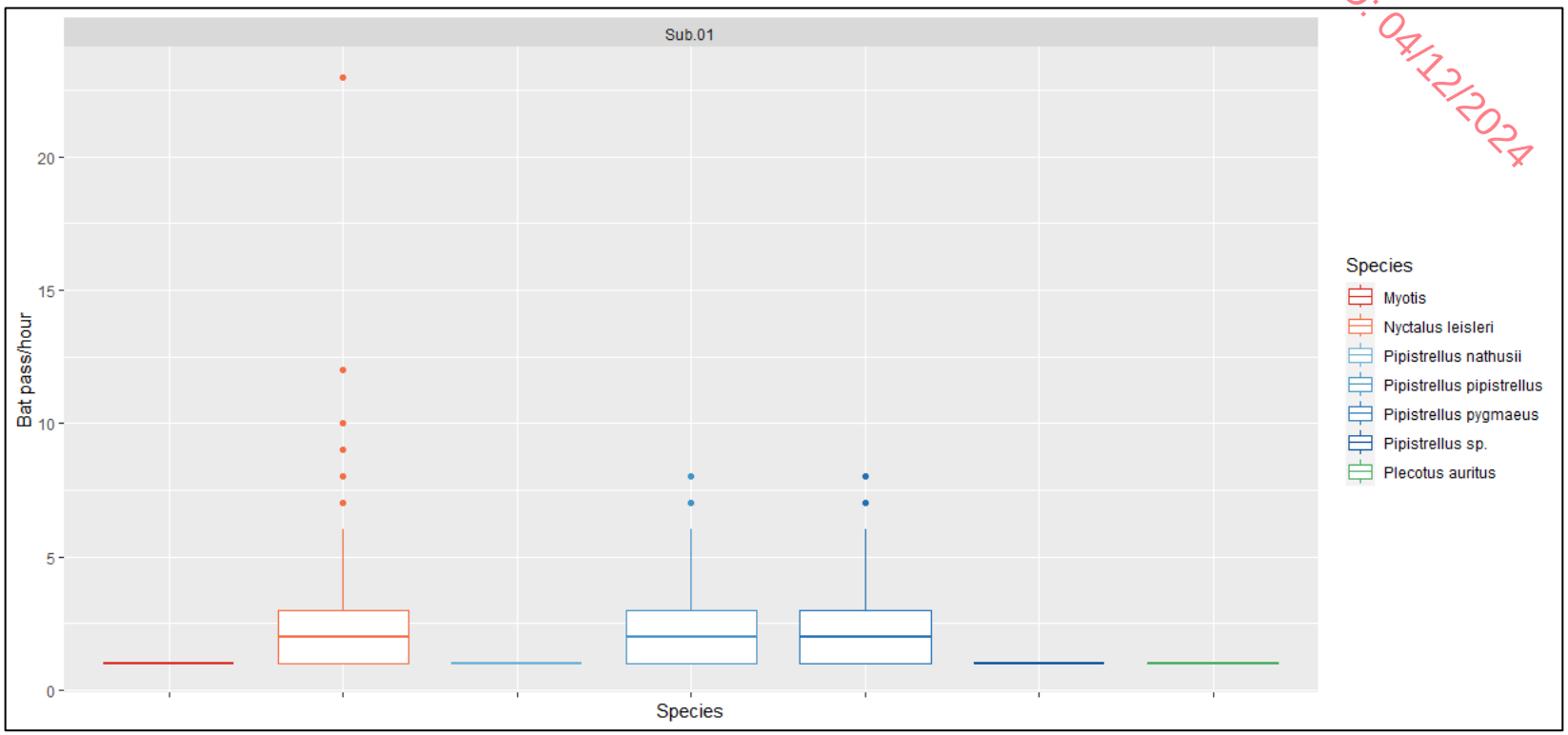

Figure 11 - Overall passes of each species at detector locations across the 2023 permanent deployment at the substation location.

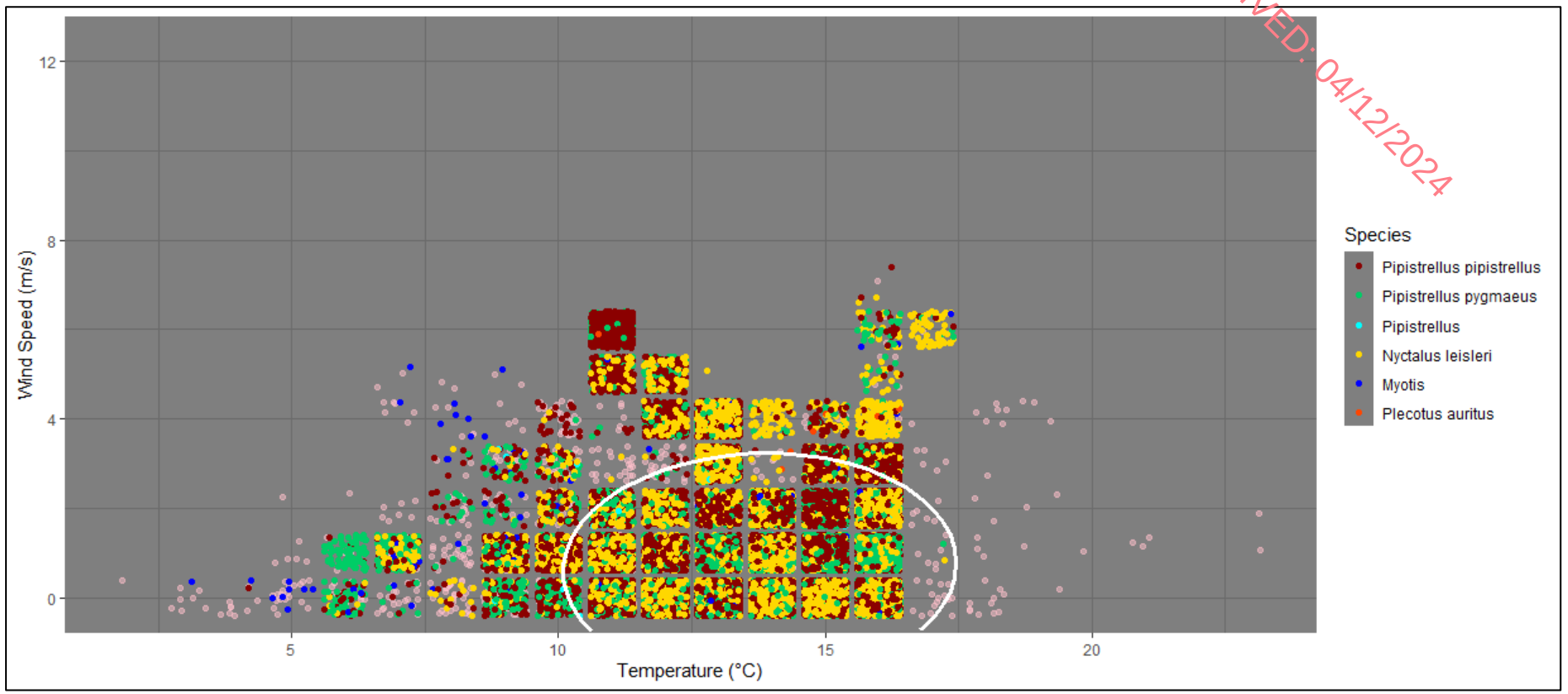

Figure 12: Weather data showing 95% interval ellipse of individual bat passes by wind speed (m/s) vs temperature (°C). Note: Pink dots represent weather data that does not correlate with a bat pass.

3.1 2023 Swarming Surveys

Swarming dusk/dawn survey details can be viewed in Table 9 and Table 10. See the results of each survey below:

Dusk swarming survey 1: 16th August 2023

Throughout this survey, commuting and/or foraging activities were detected among at least five species: common pipistrelles, soprano pipistrelles, Leisler's bats, brown long-eared bats, and *Myotis* sp. Additionally, two events of social activity from Leisler's bat were detected over the survey duration. No bat roost emergencies were observed.

Results**:** 1 social call per hour.

Dawn swarming survey 1: 17th August 2023

Throughout this survey, commuting and/or foraging activities were detected among three species: common pipistrelles, soprano pipistrelles, and Leisler's bats. Additionally, 44 events of social activity from Pipistrelle bats and two events from a non-identified bat species were detected over the survey duration. No bat roost re-entries were observed.

Results: 22 socials call per hour.

Dusk swarming survey 2: 12th September 2023

Throughout this survey, commuting and/or foraging activities were detected among two species: common pipistrelles and soprano pipistrelles. Additionally, at least 101 events of social activity from Pipistrelle bats and 14 events from a non-identified bat species were detected over the survey duration. No bat roost emergencies were observed.

Results: 57 socials call per hour.

Dawn swarming survey 2: 13th September 2023

Throughout this survey, commuting and foraging activities were detected among at least five species: common pipistrelles, soprano pipistrelles, Leisler's bat, *Myotis* spp., and brown long-eared bats. No social activity or bat roost re-entries were detected/observed.

Results:: 0 socials call per hour.

Dusk swarming survey 3: 02nd October 2023

Throughout this survey, commuting and foraging activities were detected among at least five species: common pipistrelles, soprano pipistrelles, Leisler's bat, Myotis spp., and brown long-eared bats. Additionally, at least 198 events of social activity from Pipistrelle bats and one event from a non-identified bat species were detected over the survey duration. No bat roost emergencies were observed.

Results: 99.5 socials call per hour.

Dawn swarming survey 3: 03rd October 2023

Throughout this survey, commuting and foraging activities were detected four species: common pipistrelles, soprano pipistrelles, Leisler's bat, and brown long-eared bats. Additionally, at least three

events of social activity from Pipistrelle bats were detected over the survey duration. No bat roost re-entries were observed.

Results: 1.5 socials call per hour.

Dusk swarming survey 4: 09th October 2023

Throughout this survey, commuting and foraging activities were detected three species: common pipistrelles, soprano pipistrelles, and Leisler's bat. Additionally, at least 516 events of social activity from Leisler's bats and 66 events from Pipistrelle bats were detected over the survey duration. No bat roost emergencies were observed.

Results: 258 socials call per hour.

Dawn swarming survey 4: 10th October 2023

Throughout this survey, commuting and foraging activities were detected two species: common and soprano pipistrelles. No social activity was detected during this survey. No bat roost re-entries were observed.

Results : 0 socials call per hour.

4 DISCUSSION

4.1 Summary of roost survey data

As per the results, no roosts were confirmed within the proposed site. Table 14 details the summarised results of roosts surveys conducted on site in 2022 and shows the locations of where these surveys were carried out. Images of these can also be found in Appendix 1: Roost survey locations. From the survey results, the section of mature woodland where D.08 was deployed (see Figure 3), is an area of significant importance to the local bat population. The presence of multiple potential roost features (PRFs) was recorded within this section of woodland. Some of these PRFs have been classified as having high suitability with capacity to hold multiple bats. In addition, activity for at least four species (soprano pipistrelle, common pipistrelle, Leisler's and *Myotis* spp.) was recorded during the roost emergence window during the deployment period for detector D.08.

While no roosts were confirmed during surveys the activity recorded at detector location D.08 would indicate that roosts are present within this area of woodland habitat. There is a high likelihood that bats may be using these trees on a transitional basis. CIEEM's In Practice December 2022 issue (Hinds & Davidison-Watts, 2022) discuss the fission and fusion behaviour of tree dwelling bats where bats regularly switch roosting sites. Fusion behaviour is where bats of a colony are present all in the one roost, while fission behaviour is where bats switch between roosting sites and disperse or interchange with other populations or colonies of bats. This roost switching behaviour is likely caused by the change in microclimatic conditions and seasonal and phenological changes, parasite avoidance, and other factors. This dynamic behaviour makes it challenging to definitively rule out the existence of any bat roost during punctual observations or surveys. Therefore, trees with potential roost features should be considered as roosts and will require appropriate mitigation measures if these features are to be removed as part of the proposed development.

4.2 Summary of static deployment data

The following are some notable points taken from the results of the static deployments.

During the 2022 survey year, as a general trend there was an increase in bat activity from spring to summer with summer and autumn being very similar in activity levels. This result is not unexpected as the main bat activity period is typically considered to be May to August. With April, September and October considered to the shoulder months. The static results showed that D.08 had the highest activity for Leisler's bats, common pipistrelle, and soprano pipistrelle. In terms of outlier peaks 200+ bp/h at its highest level of activity. This was evident from the social activity that was noted close to this detector. When comparing with D.05, located in the adjacent commercial spruce woodland, this detector recorded low bat activity with no species having mean bat passes per hour greater than 3 bp/h. The woodland at D.08 is a very important feature to local bat populations occurring in the vicinity of the proposed site. This area of woodland needs to be considered appropriately in a bat context during the design process of the proposed development. Another habitat feature of importance to the local bat population within the proposed site is Drumshallon Lough and its associated stream, which is used by commuting and foraging bats. D.06 during the deployment period detected high activity levels of bats in this area. Aquatic habitats are usually very important to bats since it's the primary source of food and drinking water for many bat species (Salvarina, 2016). Therefore, the aquatic source that flows from Drumshallon Lough it is considered to be an important feature to the local bat population. These aquatic habitat features need to be considered appropriately in a bat context during the design process of the proposed development. In considering bat activity in relation to weather conditions, it is significant to highlight that 95% of the total bat activity observed on the site occurred within a temperature range of 10°C to 16°C, coupled with wind speeds ranging between 0 m/s and 3 m/s. This result might present valuable insights for informing mitigation strategies aimed at minimizing the impact of the wind farm's operational phase on the local bat population, particularly for species like Leisler's bats, known to face higher collision risks.

Throughout the 2023 permanent survey conducted at the proposed substation location, there was a consistent observation of low to moderate bat activity. Notably, this location exhibited a high diversity of bat species in line with the Irish context, with at least six distinct species detected. Since the deployment of the detector was within a hedgerow, the results obtained emphasized the critical role of linear features in supporting bat populations. Among the species observed, Leisler's bats displayed the highest activity levels at the site, followed by common and soprano pipistrelles. Remarkably, the presence of Nathusius pipistrelle was recorded solely during the 2023 sampling, distinguishing it from the prior 2022 static survey conducted within the wind farm site area. Generally, the impacts of a substation primarily revolve around habitat loss and lighting, albeit these effects are typically less substantial compared to the potential impacts of a turbine. It is important to note that the maintenance of linear structures, such as hedgerows, and the preservation of appropriate distances from these features and forest fragments are pivotal in mitigating the impact of substation installation on local bat populations. Ensuring that lighting does not disrupt these habitats further diminishes potential negative effects. Consequently, if the installation of the substation does not impede or eliminate these critical linear structures and maintains a safe distance from them and the existing forest fragments, it is anticipated that the impact on the local bat population will be mitigated.

The survey carried out in 2024 covered areas to which turbines had moved that were not part of the data gathering effort in previous years. Specifically, the turbine locations T2, T3, and T4. The 2024 deployment presented similar findings to those in 2023, with overall much lower activity in spring and higher activity from Leisler's bat, soprano pipistrelle, and common pipistrelle in summer and Autumn. The new substation location (Sub.02), consistently had the highest activity for these species with the one exception of Leisler's bat in summer. This is likely due to the detector being placed along a hedgerow which converges with a small stand of native woodland. This are is highly suitable for foraging bats.

4.3 Summary of 2023 Swarming survey data

The 2022 survey findings regarding the mature woodland treeline in the southern area of the site (where D.08 was deployed) highlighted its significant importance for the local bat populations. Not only was this area identified as a potential important roosting feature, but the data as a site of high social and foraging activity. Swarming sites are associated with roost entrances, generally in buildings and caves (Collins *et al.* 2023). The swarming surveys carried out on site did not confirm any roosting locations. We have concluded that this location is not a swarming site, however, it is an important area for foraging bats and bats engaging in social behaviour.

Consequently, the high importance of this treeline for social and foraging activity in bats, underscores the necessity for larger turbine buffers to safeguard these habitats, a proposition aligned with the recommendations by NatureScot.

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6 APPENDIX 1: ROOST SURVEY LOCATIONS

Potential roost feature reference	Photographic evidence
R01	 

Potential roost feature reference	Photographic evidence
	
	
	

Potential roost feature reference	Photographic evidence
	
R02	 

Potential roost feature reference	Photographic evidence
R03	  

Potential roost feature reference	Photographic evidence
	
R04	 

Potential roost feature reference	Photographic evidence
	
R05	 

Potential roost feature reference	Photographic evidence
R06	 
R07	

Potential roost feature reference	Photographic evidence
	 
R08	

Potential roost feature reference	Photographic evidence
	
	
	
	

Potential roost feature reference	Photographic evidence
	 
R09	

Potential roost feature reference	Photographic evidence
R10	  

Potential roost feature reference	Photographic evidence
	
	
	

Potential roost feature reference	Photographic evidence
	

7 **APPENDIX 2:** WEATHER DATA

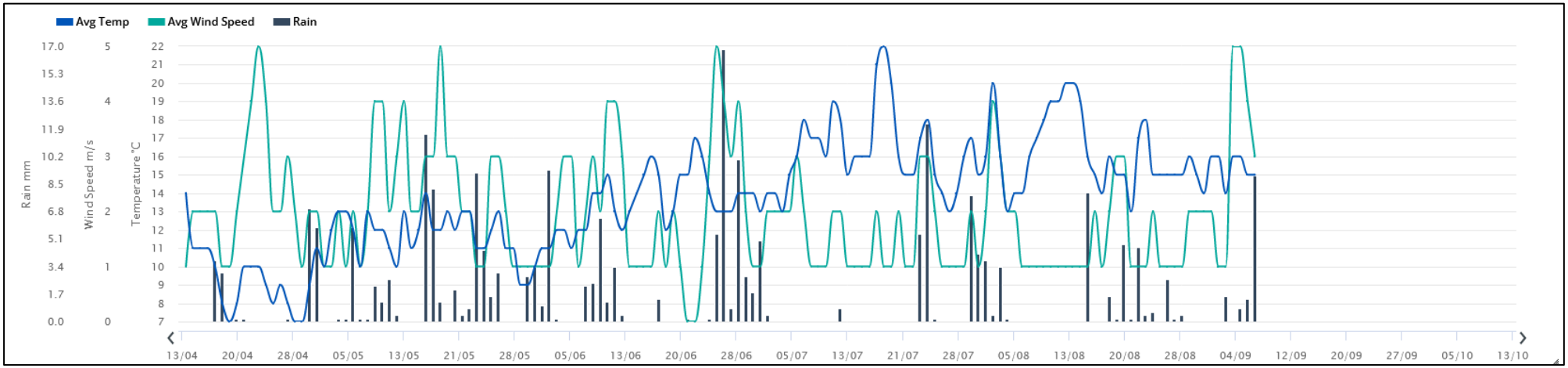

Figure 13. Mean hourly weather conditions for the duration of the 2022 deployment.

8 **APPENDIX 3:** STATIC DETECTOR LOCATIONS 2022 AND 2023

8.1 2022 deployment

Location code	Photographic evidence
D.01	
D.02	

D.03	
D.04	

D.05	

D.06	
D.07	

D.08	
D.09	

D.10	

8.2 2023 deployment

Location code	Photographic evidence
Sub.1	

9 APPENDIX 4: WINTER HIBERNATION SURVEYS

Reference	Suitability	Location	Photographic evidence
H1	Moderate	53.785531 -6.360317	
H2	Moderate	53.785531 -6.360317	 

H3	Moderate	53.785531 -6.360317	
H4	Moderate	53.785531 -6.360317	
H5	Moderate	53.785531 -6.360317	

H6	Moderate	53.785531 -6.360317	 
H7	High	53.785531 -6.360317	

			 
H8	Moderate	53.785531 -6.360317	

H9	Moderate	53.785531 -6.360317	
H10	Moderate	53.785531 -6.360317	
H11	Moderate	53.785531 -6.360317	

			
H12	Moderate	53.785531 -6.360317	 

H13	Low	53.785531 -6.360317	

10 APPENDIX 5: BCI DATA RESULTS.

BCI Data results

Grid reference	Distance from centre of site	Date	Species observed
O026765	8.967	28/05/2004	*Myotis nattereri, Nyctalus leisleri, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Plecotus auritus, Myotis mystacinus*
O0380976130	8.593	07/08/2018	*Myotis daubentonii, Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus , Myotis* spp.
O088754	8.167	16/08/2007	*Pipistrellus pipistrellus ,Pipistrellus pygmaeus, Nyctalus leisleri, Myotis* spp.
O088754	8.167	17/07/2008	*Pipistrellus pygmaeus, Nyctalus leisleri*
N9883375936	12.018	27/04/2008	*Pipistrellus pygmaeus*
O0072580904	7.876	25/08/2017	*Pipistrellus pipistrellus , Pipistrellus pygmaeus*
O1256076690	8.133	15/07/2008	*Pipistrellus pygmaeus*
O1387877749	8.123	15/07/2008	*Pipistrellus pygmaeus, Pipistrellus pipistrellus*
O1403380325	6.675	07/07/2008	*Pipistrellus pygmaeus, Pipistrellus pipistrellus*
O1185282101	3.947	07/07/2008	*Pipistrellus pygmaeus*
O0571789287	6.23	07/07/2008	*Pipistrellus pipistrellus , Pipistrellus pygmaeus*
O0591087883	4.878	07/07/2008	*Pipistrellus pipistrellus , Pipistrellus pygmaeus*
O0589886615	3.807	07/07/2008	*Pipistrellus pygmaeus, Myotis daubentonii*
O0277887146	6.463	22/07/2008	*Pipistrellus pygmaeus, Nyctalus leisleri, Myotis* spp., *Myotis daubentonii*, Unidentified bat
N9886785768	9.532	22/07/2008	*Pipistrellus pygmaeus*
N9976881712	8.572	16/07/2008	*Pipistrellus pygmaeus*

O1446789615	8.723	22/07/2008	*Pipistrellus pipistrellus , Pipistrellus* spp. (45 kHz/55 kHz)
O1413491273	9.739	22/07/2008	*Nyctalus leisleri, Myotis* spp.
O1347091259	9.338	22/07/2008	*Pipistrellus pygmaeus*
O1279989686	7.671	22/07/2008	*Pipistrellus pipistrellus, Nyctalus leisleri, Myotis* spp.
O030909	8.969	21/08/2009	*Myotis daubentonii*
N9976881712	8.572	30/09/2015	*Pipistrellus pipistrellus , Pipistrellus pygmaeus, Myotis daubentonii*, Unidentified bat
N9973482325	8.495	30/09/2015	*Pipistrellus pygmaeus*
N9886785768	9.532	30/09/2015	*Pipistrellus pipistrellus*
O0525175596	8.462	13/09/2017	*Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii*
O0469075973	8.326	14/09/2017	*Pipistrellus pygmaeus, Plecotus auritus*
O0054277108	9.96	14/09/2017	*Pipistrellus pygmaeus*
O0508779038	5.455	13/09/2017	*Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii, Pipistrellus* spp. (45 kHz/55 kHz)
O0176980787	6.95	20/07/2017	*Pipistrellus pipistrellus , Myotis daubentonii*, Unidentified bat
O0918481977	1.87	11/08/2017	*Pipistrellus pygmaeus*
O0580384554	2.562	11/10/2017	*Pipistrellus pygmaeus, Pipistrellus* spp. (45 kHz/55 kHz)
O0128884658	6.947	20/07/2017	*Nyctalus leisleri, Pipistrellus* spp. (45 kHz/55 kHz)
O0456285671	4.172	20/07/2017	*Pipistrellus pygmaeus, Myotis daubentonii*
O0582486633	3.865	11/09/2017	*Pipistrellus pygmaeus*
O0265687179	6.582	20/07/2017	*Pipistrellus pipistrellus*
O0565189309	6.276	11/09/2017	*Pipistrellus pygmaeus, Myotis daubentonii, Pipistrellus* spp. (45 kHz/55 kHz)
O0153390581	9.647	05/08/2017	*Myotis* spp.

O0298890899	8.975	04/08/2017	*Pipistrellus pipistrellus* , *Pipistrellus pygmaeus, Myotis daubentonii*
O0650991127	7.747	04/08/2017	*Myotis daubentonii, Myotis* spp.
O1087792077	8.934	09/09/2017	*Pipistrellus* spp. (45 kHz/55 kHz)
O0580088000	5.033	14/09/2006	*Pipistrellus nathusii, Pipistrellus pygmaeus, Pipistrellus pipistrellus*
N984794	10.582	16/06/2009	*Nyctalus leisleri*
O0046077564	9.736	28/07/2021	*Nyctalus leisleri*

BCI transect data results

Transect name	Distance from centre of site	Name	Species
O1254476333	8.4	Boyne Estuary Transect	*Myotis daubentonii*
O0842675139	8.4	Drogheda New Bridge Transect	*Myotis daubentonii, Nyctalus leisleri, Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*, Unidentified bat
O0660091170	7.8	Druncar Bridge Transect	*Myotis daubentonii, Myotis nattereri*
O0045182026	7.8	N77 (10) 2003-2008	*Pipistrellus pipistrellus* , *Pipistrellus* spp. (45 kHz/55 kHz), *Nyctalus leisleri, Pipistrellus pygmaeus*, Unidentified bat
O0140185403	7.0	N77 (11) 2003-2008	*Pipistrellus pipistrellus* , *Pipistrellus pygmaeus, Pipistrellus* spp. (45 kHz/55 kHz), *Nyctalus leisleri*
O0243989410	8.2	N77 (12) 2003-2008	*Pipistrellus pipistrellus* , *Nyctalus leisleri, Pipistrellus* spp. (45 kHz/55 kHz), *Pipistrellus pygmaeus*
O0045182026	7.8	N77 (2) 2009-	*Plecotus auritus, Pipistrellus pygmaeus, Pipistrellus pipistrellus* , *Nyctalus leisleri, Pipistrellus* spp. (45 kHz/55 kHz)

O0140185403	7.0	N77 (3) 2009-	*Nyctalus leisleri, Pipistrellus pipistrellus , Pipistrellus pygmaeus*
O0243989410	8.2	N77 (4) 2009-	*Pipistrellus pipistrellus , Nyctalus leisleri, Pipistrellus* spp. (45 kHz/55 kHz), *Pipistrellus pygmaeus*
O0455076250	8.1	Obelisk Bridge Transect	*Myotis daubentonii, Nyctalus leisleri,* Unidentified bat, *Pipistrellus pygmaeus, Pipistrellus pipistrellus*
O0460076200	8.1	Oldbridge	*Myotis daubentonii, Myotis nattereri,* Unidentified bat, *Pipistrellus pygmaeus, Nyctalus leisleri*

11 APPENDIX 6: SPECIES CORE SUSTENANCE ZONES

Species	CSZ radius (KM)	No. of bats studied	No. of Studies	Confidence in zone size
Lesser horseshoe	3	83	4	Good
Greater horseshoe	3	39	4	Moderate
Daubenton's bat	2	7	2	Poor
Whiskered/Brandt's bat	1	24	1	Poor
Natterers bat	4	53	2	Good
Bechstein's bat	1	70	4	Moderate
Noctule	4	20	1	Poor
Leisler's bat	3	20	2	Moderate
Common pipistrelle	2	23	1	Poor
Soprano pipistrelle	3	91	3	Good
Nathusius pipistrelle	3	9	2	Poor
Serotine	4	13	1	Poor
Barbastelle	6	69	3	Moderate
Brown long-eared	3	38	1	Poor
Grey long eared	3	20	1	Moderate

12 APPENDIX 7: SPECIES RECORDED DURING THE EMERGENCE WINDOW AT EACH DETECTOR LOCATION

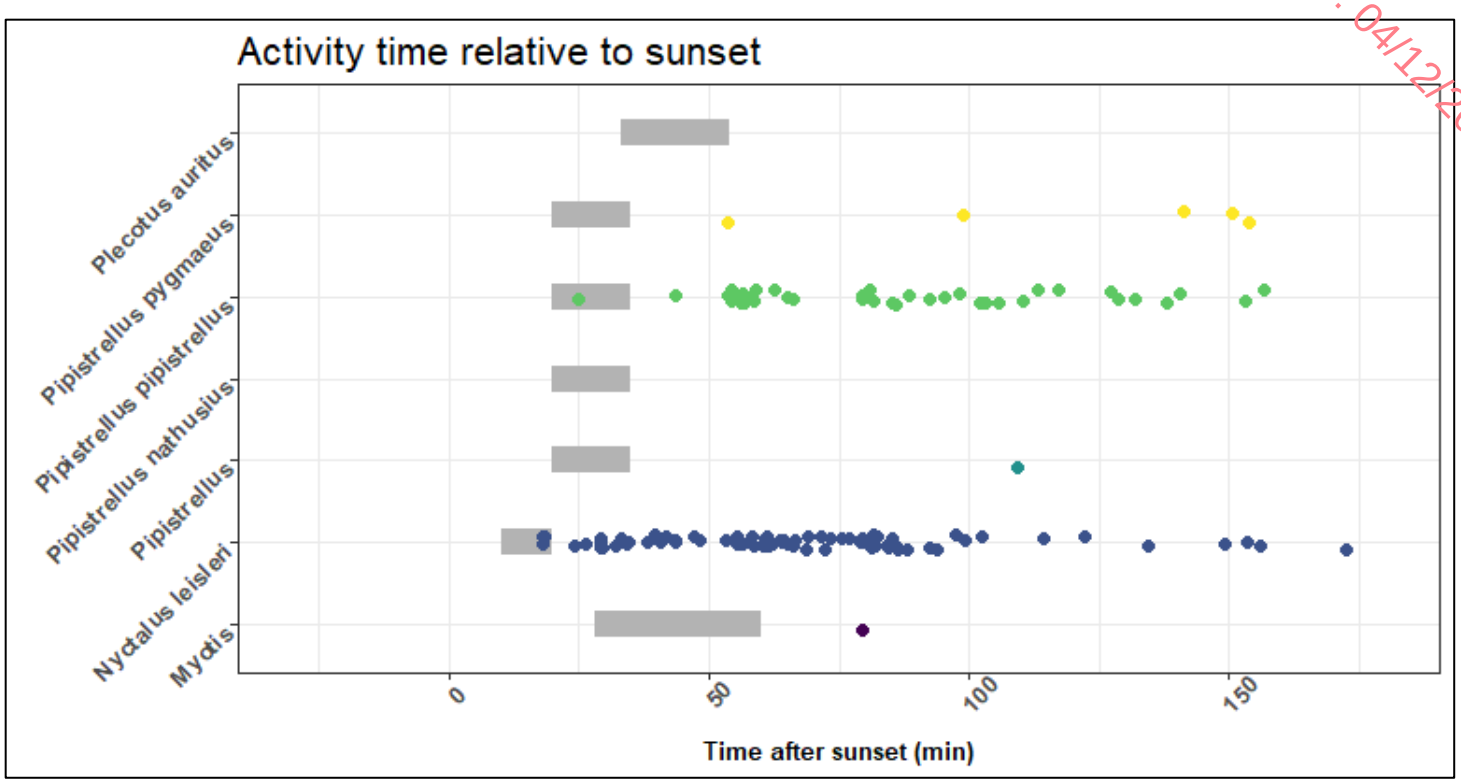

Figure 14. Location D.01 emergence windows for species present at this location.

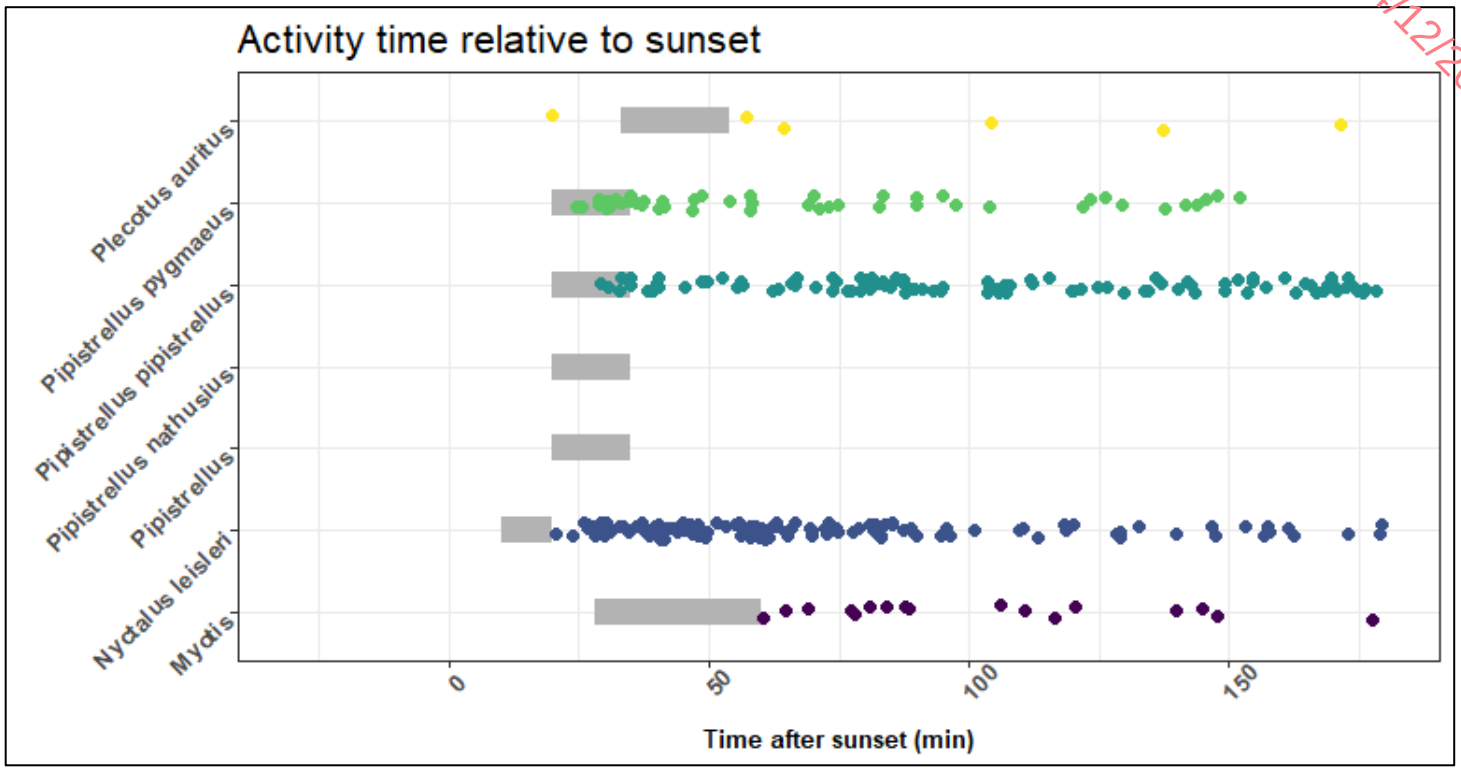

Figure 15. Location D.02 emergence windows for species present at this location.

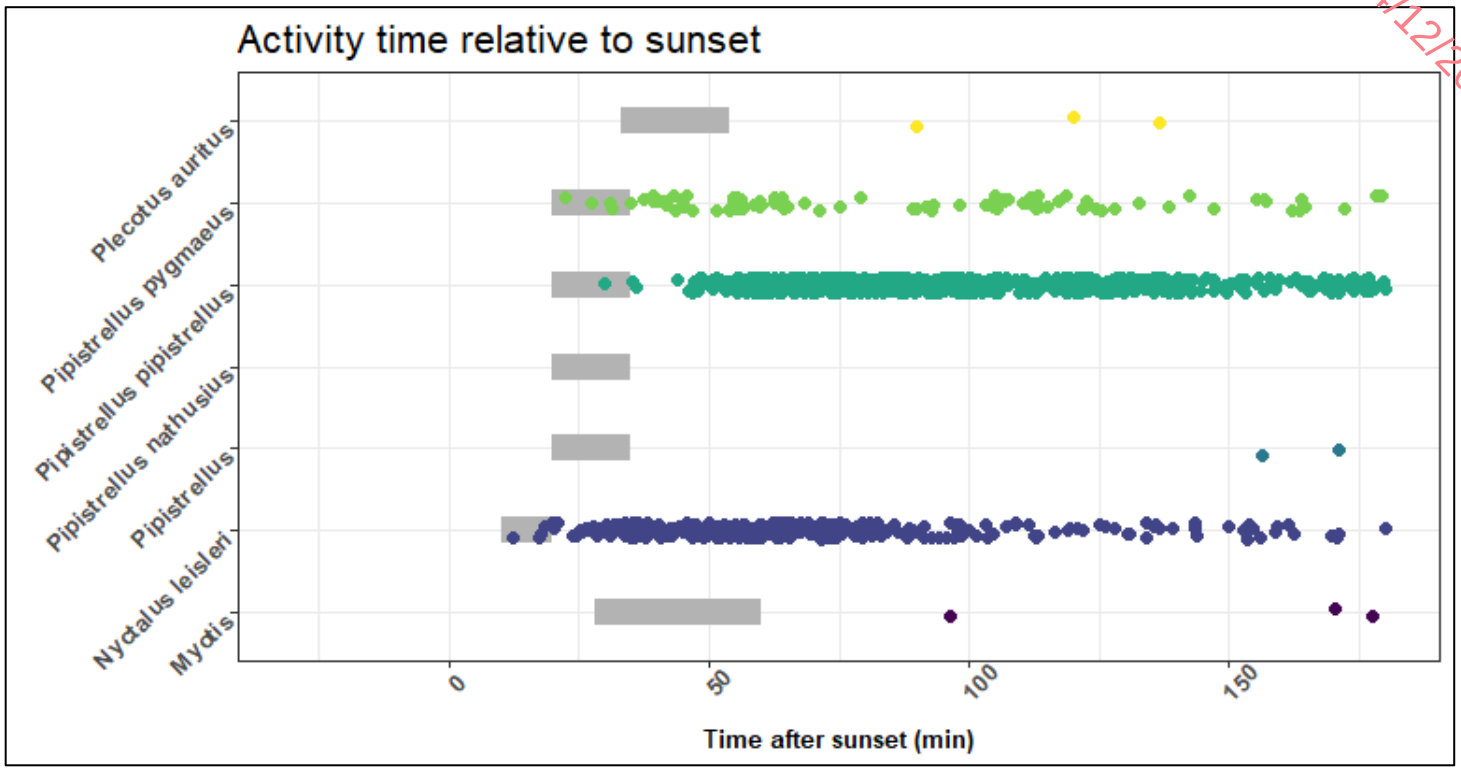

Figure 16. Location D.03 emergence windows for species present at this location.

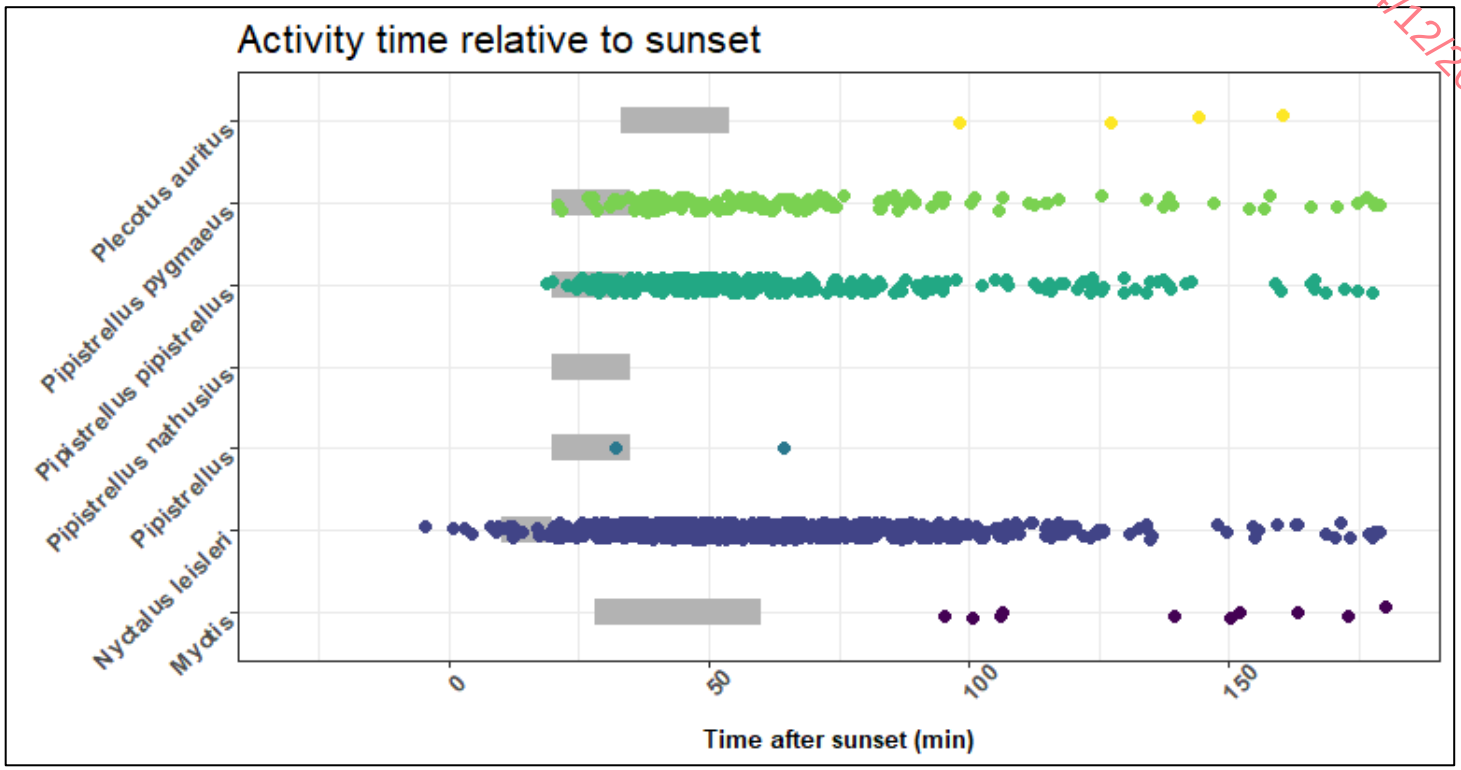

Figure 17. Location D.04 emergence windows for species present at this location.

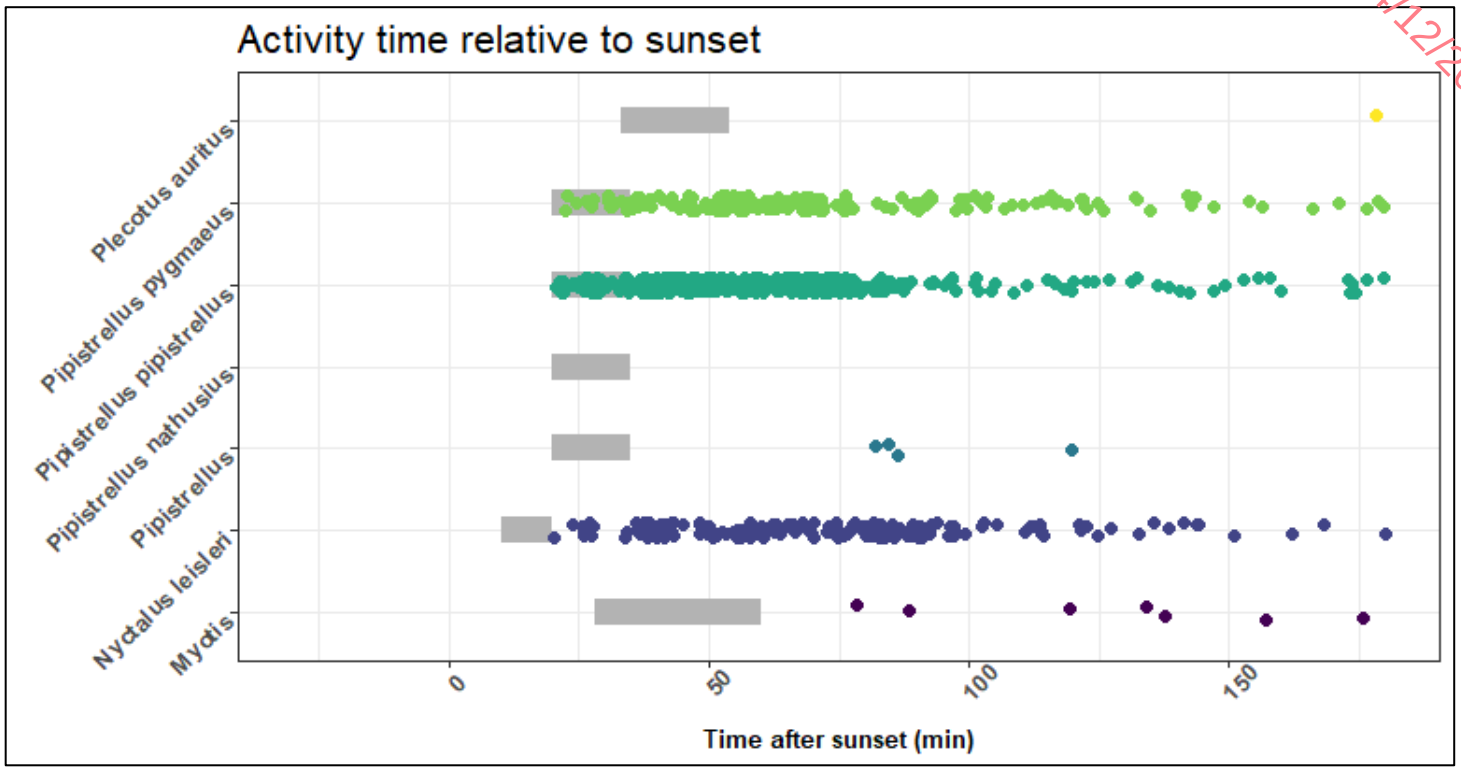

Figure 18. Location D.05 emergence windows for species present on site at this location.

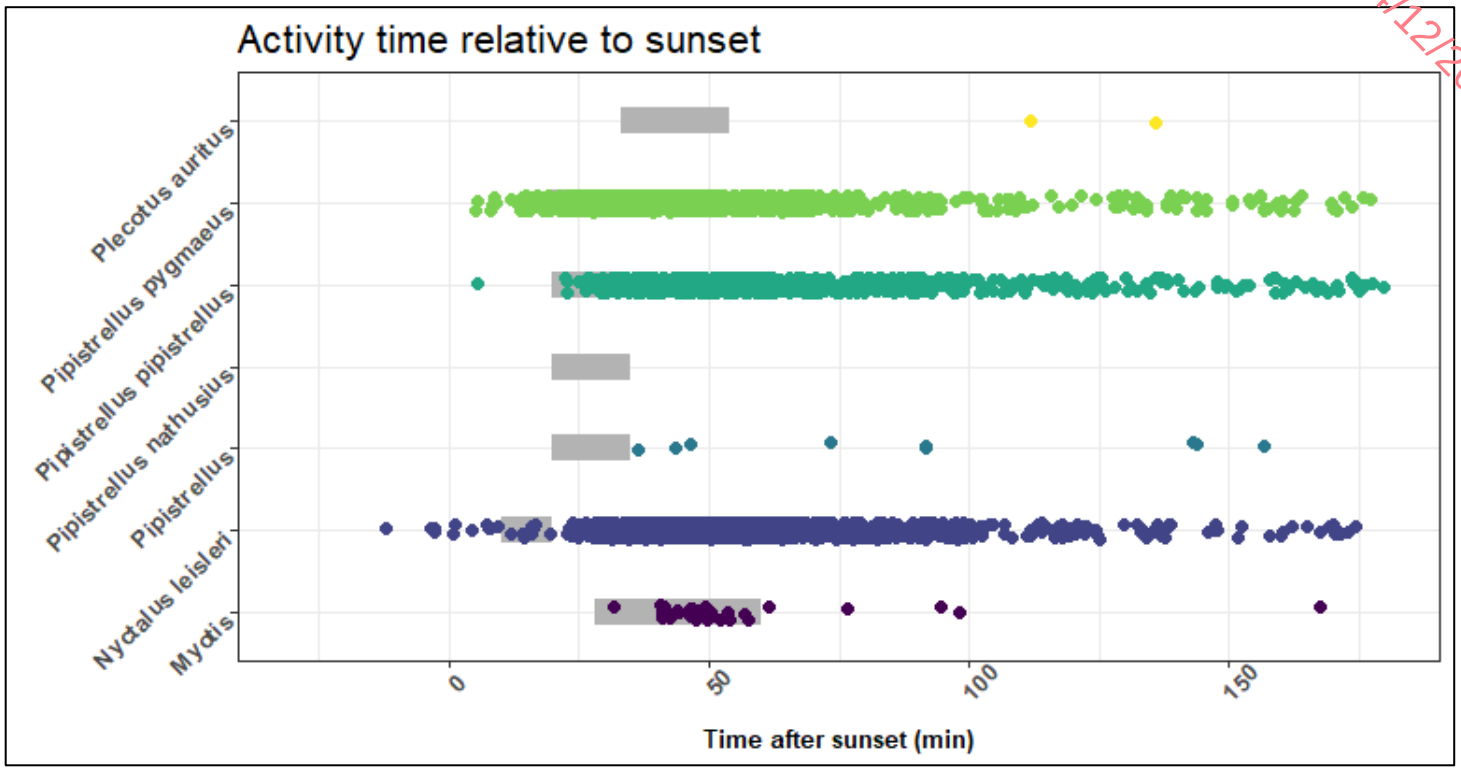

Figure 19. Location D.06 emergence windows for species present on site at this location.

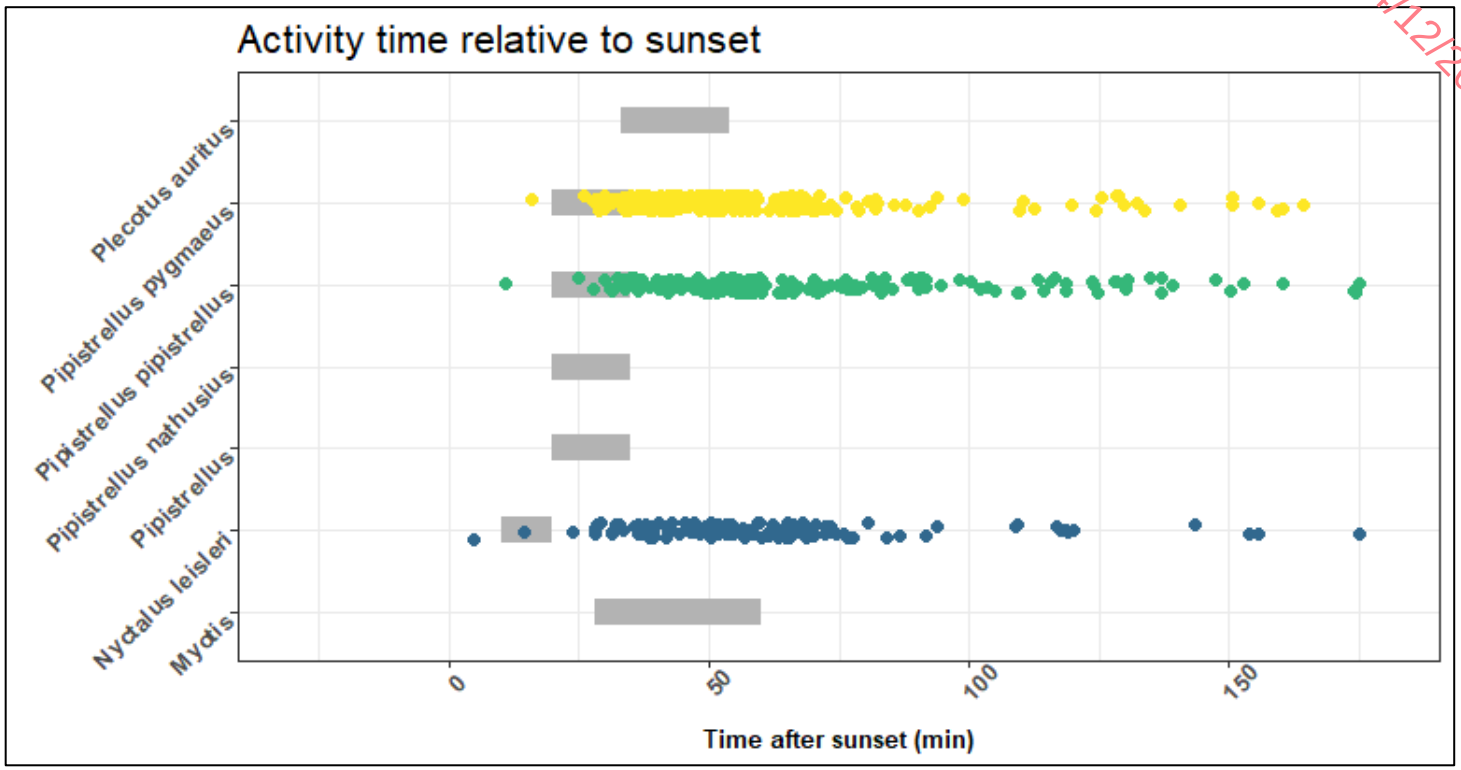

Figure 20. Location D.07 emergence windows for species present on site at this location.

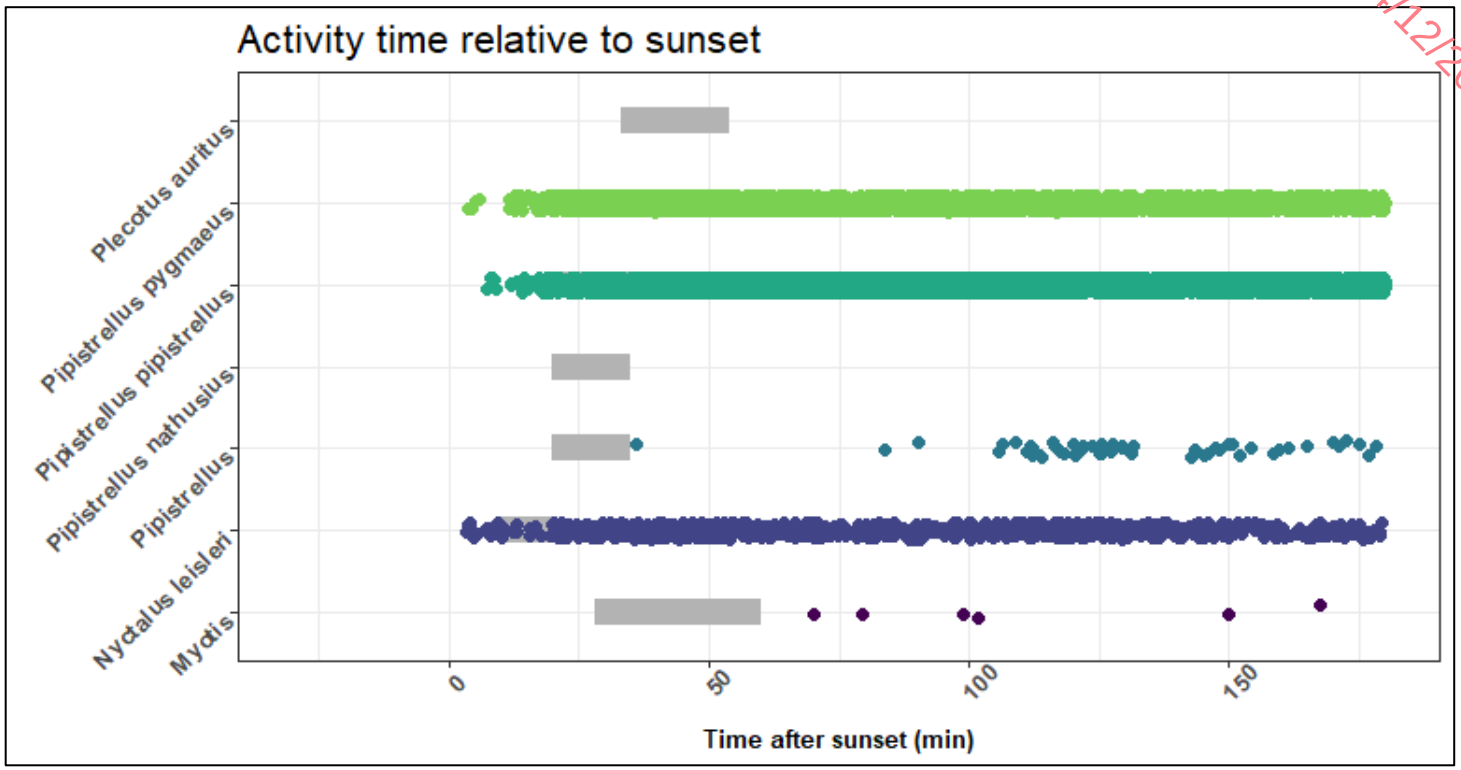

Figure 21. Location D.08 emergence window for species present on site at this location.

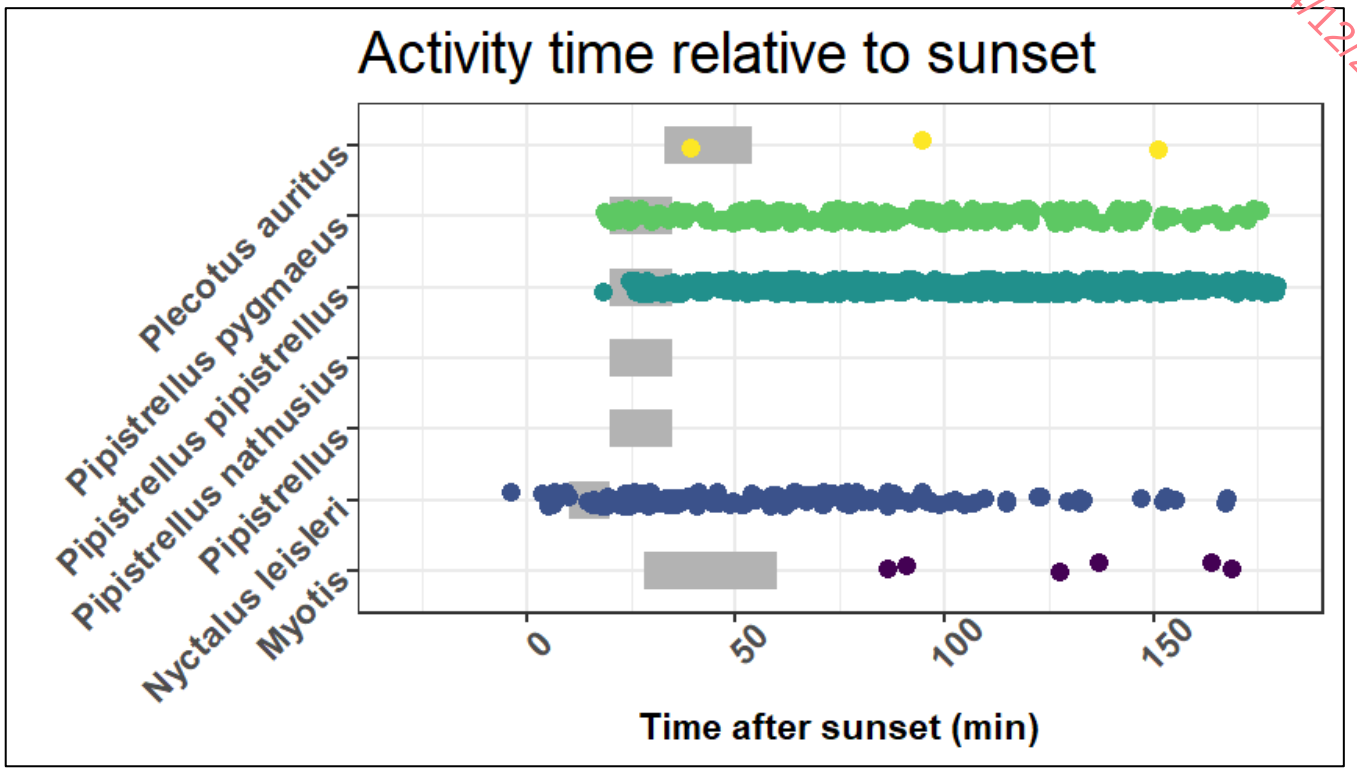

Figure 22. Location D.09 emergence window for species present on site at this location.

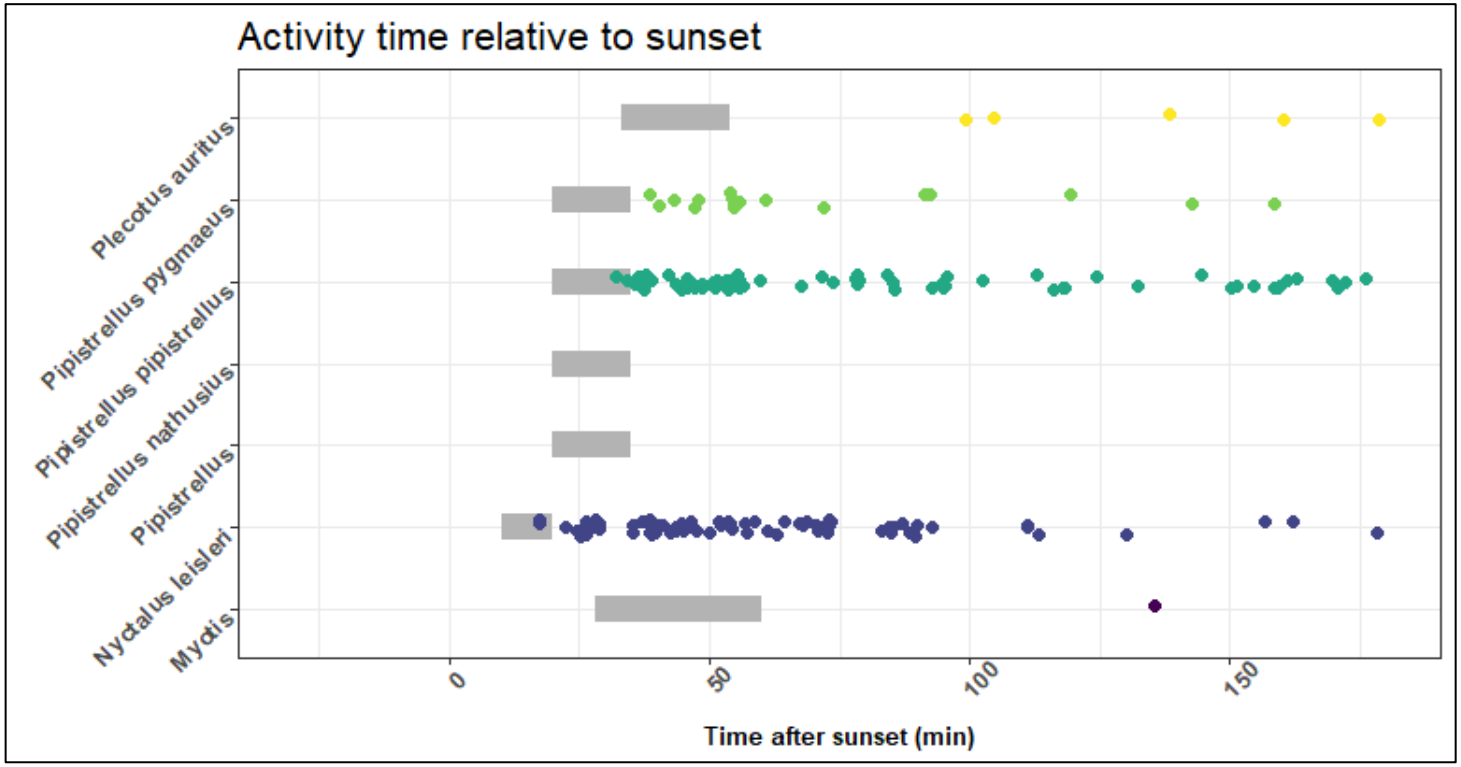

Figure 23. Location D.10 emergence window for species present on site at this location.

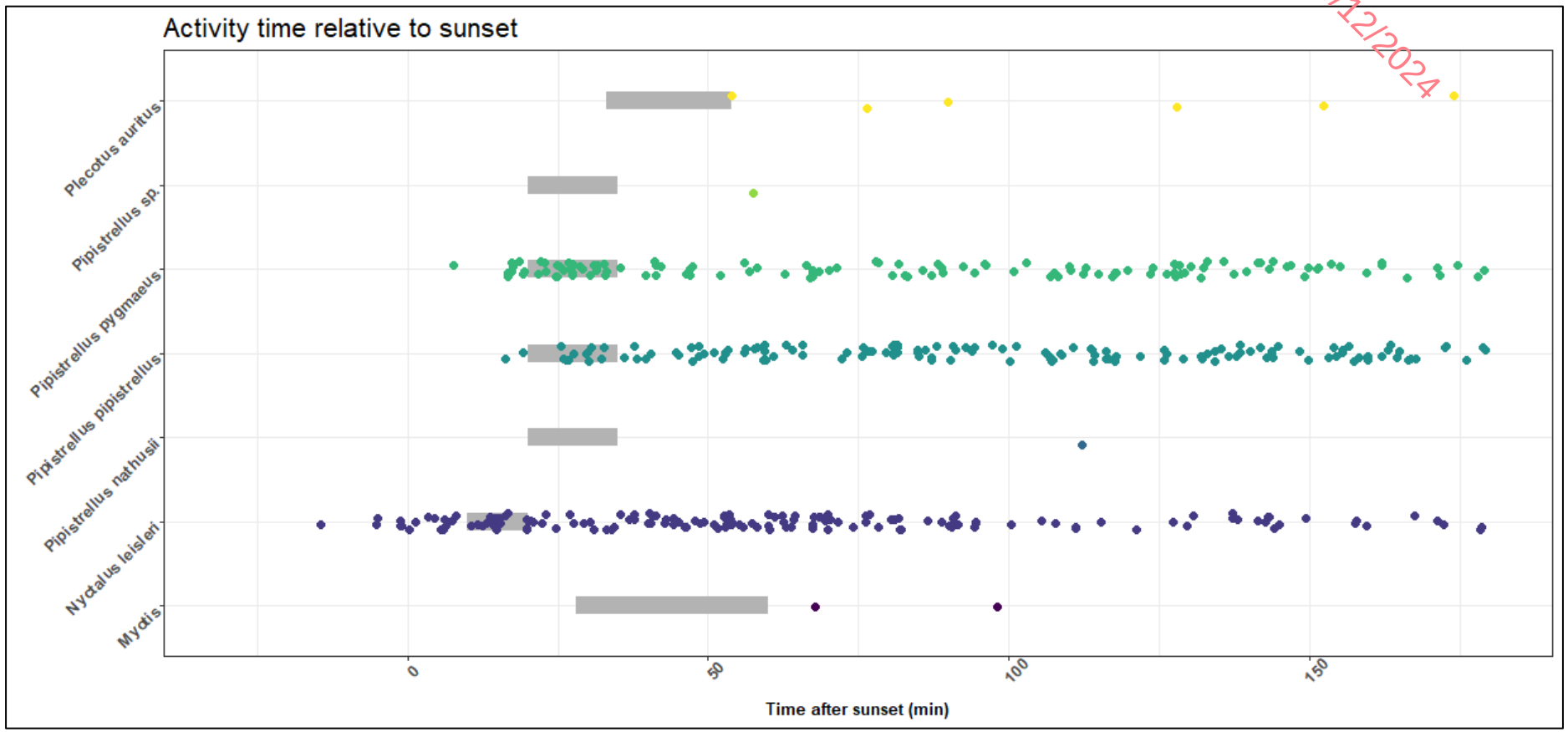

Figure 24. Location Sub.1 emergence window for species present on site at this location.

13 **APPENDIX 8:** SPECIES SPATIAL ACTIVITY RECORDED DURING 2022 STATIC SURVEYS BY SEASON

Note: The points marked on the figures below represent the locations of bat pass recordings at each detector site. These points are indicative and have been placed for visual representation purposes, facilitating easier visualization. They do not depict the actual geographical locations of the bat passes.

Figure 25. Spatial representation of common pipistrelle bats (*Pipistrellus pipistrelus*) activity (bat passes/hour) at the site during the 2022 spring static detector survey.

Figure 26. Spatial representation of soprano pipistrelle bats (*Pipistrellus pygmaeus*) activity (bat passes/hour) at the site during the 2022 spring static detector survey.

Figure 27. Spatial representation of *Pipistrellus* species bats (*Pipistrellus* sp.) activity (bat passes/hour) at the site during the 2022 spring static detector survey.

Figure 28. Spatial representation of *Myotis* species bats (*Myotis* sp.) activity (bat passes/hour) at the site during the 2022 spring static detector survey.

Figure 29. Spatial representation of Leisler's bats (*Nyctalus leisleri*) activity (bat passes/hour) at the site during the 2022 spring static detector survey.

Figure 30. Spatial representation of brown long-eared bats (*Plecotus auritus*) activity (bat passes/hour) at the site during the 2022 spring static detector survey.

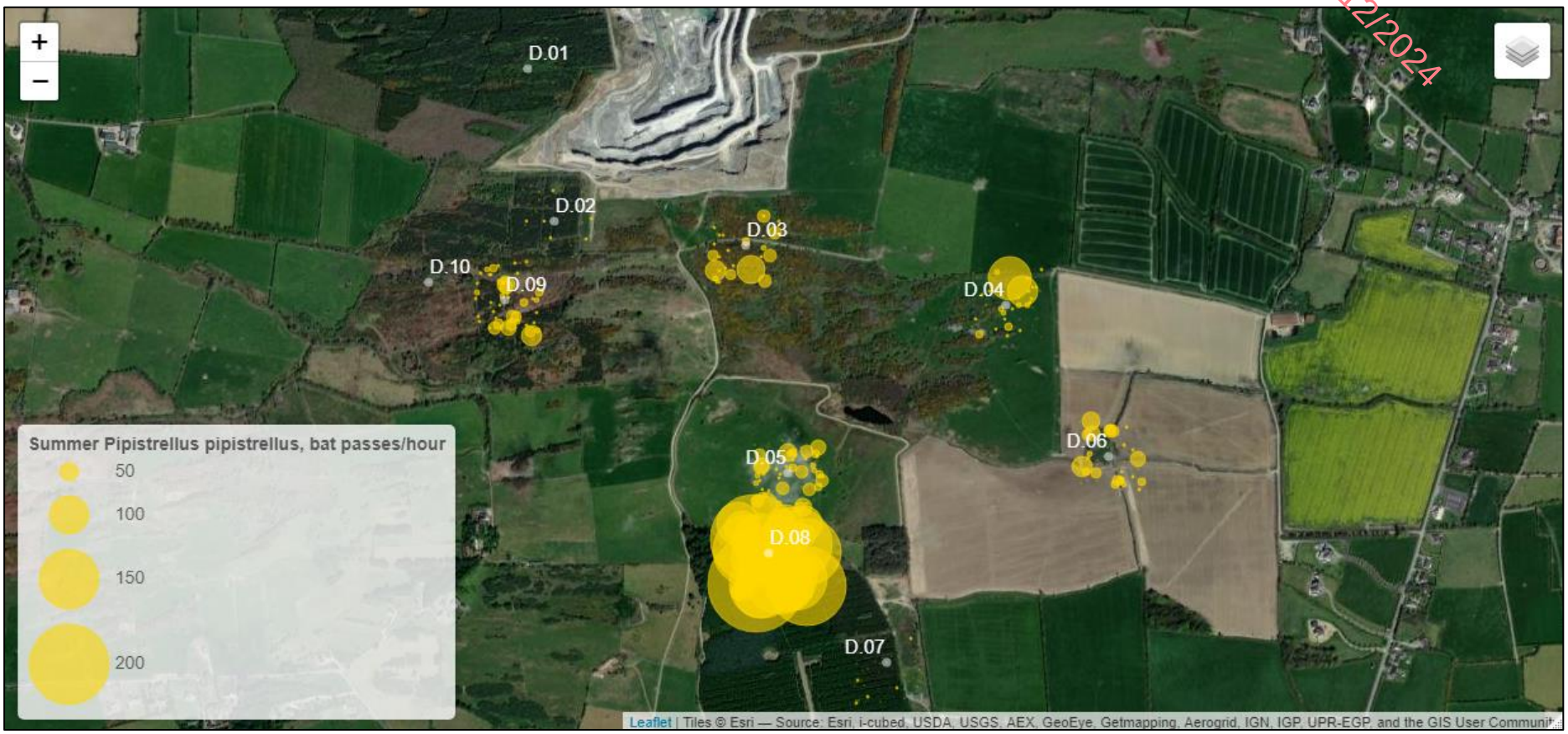

Figure 31. Spatial representation of common pipistrelle bats (*Pipistrellus pipistrelus*) activity (bat passes/hour) at the site during the 2022 summer static detector survey.

Figure 32. Spatial representation of soprano pipistrelle bats (*Pipistrellus pygmaeus*) activity (bat passes/hour) at the site during the 2022 summer static detector survey.

Figure 33. Spatial representation of *Pipistrellus* species bats (*Pipistrellus* sp.) activity (bat passes/hour) at the site during the 2022 summer static detector survey.

Figure 34. Spatial representation of *Myotis* species bats (*Myotis* sp.) activity (bat passes/hour) at the site during the 2022 summer static detector survey.

Figure 35. Spatial representation of Leisler's bats (*Nyctalus leisleri*) activity (bat passes/hour) at the site during the 2022 summer static detector survey.

Figure 36. Spatial representation of brown long-eared bats (*Plecotus auritus*) activity (bat passes/hour) at the site during the 2022 summer static detector survey.

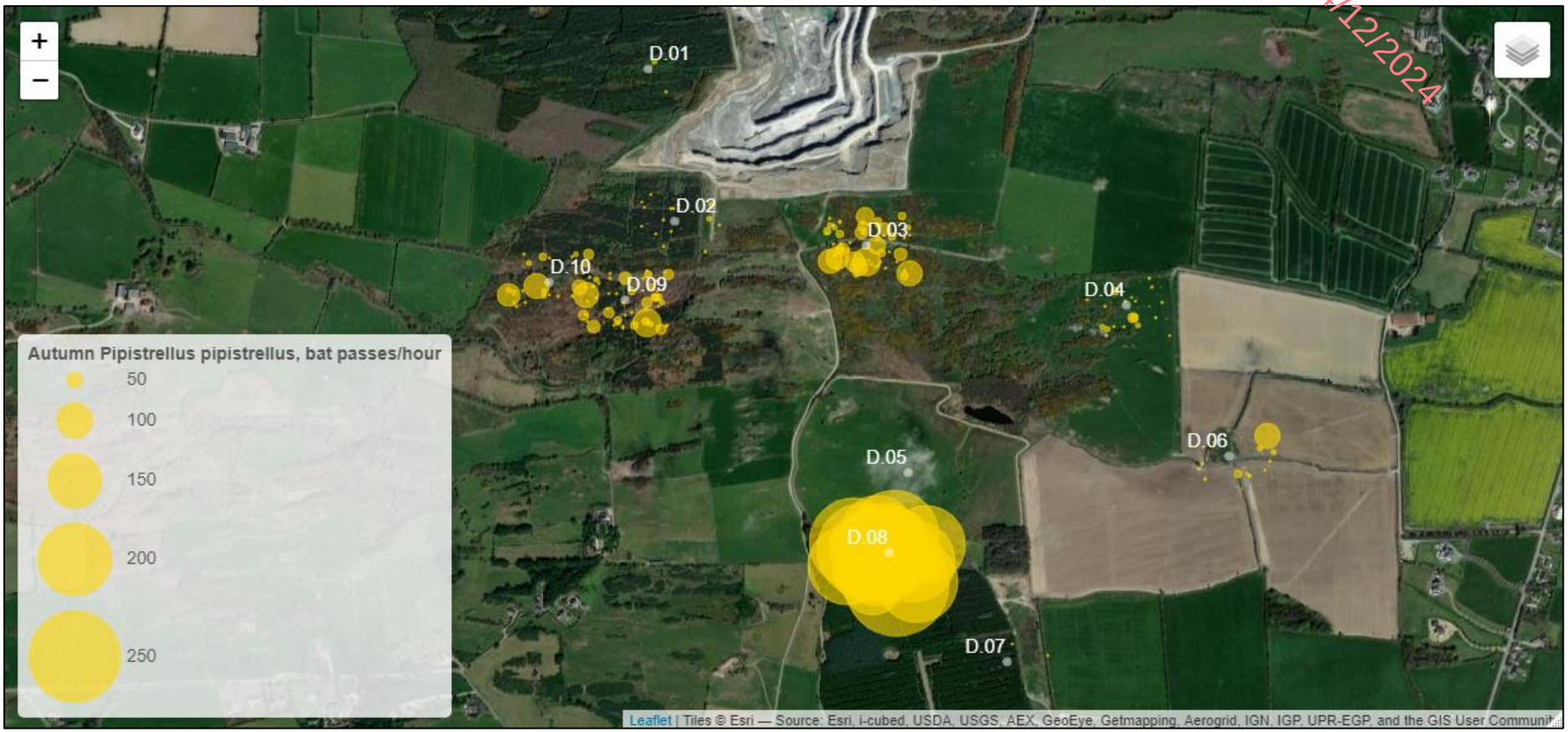

Figure 37. Spatial representation of common pipistrelle bats (*Pipistrellus pipistrelus*) activity (bat passes/hour) at the site during the 2022 autumn static detector survey.

Figure 38. Spatial representation of soprano pipistrelle bats (*Pipistrellus pygmaeus*) activity (bat passes/hour) at the site during the 2022 autumn static detector survey.

Figure 39. Spatial representation of *Pipistrellus* species bats (*Pipistrellus* sp.) activity (bat passes/hour) at the site during the 2022 autumn static detector survey.

Figure 40. Spatial representation of *Myotis* species bats (*Myotis* sp.) activity (bat passes/hour) at the site during the 2022 autumn static detector survey.

Figure 41. Spatial representation of Leisler's bats (*Nyctalus leisleri*) activity (bat passes/hour) at the site during the 2022 autumn static detector survey.

Figure 42. Spatial representation of brown long-eared bats (*Plecotus auritus*) activity (bat passes/hour) at the site during the 2022 autumn static detector survey.

14 **APPENDIX 9:** SPECIES SPATIAL ACTIVITY RECORDED DURING 2023 SUBSTATION STATIC SURVEY

Note: The points marked on the figures below represent the locations of bat pass recordings at each detector site. These points are indicative and have been placed for visual representation purposes, facilitating easier visualization. They do not depict the actual geographical locations of the bat passes.

Figure 43. Spatial representation of common pipistrelle bats (*Pipistrellus pipistrelus*) activity (bat passes/hour) at the site during the 2023 substation static detector survey.

Figure 44. Spatial representation of soprano pipistrelle bats (*Pipistrellus pygmaeus*) activity (bat passes/hour) at the site during the 2023 substation static detector survey.

Figure 45. Spatial representation of *Pipistrellus* species bats (*Pipistrellus* sp.) activity (bat passes/hour) at the site during the 2023 substation static detector survey.

Figure 46. Spatial representation of *Myotis* species bats (*Myotis* sp.) activity (bat passes/hour) at the site during the 2023 substation static detector survey.

Figure 47. Spatial representation of Leisler's bats (*Nyctalus leisleri*) activity (bat passes/hour) at the site during the 2023 substation static detector survey.

Figure 48. Spatial representation of brown long-eared bats (*Plecotus auritus*) activity (bat passes/hour) at the site during the 2023 substation static detector survey.

Figure 49. Spatial representation of Nathusius' pipistrelle bats (*Pipistrellus nathusii*) activity (bat passes/hour) at the site during the 2023 substation static detector survey.