FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 8-1

Biodiversity

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Assessment Contributors

Contributor	Work/Surveys Completed	Biography
Ben O'Dwyer	EcIA/EIAR Biodiversity Chapter Botanical/habitat surveys Mammal surveys General ecological walkover surveys Marsh fritillary surveys Bat roost PRA/GLTA surveys	Ben is a Senior Project Ecologist with Fehily Timoney with over 8 years' experience in ecological assessment and holds a BSc (Hons) in Wildlife Biology from Institute of Technology Tralee (now MTU). Ben has prepared EcIAs, EIAR Biodiversity chapters, AA Screening reports and Natura Impact Statements for numerous large scale infrastructure projects in the renewable energy, commercial, waste management and transport sectors. He is an experienced and versatile field surveyor and his experience across a broad range of habitats and projects in Ireland has given him an extensive knowledge of protected sites and species across the country.
Chandra Walter	Static bat detector surveys Bat activity surveys Bat activity analysis, reporting and assessment	Chandra Walter is a Project Ecologist working as part of the Energy and Planing Team at Fehily Timoney. Chandra holds a BSc in Ecology from University College Cork and an MSc in Organic Horticulture from University College Cork. (Both First Class Honours). Her degrees focused on nature conservation and included a wide variety of surveying skills, including habitat surveys, bird surveys and insect surveys, research skills and report writing. She has completed numerous bat surveys for proposed wind farm developments and also completed reporting and assessment for a diverse range of projects.
Hugh Rowlands	Botanical/habitat surveys Marsh fritillary surveys	Hugh is an Ecologist and GIS analyst with FT. He has experience in ecological survey methods pertaining to habitats, invertebrates, birds and mammals. He is well versed in the Fossitt habitat classification and has excellent species identification skills.

Contributor	Work/Surveys Completed	Biography
		Hugh has over 5 years' experience in the GIS and data management sector. He has worked with data in several sectors including ecological, environmental and agricultural. In his roles he has been responsible for a suite of data management procedures across multiple different projects. He has vast experience in data management software. He has been responsible for the maintenance and preparation of multiple diverse large scale datasets on behalf of bodies such as the Environmental Protection Agency in Ireland, the Department of Agriculture, Environment and Rural Affairs in Northern Ireland, and the Department of Agriculture, Food and the Marine in Ireland.
Jason Guile	Static bat detector surveys Bat activity surveys	Jason is a Senior Ecologist with Fehily Timoney and has over 10 years' experience in ecological assessment and holds a BSc in Marine Biology/Oceanography from the University of Wales, Bangor and a HND in Coastal Conservation with Marine Biology from Blackpool and Fylde College. Jason has prepared Appropriate Assessment Screening reports and Natura Impact Statements for numerous large scale infrastructure projects in the commercial, energy and transport sectors.
David Daly	Static bat detector surveys Bat activity surveys Bat roost PRF surveys	David Daly is a Project Ecologist with Fehily Timoney and Company. He holds a Bachelor of Science (BSc) in Ecology from University College Cork, and a Master of Science (MSc) in Species Identification and Survey Skills from University of Reading. David's work focused on the survey and assessment of proposed wind and solar energy development Sites, and he has carried out comprehensive ecological work on numerous Sites. He has carried out numerous mammal surveys including bat, badger, otter, and general mammal surveys, and acted as ecological clerk of works on a cable route construction project.

Contributor	Work/Surveys Completed	Biography
Ken Bond	Marsh fritillary surveys	Ken is Ireland's leading authority on Lepidoptera (butterflies and moths), having spent almost 40 years surveying and recording moths and butterflies for all counties in Ireland. During this time, he has amassed a database of 50,000 records on butterflies and moths, making a huge contribution to our understanding of Irish Lepidoptera. At the European level he is recognised as a leading regional authority on moths, being particularly expert on the taxonomy of some of the moth groups usually referred to as micro-Lepidoptera. Ken has published more than 30 papers on various aspects of Lepidoptera, including accounts of species which were unknown for Ireland until his discoveries. He was also one of the main Irish contributors to the landmark, eleven volume publication The Butterflies of Great Britain and Ireland. Ken holds a BSc in Zoology from Trinity College Dublin. Ken completed the Lepidoptera and Marsh Fritillary Survey for the Annagh Project.
Ross Macklin	Otter survey Kingfisher survey Lizard survey	Ross is a principal ecologist with Triturus Environmental Ltd. He is currently completing a Ph.D. in Environmental Science from University College Cork and holds a B.Sc. (Hons) in Applied Ecology from University College Cork. Ross is a member of Chartered Institute of Ecology and Environmental Management and a registered member Institute of Fisheries Management. Ross has over 17 years' professional experience in Ireland. He specialises in freshwater fisheries ecology, biology and water quality. He has considerable experience in a wide range of ecological and environmental projects including EIAR, EcIA and AA/NIS reporting, as well as biodiversity, water quality monitoring, invasive species and fisheries management. He also has expert identification skills in macrophytes, freshwater invertebrates, protected aquatic habitats and protected aquatic species including freshwater pearl mussel. His diverse project list includes work on renewable energy developments, flood relief schemes, road schemes, blueways/greenways, biodiversity projects, fisheries management projects and catchment wide water quality management.

Contributor	Work/Surveys Completed	Biography
Will O'Connor	Aquatic surveys Kingfisher habitat appraisal	Dr. William O'Connor is a senior environmental scientist who has over 20 year's professional ecological management experience. He is a graduate of the University of Wales, Cardiff where he was awarded an MSc degree in Applied Hydrobiology, and the National University of Ireland, Galway where he received a PhD degree in Zoology. He is a Fellow of the Society of Biology and also a member of the Chartered Institute of Ecology and Environmental Management, and the Institute of Fisheries Management. He was employed as a Senior Fisheries Biologist with the Electricity Supply Board during the period 1992-1998 and has been working as a private environmental consultant since 1999.
Tom O'Donnell	Summer bat roost surveys Bat activity surveys	Tom is a Chartered Environment Scientist (CEnv) and a full member of the Institute of Ecology and Environmental Management (MCIEEM). He has over 14 years' experience in the environmental industry, in Ireland the UK and New Zealand. Qualifications: BSc Environmental & Earth System Science, University College Cork (2003-2007); MSc Ecological Assessment, University College Cork (2008-2009); MSc Organic Farming, University of Glasgow (ongoing). Tom has experience of numerous ecological and environmental projects including EIAR, EcIA and AA/NIS reporting. Tom has significant experience in the ecological assessment of major projects such as wind farms and linear projects (incl. greenways, overhead lines, roads etc.). He has considerable experience of environmental management of construction projects, including over 3 years based on-site full-time. Tom is recognised for his skill and experience in stakeholder engagement and the design and delivery of meaningful and buildable ecological mitigation and enhancement measures. Tom lectures in Technological University Dublin (TUD) for the 'Environmental Accountability in Development' module.

APPENDIX 8-1.2

Ecological Resource Evaluation Tables

Table 1: Ecological Resource Evaluation Criteria

Resource Evaluation	Defining Criteria
International Importance	• 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA), candidate Special Area of Conservation (cSAC) or proposed Special Protection Area (pSPA). • Sites that fulfil the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). Features essential to maintaining the coherence of the Natura 2000 Network. • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural and Natural Heritage, 1972). • Biosphere Reserve (UNESCO Man and The Biosphere Programme). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Biogenetic Reserve under the Council of Europe. European Diploma Site under the Council of Europe. • Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance	• Site designated or proposed as a Natural Heritage Area (NHA). • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Acts. • National Park. • Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA) • Statutory Nature Reserve • Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park • Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. • Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive

Resource Evaluation	Defining Criteria
County Importance	• Area of Special Amenity. • Area subject to a Tree Preservation Order. • Area of High Amenity, or equivalent, designated under the County Development Plan. • Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. • County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (Higher Value)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list • Sites containing semi natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (Lower Value)	• Sites containing small areas of semi natural habitat that are of some local importance for wildlife • Sites or features containing non-native species that are of some importance in maintaining habitat links.

Aquatic Receptor Evaluation

Ecological features are assessed on a scale ranging from international-national-county-local (see Table 8-16). The local scale is approximately equivalent to one 10 km square but can be operationally defined to reflect the character of the area of interest.

Watercourses, evaluated following the NRA (2009a) criteria were evaluated on the basis of a number of characteristics and features defined as follows:

- Aquatic habitat refers to the in-water conditions of any watercourse; including substrate and stream structure (i.e. proportion of riffles, runs and pools).
- The fisheries value of a watercourse refers to its suitability for fish, primarily Salmonids (Salmon and Trout), and to the associated value for recreational angling purposes.
- Annex II species are those that are listed under the EU Habitats Directive (92/43/EEC).
- Annex I habitats are those that are listed under the EU Habitats Directive, including Priority Habitats.
- The evaluation of water quality uses a five-point biotic index (Q-value) based on the presence and relative abundance of various invertebrates using the Environmental Protection Agency's (EPA) standard technique.

Assessing Effect Significance

Once the value of the identified ecological receptors (features and resources) was determined, the next step was to assess the potential effect or impact of the project on the identified key ecological receptors.

Table 8-18 to Table 8-24 outline the EPA evaluation criteria utilised in this appraisal of the Environmental Factor, Biodiversity. This criteria is included in the Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

Table 2: Probability of Effects (EPA, 2022)

Likely Effects	Unlikely Effects
The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Table3: Quality of Effects (EPA, 2022)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities)
Neutral Effect	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.

Quality of Effect	Description
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 4: Significance of Effects (EPA, 2022)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
Profound	An effect which obliterates sensitive characteristics

Table 5: Duration of Effects (EPA, 2022)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years

Table 6: Types of Effects (EPA, 2022)

Type of Effect	Description
Effect/Impact	A change resulting from the implementation of a project
Likely Effects	The effects that are specifically predicted to take place – based on an understanding of the interaction of the proposed project and the receiving environment.

Type of Effect	Description
Indirect Effects (a.k.a. secondary effects)	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
'Do Nothing' Effects	The environment as it would be in the future should the subject project not be carried out.
'Worst Case' Effects	The effects arising from a project in the case where mitigation measures substantially fail
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
Reversible Effects	Effects that can be undone, for example through remediation or restoration
Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect
Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).

Table 7: Definition of Terms – Source, Pathway, Receptor (EPA, 2022)

Term	Description
Source	The activity or place from which an effect originates
Pathway	The route by which an effect is conveyed between a source and a receptor.
Receptor	Any element in the environment which is subject to effects.
Effect/Impact	A change resulting from the implementation of a project

Table 8: Confidence levels of predictions of impacts (NRA, 2009a)

Confidence level category	
Near certain	>95% chance of occurring as predicted
Probably	50-95% chance of occurring as predicted
Unlikely	5-50% chance of occurring as predicted
Extremely unlikely	<5% chance of occurring as predicted

APPENDIX 8-1.3

Drehid Wind Farm Otter Report 2023

Otter (*Lutra lutra*) survey of Drehid Wind Farm, Co. Kildare (2022-2023)

Triturus

Prepared by Triturus Environmental Ltd. for Fehily Timoney & Company

October 2023

Please cite as:

Triturus (2023). Otter (*Lutra lutra*) survey of Drehid wind farm, Co. Kildare (2022-2023). Report prepared by Triturus Environmental Ltd. for Fehily Timoney & Company. October 2023.

Table of contents

1. Introduction

1.1 Project background

Triturus Environmental Ltd. were commissioned by Fehily Timoney & Company to undertake an otter (*Lutra lutra*) survey of the watercourses in the vicinity of the proposed Drehid wind farm project, located near the Kildare/Meath border south of Enfield, Co. Meath (**Figure 2.1**).

Site surveys completed as part of the Environmental Impact Assessment Report (EIAR) for the proposed development in 2018 identified two otter signs (including a potential holt) along the Fear English River within the study area and concluded that "*otters are likely to utilise the Fear English River which bisects the proposed development site*" (FT, 2018). Subject to a further information request on the 19th February 2019 from Kildare County Council (Planning Ref 18/1534), and in order to ensure the EIAR and AA Screening/NIS had sufficient scientific data to support its assessment, findings and conclusions, a dedicated otter survey within the development footprint was undertaken within the development footprint in May 2019. The survey recorded a low number of otter signs along the Fear English River, including two potential holts (Triturus, 2019).

The current baseline surveys, undertaken in October 2022 and October 2023, aimed to update previous otter surveys of the site (Triturus, 2019) to provide more contemporary records of otter distribution by identifying otter field signs (i.e. holts, spraints, couches, prints & other signs). The distribution of these signs acted as an indicator of the most important areas of aquatic and riparian habitat used by otters, inclusive of potential breeding and resting areas (i.e. holts and couches). This data would also help to further inform mitigation for the proposed development and minimise potential direct and indirect impacts to otter.

1.2 Legislative protection & conservation status

The Eurasian otter (*Lutra lutra*) is a species of conservation concern and high priority having suffered major declines in its range and population throughout Europe since the 1950s. It is classified as 'near threatened' by the IUCN Red List with a decreasing population trend and, as such, is listed in Appendix I of CITES, Appendix II of the Bern Convention (Council of Europe, 1979) and Annexes II and IV of the EC Habitats Directive (92/43/EEC).

Otters, along with their breeding and resting places, are also protected under provisions of the Irish Wildlife Acts 1976-2023. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Directive 92/43/EEC, which is transposed into Irish law by the European Union (Birds and Natural Habitats) Regulations 2011-2021.

The protection of otters is outlined in Article 51(1) and (2):

Protection of fauna referred to in the First Schedule;

51.(1) *The Minister shall take the requisite measures to establish a system of strict protection for the fauna consisting of the species referred to in Part 1 of the First Schedule.*

***51.(2)** Notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a license granted by the Minister under Regulation 54, a person who in respect of the species referred to in Part 1 of the First Schedule (listed below). Items (b) and (d) may be considered most relevant to developments.*

(a) *deliberately captures or kills any specimen of these species in the wild,*

(b) *deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,*

(c) *deliberately takes or destroys eggs of those species from the wild,*

(d) *damages or destroys a breeding site or resting place of such an animal, or*

(e) *keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive, shall be guilty of an offence.*

According to the NPWS (2021), '*it should also be noted that in the case of Regulation 51(d) 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 and this action does not need to be deliberate*'. Furthermore, '*breeding and resting places are protected even when the animals are not using them, once there is a high probability that they will return*' (CJEU Case C-477/19) (NPWS, 2021). Regulation 51(d) therefore places a strict responsibility of due diligence on anyone proposing to carry out an 'action or project' that can 'damage or destroy' the breeding place of Annex IV species.

In an Irish context, according to the most recent Article 17 reporting (NPWS, 2019), otter conservation status has improved, with the species now evaluated as being of 'Favourable' conservation status. Otters were considered to be previously 'Near Threatened' (Marnell, 2009) based on a 20-25% decline between 1980 and 2005 (Bailey & Rochford, 2006). However, the current conservation status is now of 'Least Concern' (Marnell et al., 2019).

1.3 Study area description

The c. 393ha landholding in which the Proposed Wind Farm and Substation are located is composed primarily by agricultural pasture (GA1; Fossitt, 2000) to the north and south, with more central areas dominated by coniferous afforestation and associated clear-fell (WS5) over peat soils. To the east of the site boundary sits Timahoe North Bog, a large area of cutaway bog (PB4). Small areas of degraded raised bog (PB1), scrub (WS1), bog woodland (WN7) and mixed broad-leaved woodland (WD1) are also scattered throughout the wider site.

The site is bisected by the Fear English River (aka Ballynamullagh/Coolree River), a tributary of the (Longwood) River Blackwater which has indirect connectivity with the River Boyne and River Blackwater SAC (site code: 002299) site approximately 15km downstream. Both the Kilcooney River (aka Coolree Stream) and Sweep River (aka Clonkeeran Stream), as well as several unnamed adjoining drainage channels, adjoin the Fear English River within the proposed landholding boundary (**Figure 2.1**). A small, c. 0.16 ha dystrophic lake (FL1 habitat) is situated in recolonising cutover bog (PB4) and wet heath (HH3) habitat adjoining the proposed development boundary near turbine T8. To the south of the site, the Fear English River channel flows through an agricultural landscape bordered to the east by cutaway bog. The channel has been extensively straightened and deepened historically, with a largely trapezoidal profile of poor hydromorphology (i.e. steep more V-shaped sloping banks with flat uniform bed). Much of the upper and lower survey reaches are heavily scrubbed over by bramble (*Rubus fruticosus* agg.) and hawthorn (*Crataegus monogyna*), with intermittent treelines largely composed of mature ash (*Fraxinus excelsior*). More open areas are often dominated by instream growth of fool's watercress (*Apium nodiflorum*), branched bur reed (*Sparganium erectum*) and common duckweed (*Lemna minor*). Riparian shading is invariably high throughout, particularly in the middle reaches of the survey area where particularly steep banks (up to 4m in height) have promoted arboreal tunnelling of the channel. Basal flow rates are typically slow (glide habitat), with the substrata dominated by silt throughout. Some shallow, higher energy areas of coarse gravels, cobble and limited boulder are present but these are invariably bedded and silted. The lower reaches of the Kilcooney and Sweep rivers, which are also heavily scrubbed, historically straightened and situated in agricultural landscapes, also suffer from hydromorphological and siltation pressures.

2. Methodology

2.1 Desktop review of otter records

A desktop review of the available otter data for the Drehid wind farm site and surrounding areas was undertaken. Data records held by the National Parks & Wildlife Service (NPWS) and National Biodiversity Data Centre (NBDC) were also reviewed. Otter data collated during previous ecological surveys of the site (Triturus, 2019; FT, 2018) was also reviewed. Grey literature in the form of consultancy reports for other nearby habitats (e.g. Timahoe North Bog) were also consulted.

2.2 Otter sign surveys

Walkover otter surveys of the aquatic habitats in the vicinity of the proposed development were undertaken on the 15th and 16th October 2022 and the 10th October 2023. Mirroring previous efforts (Triturus, 2019), the survey area encompassed sections of the Fear English River (aka Ballynamullagh or Coolree River), Kilcooney River (aka Coolree Stream) and Sweep River (aka Clonkeeran Stream), as well as several unnamed adjoining drainage channels (**Figure 2.1**). This equated to a total linear channel survey distance of 6.9km (**Table 2.1).** A small bog pool (covering c.1ha surface area), located near proposed turbine T8, was also surveyed.

The surveys were completed during dry, mild, bright and settled conditions, which ensured that a good representation of habitat marked by otter could be recorded in the field, including territorial marking or marking of feeding areas. Each otter sign was logged by type, location (handheld GPS), condition and approximate age for later interpretation to distinguish differences in habitat use and activity. Spraints were subjectively assessed as either fresh (recent), mixed-age (recent and older spraints, typically indicative of a regular sprainting site) or old (spraint degrading and not recently deposited). Furthermore, indicative counts of spraint (i.e. number of individual spraints) and the number of sprainting sites (often separate clusters in one area) were noted. This helped indicate the frequency of otter marking, which can clarify levels of activity in particular areas, inclusive of breeding (holt) and resting (couch) areas.

Table 2.1 Watercourses surveyed for otter in the footprint of the proposed Drehid wind farm site, Co. Kildare, October 2022 & October 2023

Watercourse	EPA code	Alternative name (EPA)	Length of channel surveyed (nearest 0.1km)
Fear English River	07B19, 07C23	Ballynamullagh River, Coolree River	5.7
Fear English River	n/a	n/a	0.2
Fear English River	07C23	Coolree River	0.5
Fear English River	07C26	Clonkeeran Stream	0.5
Total channel length surveyed			**6.9**

2.3 Total corridor otter survey (TCOS) methodology

The survey broadly followed the best practice survey methodology for otter as recommended by Lenton et al. (1980), Chanin (2003) and Bailey & Rochford (2006). However, methodology differed in that the entire waterline was surveyed rather than the standard 500-600m sections from accessible points (e.g. bridges). The novel survey technique, known as a total corridor otter survey (TCOS) (Macklin et al., 2019), encompassed the entire riparian zone (both banks) within the survey area.

Total corridor survey methodology typically involves the use of two (or more) surveyors working independently (in tandem) along each respective bank of an individual watercourse (where practical). This also facilitates one to work from a more elevated position (e.g. bank top) with one surveying (with appropriate PPE such as a dry suit or chest waders) from within the channel, thus greatly increasing the likelihood of otter sign detection. This is especially true of more cryptic signs such as holts, which can be located in undercut banks, under tree root systems etc. out of the view of traditional surveys. Surveyors can alternate between the channel and each bank depending on surveyor knowledge and experience of preferential areas of habitat likely to be used by otter.

2.4 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

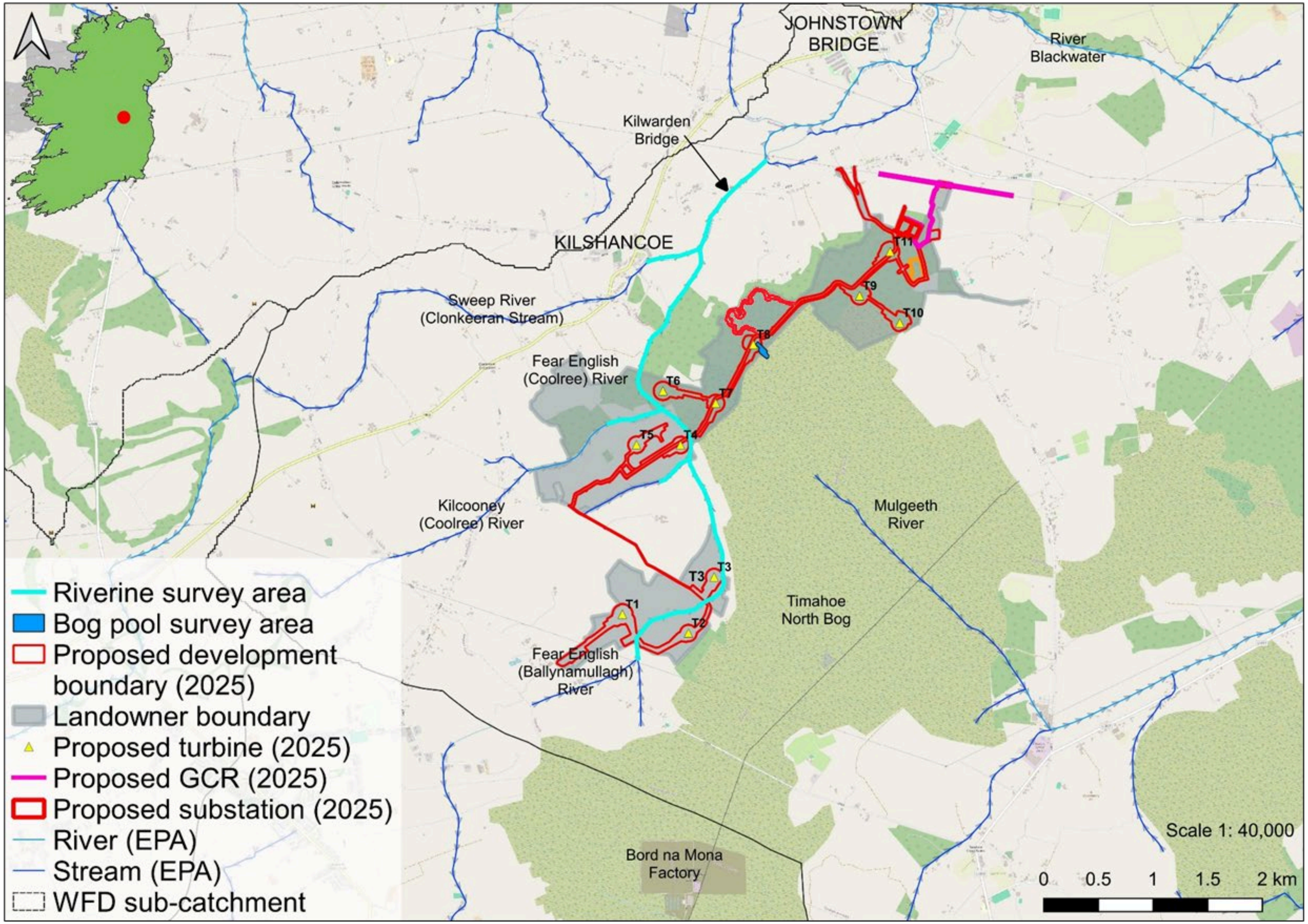

Figure 2.1 Overview of the otter survey area in the vicinity of the proposed Drehid wind farm, October 2022 & October 2023

3. Results

3.1 Desktop review of otter records

A desktop review revealed a low number of otter records within and in the vicinity of the survey area. Otter signs (spraint) were recorded in the 2012-2013 period along bog drainage channels to the south-east of turbine 7 and 8 of the proposed wind farm (FT, 2018). During 2018 surveys, two otter signs were observed within the study area; one outside of the proposed development and one within. An otter slide was observed just outside the proposed development along the Fear English (Ballynamullagh) River; approximately 93m from proposed turbine T3 hardstanding area. An otter holt[1] was observed within the proposed development boundary along the Fear English River, approximately 27m from a new access track and 16m from felling activities (FT, 2018).

A low number of contemporary otter records were also available for the Fear English River (2015, NBDC data) and adjacent Timahoe North Bog (Triturus, 2019b; NBDC data).

Previous otter surveys of the proposed wind farm site revealed a low number of spraint sites, prints and two holt areas (Triturus, 2019). Apart from prints near a bog pool adjacent to turbine T8 , all signs were recorded along the Fear English River channel.

3.2 Otter records [2]

A total of *n*=8 otter signs were recorded within the survey area during the October 2022 survey, with *n*=6 signs recorded in October 2023 (**Table 3.1; Figures 3.1**).

Considering data compiled over the two years of surveys, spraint sites (*n*=7) accounted for the majority of all signs recorded, with 3 no. set of prints and 2 no. holts (H1 and H2) also recorded (**Table 3.1**). Based on the 2023 survey data holt H2 was considered active while holt H1 was considered inactive.

Apart from fresh prints (and associated slide) in the soft littoral mud of the bog pool adjacent to turbine T9 and prints recorded in the lowermost reaches of the Kilcooney (Coolree) River during October 2022, all signs were recorded along the Fear English River channel.

[1] This is the same location as the current holt H2 (see Table 3.1 and Results section)

[2] Please note that, to protect the location of sensitive potential otter breeding and resting areas, a redacted version of this report is required should the data be made publicly available

Table 3.1 Summary of the otter signs recorded in the vicinity of the proposed Drehid wind farm, October 2022 & October 2023

Otter sign	Watercourse	Within landholding boundary	Nearest turbine	Notes	ITM X	ITM Y
October 2022						
Spraint	Fear English River	Yes	T3	Regular sprainting site on marginal rock. Mixed age.	674759	734819
Holt (H1)	**Fear English River**	**Yes**	**T4 (0.14km approximately)**	**Located downstream of adjoining drainage channel. Inactive at time of survey with root growing across entrance.**	**674461**	**735787**
Holt (H2)	**Fear English River**	**Yes**	**T4 (0.22km approximately)**	**Potentially active holt along Fear English River channel. Two entrances. Previously identified in November 2018(FT, 2018).**	**674363**	**736122**
Spraint	Fear English River	Yes	T4 (0.22km approximately)	Regular sprainting site on marginal rock adjacent to holt. Mixed age.	674348	736122
Spraint	Fear English River	Yes	T4 (0.25km approximately)	Single old spraint on marginal rock adjacent to holt. Mixed age.	674321	736146
Prints	Kilcooney (Coolree) River	Yes	T6 (0.18km approximately)	Recent prints on muddy littoral at confluence of Kilcooney & Fear English channels	674196	736221
Spraint	Fear English River	No	n/a	Regular sprainting site on ledge & cross-channel pole under Kilwarden Bridge. Mixed age.	674846	738231
Prints	Bog pool	Yes	T8 (0.08km approximately)	Fresh prints with associated slide in muddy littoral of bog pool	675116	736776
October 2023						
Spraint	Fear English River	Yes	T6 (0.17km approximately)	Fresh on muddy mound at drainage channel confluence near holt area, north bank	674222	736225
Prints	Fear English River	Yes	T6 (0.19km approximately)	Fresh prints in marginal clay slope, north bank	674244	736206
Holt (H1)	**Fear English River**	**Yes**	**T4 (0.14km approximately)**	**Inactive at time of survey with no access for otter due to bisecting tree root**	**674461**	**735787**

Holt (H2)	**Fear English River**	**Yes**	**T4 (0.22km approximately)**	**Potentially active holt with two entrances. Northern (smaller) entrance had signs of recent mammal activity.**	**674363**	**736122**
Spraint	Fear English River	No	n/a	On old telegraph pole used as sheep drink	674651	737980
Spraint	Fear English River	No	n/a	Regular sprainting site on ledge & cross-channel pole under Kilwarden Bridge. Mixed age.	674846	738231

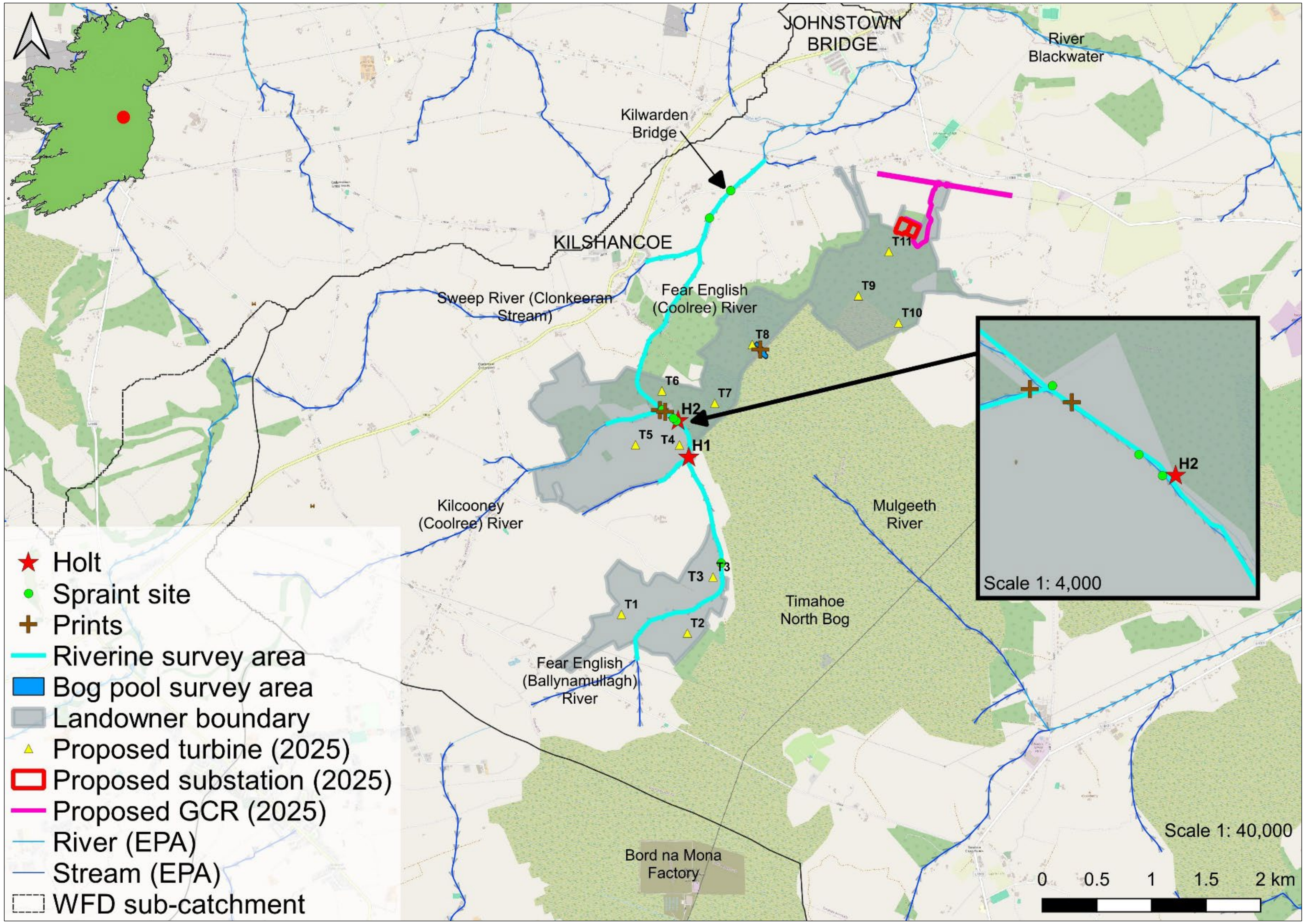

Figure 3.1 Overview of the otter signs recorded within the vicinity of the proposed Drehid wind farm, October 2022 & October 2023

Figure 3.2 Location of otter holts and nearby signs, October 2022 & October 2023

Plate 3.1 Otter spraint and anal jelly deposited on marginal rock on the Fear English River, October 2022

Plate 3.2 Previously identified holt H1 (from 2019) adjacent to the Fear English River with root now restricting access for otter (October 2023)

Plate 3.3 Old otter spraint recorded along the Fear English River channel, October 2022

Plate 3.4 Smaller entrance of holt H2 along the Fear English River channel, October 2023, with signs of recent activity

Plate 3.5 Larger entrance of holt H2 along the Fear English River channel, October 2023, with eroded path indicating signs of recent activity

Plate 3.6 A spraint site was located on top of old pole across the Fear English River, October 2023

Plate 3.7 Example of the historically modified nature (poor hydromorphology) of the Fear English River, October 2023

Plate 3.8 Old otter spraint on cross-channel pole at Kilwarden Bridge on the Fear English River, October 2023

4. Discussion

The current total channel otter survey (TCOS) recorded a total of *n*=8 ad *n*=6 otter signs within the survey area over October 2022 and October 2023, respectively (**Figure 3.1**). This was a comparably low number to previous surveys of the site (Triturus, 2019). Apart from prints located in the margins of a bog pool near the proposed site of turbine T8 and in the lowermost reaches of the Kilcooney (Coolree) River in October 2022, all signs (i.e. spraints, prints, anal jelly & potential holts) between the two survey years were recorded along the Fear English River. This supports previous findings for the site which suggested the Fear English channel to be the primary otter habitat in vicinity of the proposed wind farm. No signs were recorded on the lower reaches of the Clonkeeran (Sweep) River.

The lower number of signs recorded in October 2023 (6) compared with October 2022 (8) likely reflects the higher water levels throughout the survey area due to recent heavy rainfall, which further reduced the already scarce marking opportunities for otter through submersion (e.g. some prominent marginal boulders were underwater). Recent mammal activity was observed at the smaller entrance of holt H2 in October 2023 (**Plate 3.4**) and given the wetted, worn trail leading into the hole, it would suggest usage by otter. No recent activity was observed at the larger of the two entrances at holt H2 (Plate 3.5). Despite previous suitability (Triturus, 2019), holt H1 was not considered accessible to otter in October 2022 or October 2023 due to a bisecting tree root and no recent worn trails (**Plate 3.2**).

The deposition of spraint and other marking behaviour (e.g. scent marking via urination) is known to serve a variety of territorial and communicative functions in otter populations (Sittenthaler et al., 2020; Remonti et al., 2011; Kean et al., 2011; Kruuk, 1992). Sign marking is routinely associated with prominent features such as large instream boulders and riparian tree root systems (Almeida et al., 2012). Historical modifications (drainage) removes the majority of such features (**Plate 3.7**; O'Grady et al., 2017), typically resulting in habitats with poor otter marking opportunities and, consequently, a low number of detectable signs, even where otter utilisation occurs. The paucity of potential marking sites also increases the frequency of intra-annual and inter-annual use (i.e. same sites marked repeatedly over time). This pattern has been repeatedly observed on the Fear English River and tributaries in vicinity of the proposed development.

River hydromorphology is known to be a key driver of otter distribution and habitat utilisation (Couturier et al., 2023; Macklin et al., 2019; Scorpio et al., 2016), primarily through impacts to fish populations, the key prey resource for otter (Krawczyk et al., 2016). Historical straightening and deepening of watercourses removes habitat and hydromorphological heterogeneity, encourages sediment deposition and invariably results in irreparable damage to fisheries potential (O'Grady et al., 2017; O'Grady, 2006). Whilst there is a paucity of contemporary fisheries data for the watercourses in question, the Kilcooney (Coolree) River, a tributary of the Fear English River, is known to support brown trout (*Salmon trutta*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*), minnow (*Phoxinus phoxinus*) and brook lamprey (*Lampetra planeri*) (Ecofact, 2022, 2018). Walkover surveys of the Fear English River have confirmed the presence of brown trout (at evidently low densities) and three-spined stickleback were recorded previously (Ecofact, 2018). Nonetheless, fish prey resources preferred by foraging otter are appreciably poor within the survey area and would likely support only a small otter population. However, even areas of river channel with lower inherent value for otter are important to enable lateral and longitudinal colonisation, by allowing otters to commute between better quality habitats (Van Looy et al., 2014).

As per 2019, signs of otter activity (i.e. prints and slide through vegetation) were recorded in the vicinity of the bog pool located adjacent to proposed turbine T8 in October 2022 (but not October 2023). Whilst significant fish stocks (the primary component of otter diet) were unlikely to be present given a lack of surface water connectivity (but three-spined stickleback possible), the bog pool did support a range of aquatic species known to form a component of otter diet, such as common frog (*Rana temporaria*) and provides suitable habitat for common waterbird species (Kloskowski et al., 2013; Reid et al., 2013a; Wise et al., 1981). Given its proximity to the Fear English River channel (<1km distance), this pool likely serves as an occasional foraging habitat for otter utilising nearby riverine corridors.

River drainage, together with clearance of riparian vegetation, are the main causes of otter habitat loss in Ireland (Reid et al., 2013b; NPWS, 2009). Suitability for holting was typically low on the watercourses within the survey area given agricultural land use practices (i.e. narrow riparian zones and historical bank modifications (including riparian clearance). Nevertheless, two potential holts (first identified in 2019) were situated in the middle survey reaches of the Fear English River. One of holts (between turbines T4 and T6 **H2, Figure 3.2**) was considered potentially active during the survey period given nearby spraint sites and a wetted trail to the holt as previously described. Otters, along with their breeding and resting places, are protected under provisions of the Irish Wildlife Acts 1976-2023. Therefore, as works may disturb otter breeding/resting areas, a derogation licence may be required from the National Parks and Wildlife Service (NPWS) in advance of any works activity within ≤150m of identified otter holts. Trail camera monitoring at the potentially active holt is recommended to determine whether the sites are utilised by breeding otter or not, in advance of proposed works (under a NPWS Sections 9 & 23(6)b licence to photograph/film wild animals).

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APPENDIX 8-1.4

Drehid Wind Farm Bat Report

DREHID WIND FARM

Drehid Wind Farm Bat Report

Prepared for:

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Date: May 2025

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DREHID WIND FARM BAT ASSESSMENT

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT

User is responsible for Checking the Revision Status of This Document

Rev. No.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
	Draft	CW/BOD/KB	BOD	JK	03/06/2025

Client: Statkraft

Keywords: Drehid, Wind Farm, Bats

Abstract: This report details the bat surveys conducted at the proposed Drehid Wind Farm, Co. Kildare between 2022 and 2024.

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1. INTRODUCTION

This report details the results of the bat surveys carried out at the proposed site during 2023. In addition to a desktop study, the following field surveys were undertaken within and adjacent to the Proposed Development:

- Bat activity transects for (2022 and 2023)
- Static detector (near proposed turbine locations for 2022 and 2023)
- Roost surveys (2022, 2023 and 2024).

All surveys adhered to SNH (2019, 2021) guidelines at the time of survey. These guidelines remain current at the time of writing.

Bat activity was recorded along predetermined walked transects in July and August 2022 and May, August, and September 2023. Static detector surveys were carried out between May - September 2022 inclusive, and May - October 2023 inclusive. The survey types utilised were determined as the most appropriate to establish a baseline species assemblage, along with spatial and temporal distribution of species activity within the development.

1.1 Site Location

The proposed Wind Farm is located in County Kildare and includes lands in the townlands of Ballynamullagh, Kilmurry, Killyon, Coolree, Mulgeeth and Drehid. The Proposed Development site is c. 69.7 ha in extent. It is located approximately 2 km south of Johnstown Bridge and approximately 4.8 km east of Carbury in Co. Kildare.

The Proposed Substation, including the loop-in connection to the existing Kinnegad-Rinawade overhead line, is wholly located in County Kildare, within the townland of Coolree. The connection to the overhead line will traverse forestry and GA1.

High-level habitats overlapped by the Proposed Development and Proposed Substation and surrounds include conifer plantation, broadleaved woodland, raised bog, cutover bog, agricultural grassland and arable land.

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are included as part of this application and are assessed as part of this EIAR.

It is proposed to deliver turbines to the site from the port of delivery in Dublin via the M4 motorway and then the R402 to the junction of the L402/L5025 and follow the L5025 to the main site entrance. Components for turbines 1-3 will continue from the main site entrance to their destinations via internal access roads. Components for turbines 4 - 11 in the northern cluster will be turned around at the main site entrance, and travel back along the L5025, turning north-east at the L5025/R402 junction to travel along the R402 until the R402/L5012 fork north of Kilshanroe where they will turn onto the L2012 and continue until the northern site entrance.

Due to the oversized nature of the wind turbine components, some alterations will be required along the route. Works will be required at points along the turbine delivery route (TDR) where obstructions would prevent passage of turbine components. These points are referred to as 'TDR nodes'. Works at TDR nodes will be localised and small-scale (vegetation clearance/trimming, tree/hedgerow removal and placement of temporary load bearing surfaces are the most invasive works required).

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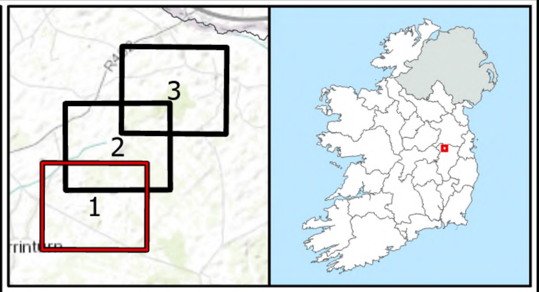

Legend

- Proposed Development Boundary
- Road widening - Access tracks
- Road widening - Temp. Access Tracks
- Access Track
- Temporary Access Track
- Blade Transfer Area
- Construction Compound
- Passing Bays
- Turbine Hardstanding
- Turbine Swept Path
- Berms
- Cable Route
- Turbines

TITLE:	Site Location and Layout
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	1.1
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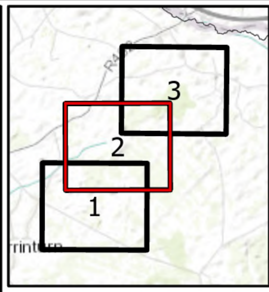

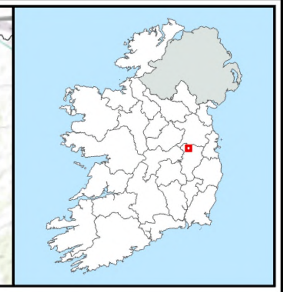

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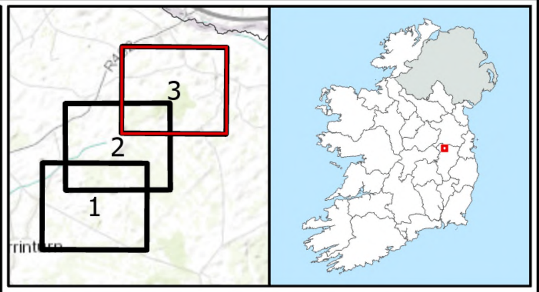

Legend

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- Road widening - Temp. Access Tracks
- Access Track
- Temporary Access Track
- Construction Compound
- Passing Bays
- Turbine Hardstanding
- Turbine Swept Path
- Peat Deposition Area
- Substation
- Berms
- Cable Route
- Grid Connection Route
- Turbines

TITLE:	Site Location and Layout
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	1.1
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1.2 Bat Species

Bats belong to the Order Chiroptera and to date, nine species are recorded as resident in Ireland. These nine species are divided into two families:

- Vespertilionidae, which contains eight Irish species (Daubenton's bat, Natterer's bat , whiskered bat, Leisler's bat, brown long-eared bat, soprano pipistrelle, common pipistrelle and Nathusius's pipistrelle; and
- Rhinolophidae, which contain one Irish species, the lesser horseshoe bat.

Brandt's bat *Myotis brandii* has only been recorded once in Ireland from a site in Co. Wicklow and is classified as a vagrant. In 2013, a single male greater horseshoe bat *Rhinolophus ferrumequinum* was recorded in Co. Wexford. In 2020 an individual was also recorded in Glendalough, Co. Wicklow. Both were considered to be vagrants. The development is outside the distribution range for lesser horseshoe bat (Bat Conservation Ireland (BCI), 2020).

1.3 Legislation

1.3.1 Irish Legislation

In the Republic of Ireland, under Schedule 5 of the Wildlife Acts 1976 to 2019, all bats and their roosts are protected by law. It is an offence to disturb either without the appropriate licence. This Act was further strengthened by the Wildlife Amendment Act 2000.

1.3.2 E.U. Legislation

Under the Habitats Directive 1992 (EEC 92/43), each member state of the E.U. was requested to identify habitats of national importance and priority species of flora and fauna. These habitats are now designated as Special Areas of Conservation (SAC).

In Ireland, all bat species are classified as Annex IV species under the Habitats Directive. Annex IV species are species in need of strict protection. Lesser horseshoe bat is also classified as an Annex II species (Priority Species). Annex II species require the designation of Special Areas of Conservation specifically for their protection.

All species of bat in Ireland are strictly protected under the Habitats Directive to include deliberate disturbance of these species, particularly during the periods of breeding, rearing and hibernation. It also specifies deterioration or destruction of breeding or resting places.

1.3.3 International Legislation

Ireland has ratified two international wildlife laws pertaining to bats:

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982) – part of this convention stipulates that all bat species and their habitats are to be conserved.

The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, Enacted 1983). This was instigated to protect migrant species across all European boundaries.

1.4 Relevant Guidance Documents

This report will draw on guidelines already available in Europe and will use the following documents:

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Ed.). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
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- BTHK (2018). Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals. Pelagic Publishing, Exeter UK.
- European Commission (2021). Commission notice. Guidance document on the strict protection of animal species of Community interest under the Habitats Directive
- CIEEM (2021). Bat Mitigation Guidelines. A guide to impact assessment, mitigation and compensation for developments affecting bats. Beta version 1.0.
- NPWS (2022). Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134.

1.4.1 Relevant Wind Farm Guidance Documents

A large array of publications has been produced to date on the potential impact of wind turbines on bats. It is important to be aware of these publications to understand the recommended survey protocols and accepted bat mitigation measures implemented across Europe to address potential impacts of wind turbines on local bat populations.

These include:

- Bats and onshore wind turbines: Survey, Assessment and Mitigations. Scottish Natural Heritage January, 2019.
- Bats and onshore wind turbines - survey, assessment and mitigation. Scottish Natural Heritage. August 2021
- UNEP/EUROBATS: Guideline for consideration of bats in wind farm projects, Publication Series No. 3.

- Natural England Technical Information Note TIN051: Bats and onshore wind turbines – Interim Report
- Guide to Turbines and Wind Farms. Bat Conservation Ireland 2012.
- Bat Conservation Ireland Guidelines for consideration of bats in wind farm projects - Revision 2014
- Wind Turbine/Wind Farm Development Bat Survey Guidelines (BCI, 2012);
- NIEA (2011). Bat survey – specific requirements for wind farm proposals. Northern Ireland Environment Agency, Department of the Environment, Belfast.
- European Commission (2020). Guidance document on wind energy developments and EU nature legislation. Brussels, 18.11.2020 C(2020) 7730 final.
- NIEA, Natural Environment Division (2021)(updated in April 2024). Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland.

1.5 Bat Survey Aims

This bat survey report is a stand-alone document and aims to provide the following information on bat activity in 2022 and 2023 within the survey area:

- Bat species list for the development;
- Location of bat presence within the development;
- Bat activity levels within the development;
- Recommendations and mitigation measures to reduce the potential impact of the development on local bat fauna.

All surveys adhered to SNH (2019, 2021) guidelines at the time of survey. The following is a brief description of main types of surveys completed in 2022 and 2023 for this report.

Walking transect: bat surveys completed on-foot where the surveyor(s) walk the survey site from sunset to at least 120 minutes after sunset. Spot counts can also be conducted along transect surveys.

Static surveys: placement of automated recording devices within the survey area. The units are set up during the daylight hours, commence recording 30 minutes before sunset and stop recording 30 minutes after sunrise.

Roost surveys: The methods used in the bat roost survey include desktop searches, visual searches at potential roost structures, passive bat detector monitoring, and a search for Potential Roost Features (PRFs) in trees.

2. METHODOLOGY

2.1 Zone of influence (ZoI)

In accordance with Collins (2023), the geographical extent of the desk study, as a minimum, should be carried out up to 2 km from the development boundary (including all temporary works). However, the data search should be related to the scheme's ZoI[1] and consider the core sustenance zone (CSZs) of species likely to be present and may need to extend up to 10km for larger projects.

2.2 Desktop Study

A desktop data search was conducted on 04 March 2025 in order to collate existing information on bat activity, roosts and landscape features that may be used by bats. The data search comprised the following information sources:

- Collation of known bat records within a 4km radius[2] of the development site from the National Bat Database held by the National Biodiversity Data Centre (www.biodiversityireland.ie)[3];
- Review of Ordnance Survey mapping and aerial photography of the development site boundaries and their environs (i.e. 200 m plus rotor radius of the boundary of the development[4]);
- Records of designated sites within a 15km radius of the development where bats form part or all of the reason for designation (https://www.npws.ie/protected-sites);
- Collation of lesser horseshoe bat records within a 15km radius of the development from the National Parks and Wildlife Service lesser horseshoe bat database (https://www.npws.ie);
- Collation of data on known caves within a 4km radius of the development from the Cave Database for the Republic of Ireland, compiled by Trinity College (http://www.ubss.org.uk/search_irishcaves.php); and
- Review of bat survey data from Ecological Impact Assessments from proposed and permitted developments within the wider environs of the site.

2.2.1 Bat Landscapes

Bat Conservation Ireland produced a landscape conservation guide for Irish bat species using their database of species records collated during the 2000-2009 survey seasons. An analysis of the habitat and landscape associations of all bat species deemed resident in Ireland was undertaken and reported in Lundy et al., 2011.

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[1] ZoI is defined by CIEEM (2016) as 'the areas/resources that may be affected by the biophysical changes caused by activities associated with a project'.
[2] A 4km radius search distance was selected to encompass records of bat roosts within Core Sustenance Zones (CSZ) of the study area for Irish species of bat. A CSZ refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the conservation status of the colony using the roost (Collins, 2023).
[3] A specific data request was not made to Bat Conservation Ireland because they regularly update NBDC with their records and it is only judged to provide an additional useful source of data if a location is deigned of high potential for bat roosts.
[4] As per SNH (2021) guidance.

The degree of favourability ranges from 0 – 100, with 0 being least favourable and 100 most favourable for bats. The values of the grid squares represent the range of habitat suitability values the bat species can tolerate within each individual square.

A caveat is attached to the model and it is that the model is based on records held on the Bat Conservation Ireland database, while core areas have been identified, areas outside the core area should not be discounted as unimportant as bats are a landscape species and can travel many kilometres between roosts and foraging areas nightly and seasonally.

2.3 Survey Methodology

Static detector surveys and activity surveys were conducted at the Proposed Wind Farm and Substation during 2022 and 2023. Roost surveys were conducted at the Proposed Development during 2023 and 2024 (see Table 2-1 for overview of bat surveys). These surveys followed the guidelines set out by the Bat Conservation Trust in Bat Surveys: Good Practice Guidelines (Hundt, 2012 and Collins, 2023) and SNH (2019 and 2021).

In 2022 static detectors were deployed for three rounds near proposed turbine locations, mostly in edge habitat, where bat passes are higher than in forestry or agricultural fields. The proposed turbine layout changed between 2022 and 2023 and was reduced from 12 proposed locations to 11 proposed locations, where one location was removed and another was moved to a different field.

In 2023 the deployment locations of static bat detectors aligned more closely with the finalised turbine layout. Deployment locations for turbines in agricultural fields were still situated at field boundaries (edge habitat); however, the deployment locations for turbines located in wooded habitats better represented this closed habitat type in 2023. The locations of static detectors and methodology for static detector surveys followed the requirements of 'Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation' (NatureScot 2021).

Table 2-1: Bat Survey Overview 2022, 2023, 2024

Survey Type	Survey Date	Surveyor
Static Detector Survey	2022 Activity Season	Analysed by FT
Static Detector Survey	2023 Activity Season	Analysed by FT
Activity Survey 1	28/07/2022	Tom O'Donnel
Activity Survey 2	29/08/2022	Tom O'Donnel
Activity Survey 3	30/05/2023	Chandra Walter
Activity Survey 4	08/08/2023	Chandra Walter
Activity Survey 5	20/09/2023	Chandra Walter
Roost Survey 1	28-29/07/2022	Tom O'Donnell
Roost Survey 2	20/06/2023	David Daly/ Chandra Walter
Roost Survey 3	06/03/2024 & 20/03/2024 & 03/04/2024	Ben O'Dwyer
Roost Survey 4 (TDR)	30/09/2024 & 22/10/2024	Ben O'Dwyer

2.3.1 Surveyor Information

2022 activity surveys were undertaken by Tom O'Donnell CEnv MCIEEM. Tom is a Chartered Environmentalist and a full member of the Chartered Institute of Ecology and Environmental Management. He was awarded a BSc in Environmental and Earth System Science [Applied Ecology] in 2007 and an MSc in Ecological Assessment in 2009, both from University College Cork. Tom has over 15 years professional experience in the environmental industry, including working on projects including windfarms, overhead power lines, roads, cycleways and residential developments. Tom is an experienced bat surveyor, first gaining a scientific licence to disturb bats from NPWS in 2009, and has held licenses to disturb bats in England and Wales. Tom is currently licensed by NPWS for roost disturbance.

2023 activity surveys were conducted by Chandra Walter. Chandra is a Project Ecologist working as part of the Energy and Planing Team at Fehily Timoney. She holds a BSc in Ecology from University College Cork and an MSc in Organic Horticulture from University College Cork. (Both First Class Honours). Her degrees focused on nature conservation and included a wide variety of surveying skills, including habitat surveys, bird surveys and insect surveys, research skills and report writing. She has completed bat surveys and analysis for a number of proposed wind farm developments and also completed reporting and assessment for a diverse range of projects.

2022 static detector surveys were undertaken by Chandra Walter and Jason Guile. Jason is a Senior ecologist with over 13 years' experience in ecological assessment and holds a BSc in Marine Biology/Oceanography from the University of Wales, Bangor and a HND in Coastal Conservation with Marine Biology from Blackpool and Fylde College. 2023 static detector surveys were undertaken by Chandra Walter. The 2022 and 2023 static detector data was analysed by Chandra Walter.

Roost surveys were undertaken by Tom O'Donnell in 2022. Chandra Walter and Dvid Daly carried out roost surveys in 2023. David Daly is a Project Ecologist with FT. He holds a Bachelor of Science (BSc) in Ecology from University College Cork, and a Master of Science (MSc) in Species Identification and Survey Skills from University of Reading. David's work focused on the survey and assessment of proposed wind and solar energy development Sites, and he has carried out comprehensive ecological work on numerous Sites. He has carried out numerous mammal surveys including bat, badger, otter, and general mammal surveys.

During 2024, Ben O'Dwyer completed roost surveys of the proposed development, encompassing ground level tree and bat box assessments and preliminary assessment of structures and trees at the Proposed Wind Farm, Substation and TDR. Ben is a Senior Project Ecologist with Fehily Timoney with over 8 years' experience in ecological assessment and holds a BSc (Hons) in Wildlife Biology from Institute of Technology Tralee (now MTU). He is an experienced and versatile field surveyor and his experience across a broad range of species, habitats and projects in Ireland has given him an extensive knowledge of protected sites and species across the country.

2.3.2 Bat activity surveys

The schedule of site surveys is shown in Table 2-1; all transects were walked during suitable weather conditions. Bat detectors used for recording bat activity during transect surveys; Wildlife Acoustics Echo Meter Touch pro (full spectrum) was used for activity surveys in 2022 and Elekon's Batlogger M2 was used for activity surveys in 2023. Recorded bat activity was manually analysed using Wildlife Acoustics Kaleidoscope Viewer Pro, specialist bat call analysis software and BatExploer Version 2.1.11.2.

Pipistrelle calls with an 'in-between' frequency of maximum energy, FMAXE, of c. 50kHz, cannot always be reliably assigned to either common pipistrelle (typical FMAXE of c. 45kHz) or Soprano Pipistrelle (typical FMAXE c. 55kHz), and were classified as 'Pipistrellus Sp.'. The echolocation pulses of *Myotis* sp. (Daubenton's bat, Natterer's bat, whiskered bat) can be difficult to separate to species due to similarities in call types, particularly if the pulses recorded are faint, only partially detected, or atypical. Where ambiguous, these were classified as *Myotis* sp.

Walked transect routes are shown in Figure 2-1. Bat activity was recorded along transects in July and August 2022 and in May, August and September 2023, with transects covered at dates as shown in Table 2-1. Bat activity was recorded along both the outgoing walked transect and the return walked transect where the outwards walk was not done before sunset. The transects were sampled in a random order in the hours after sunset, finishing no more than 3 hours after sunset.

Bat activity is governed by the activity of their insect prey and insect abundance is in turn governed by weather conditions and climate. Insects, and therefore bats, are unlikely to be present at temperatures below 6°C or during periods of strong winds or heavy rainfall so survey in such conditions is not possible. All field surveys were undertaken within the active bat season and during good weather conditions (dry conditions and optimal temperature >/= 10°C / minimum temperature >/= 7°C) (Collins 2023).

Nocturnal bat activity is mainly bi-modal taking advantage of increased insect numbers on the wing in the periods after dusk and before dawn, with a lull in activity in the middle of the night. This is particularly true of 'hawking' species – i.e. bats which capture prey in the open air. However, 'gleaning' species remain active throughout the night as prey is available on foliage for longer periods. Gleaning is the term for taking prey from foliage or the ground.

Table 2-2: Transect Details

Year	Transect Name	Transect Length (m)	Fossitt habitats along transect
2022	A	1,493m	Mixed Broadleaved Woodland (WD1), Mixed Broadleaved/Conifer Woodland (WD2), Conifer Plantation (WD4), Eroding Rivers (FW1), Improved Agricultural Grassland (GA1), Hedgerow (WL1)
	B	1,104m	Mixed Broadleaved/Conifer Woodland (WD2), Conifer Plantation (WD4), Eroding Rivers (FW1), Improved Agricultural Grassland (GA1), Hedgerow (WL1), Buildings and Artificial Surfaces (BL3)
	C	966m	Treelines (WL2), Hedgerow (WL1), Improved Agricultural Grassland (GA1)
	D1	1,331m	Eroding Rivers (FW1), Improved Agricultural Grassland (GA1), Hedgerow (WL1), Arable Crops (BC1)
	D2	1,033m	Treelines (WL2), Eroding Rivers (FW1), Improved Agricultural Grassland (GA1), Hedgerow (WL1), Arable Crops (BC1)
2023	TR1	1,500m	Mixed Broadleaved Woodland (WD1), Mixed Broadleaved/Conifer Woodland (WD2), Conifer Plantation (WD4), Eroding Rivers (FW1), Improved Agricultural Grassland (GA1), Hedgerow (WL1)
	TR1a	1,594	Mixed Broadleaved Woodland (WD1), Mixed Broadleaved/Conifer Woodland (WD2), Conifer Plantation (WD4), Eroding Rivers (FW1), Improved Agricultural Grassland (GA1), Hedgerow (WL1)
	TR2	2,371m	Treelines (WL2), Improved Agricultural Grassland (GA1), Eroding Rivers (FW1), Drainage Ditches (FW4)
	TR2a	2,515m	Treelines (WL2), Improved Agricultural Grassland (GA1), Drainage Ditches (FW4)
	TR3	1,650m	Treelines (WL2), Eroding Rivers (FW1), Improved Agricultural Grassland (GA1), Hedgerow (WL1), Arable Crops (BC1), Bog Woodland (WN7)
	TR3a	1,763m	Treelines (WL2), Improved Agricultural Grassland (GA1), Hedgerow (WL1), Arable Crops (BC1)

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Legend

- Proposed Development Boundary
- TR1
- TR1a
- TR2
- TR2a
- TR3
- TR3a

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PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	2.1
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:20,000	**REVISION:** 0
DATE: 01/05/2025	**PAGE SIZE:** A3

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Legend

- Proposed Development Boundary
- A
- B
- C
- D1
- D2

TITLE:	Bat Activity Survey Transect Routes Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	2.2
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:20,000	**REVISION:** 0
DATE: 01/05/2025	**PAGE SIZE:** A3

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2.3.3 Static Detector Surveys

Passive Static Bat Surveys involve leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified round of time (i.e., a bat detector is left in the field, there is no observer present and bats which pass the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger. This results in a far greater sampling effort over a shorter round of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

Song Meter SM4BAT Full spectrum bat recorders use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis. Full spectrum bat recorders were utilised for all the static surveys as recommended in the revised SNH (2021) guidelines. These results are depicted on a graph showing the number of bat passes per species per hour/night. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats.

Per SNH 2019, and the updated NautreScot 2021 guidance, static units (Song Meter SM4BAT) were programmed to commence half an hour before sunset and finish half an hour after sunrise to ensure that bat species that emerge early in the evening and return to roosts late are recorded. Detectors were left out for a minimum of 10 consecutive nights across three survey rounds: spring (April-May), summer (June-mid-August) and autumn (mid-August-October) during both 2022 and 2023. To account for nights with unsuitable weather conditions, detectors were deployed longer than the minimum required 10 consecutive nights (SNH, 2021) to ensure that enough data could be gathered during suitable weather conditions.

NatureScot (2021) guidance states that "Detectors should be placed at all known turbine locations at wind farms containing less than ten proposed turbines. Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments".

A total of 11 detectors were deployed to cover all 11 potential turbine locations for all survey rounds in 2023. The detectors were placed at or close to proposed turbine locations in analogous habitats (see Figure 2-2 and Table 2-3 for distances to turbine locations). For T8, the detectors were deployed in nearby edge habitat which is representative of the situation of T8 both pre and post-construction (wooded habitat with open bog nearby. For T10, the detectors were deployed to analogous habitat (conifer plantation).

Static detector surveys in 2022 covered a total of 11 locations, some of which overlapped closely with proposed turbine locations, and others which were further from turbines and in some cases covered two turbine locations, lying roughly halfway between two turbines (see Figure 2-2 and Table 2-4). It is noted that DR04 and DR05 were placed to survey two turbine locations which have since been removed/relocated, rendering these locations more useful in detecting activity at the site scale rather than for specific turbine locations. DR05 can be approximately equated to T4 based on analogous habitat. As a result of the relocation/ removal of proposed turbine locations between 2022 and 2023 surveys and subsequent re-numbering of turbine locations, DR01 and DR02 relate to the areas where T1, T2 and T3 are located (DR02 relates more closely to T3 than T2, both in terms of distance and habitat similarity). DR04 is not located in the vicinity of any current turbine locations, and as such is representative of bog woodland edge habitat. The closest proposed turbine to DR05 is T4. DR06 is located in the vicinity of T5. Both DR07 and DR08 are located in the vicinity of T6. The closest proposed turbine to DR09 is T8. DR10 covers the area for T9. DR11 is not in the vicinity of any proposed turbine locations; however it is located on conifer plantation edge which is representative habitat for T10. DR12 is located near T11.

The locations of the static detectors are presented in Figure 2-2 and Figure 2-3 below.

The data was analysed with Kaleidoscope 5.3.9g software (Bats of Europe 5.2.1).

Table 2-3: Static Detector Locations 2023

Detector Location	Distance to Turbine	Fossitt habitats at deployment location(s)	Fossitt habitats at turbine location	Dates Deployed
T1	72m	WL1/WL2 Mosaic, GA1	WL1/WL2 Mosaic, GA1	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 20/09/23 - 23/10/23
T2	47m	WL1/WL2 Mosaic, GA1	WL1/WL2 Mosaic, GA1	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 20/09/23 - 24/10/23
T3	88m	WL1/WL2 Mosaic, GA1 (GA1 now converted to BC3 -precursor to BC1)	GA1 (GA1 now converted to BC3 -precursor to BC1)	R1: 22/05/23 - 20/06/23 R2: 13/08/23 - 30/08/23 R3: 20/09/23 - 24/10/23
T4	31m	WL1/WL2 Mosaic, GA1	WL1/WL2 Mosaic, GA1	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 20/09/23 - 24/10/23
T5	14m	WL1/WL2 Mosaic, GA1	WL1/WL2 Mosaic, GA1	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 20/09/23 - 24/10/23
T6	14m	WD4	WD4	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 19/09/23 - 23/10/23
T7	16m	WD2	WD2	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 19/09/23 - 23/10/23
T8	23m	WS1/PB1 Mosaic, PF1/PF2 Mosaic	WN7	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 19/09/23 - 23/10/23
T9	86m	WD4/ED2	WD4	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 05/10/23 - 23/10/23
T10	182m	WD4	WD4	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 19/09/23 - 23/10/23
T11	1m	WD4	WD4	R1: 22/05/23 - 20/06/23 R2: 08/08/23 - 30/08/23 R3: 19/09/23 - 24/10/23

Table 2-4: Static Detector Locations 2022

Detector Location	Turbine/ Distance	Fossitt habitats at deployment location	Fossitt habitats at turbine location	Dates Deployed
DR01	T1/8m	WL1/WL2 Mosaic, GA1	WL1/WL2 Mosaic, GA1	R1: 09/05/22 - 23/05/22 R2: 22/06/22 - 02/08/22 R3: 16/08/22 - 06/09/22
DR02	T2/362m T3/214m	GA1/BC3 (BC3 -precursor to BC1)	WL1/WL2 Mosaic, GA1 (T2) GA1 (Now BC3) (T3)	R1: 09/05/22 - 23/05/22 R2: 22/06/22 - 30/07/22 R3: 16/08/22 - 07/09/22
DR04	T3/559m	GA1/WN7	GA1	R1: 09/05/22 - 23/05/22 R2: 22/06/22 - 13/07/22 R3: 29/08/22 - 20/09/22
DR05	T4/235m	WL1,GA1	WL1/WL2 Mosaic, GA1	R1: 09/05/22 - 23/05/22 R2: 22/06/22 - 13/07/22 R3: 16/08/22 - 22/09/22
DR06	T5/156m	WL1/WL2 Mosaic, GA1	WL1/WL2 Mosaic, GA1	R1: 09/05/22 - 23/05/22 R2: 22/06/22 - 30/07/22 R3: 16/08/22 - 22/09/22
DR07	T6/80m	WD4	WD4	R1: 09/05/22 - 23/05/22 R2: 22/06/22 - 13/07/22 R3: 16/08/22 - 07/09/22
DR08	T6/118m	WD4,GA1,ED2	WD4	R1: 09/05/22 - 23/05/22 R2: 22/06/22 - 29/06/22 & 13/07/22 - 27/07/22 R3: : 16/08/22 - 07/09/22
DR09	T8/274m	WS1/PB1	WD2 (T7) WN7 (T8)	R1: 10/05/22 - 23/05/22 R2: 22/06/22 - 13/07/22 R3: : 19/08/22 - 07/09/22
DR10	T9/87m	WD4	WD4	R1: 10/05/22 - 23/05/22 R2: 22/06/22 - 13/07/22 R3: 16/08/22 - 07/09/22
DR11	T10/ 405m	WD4	WD4 (T9) WD4 (T10)	R1: 10/05/22 - 23/05/22 R2: 22/06/22 - 13/07/22 R3: 16/08/22 - 07/09/22
DR12	T11/30m	WD4	WD4	R1: 09/05/22 - 23/05/22 R2: 13/07/22 - 28/07/22 R3: 16/08/22 - 07/09/22

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- Proposed Development Boundary
- Static Detectors
- Turbine Locations

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Legend

- Proposed Development Boundary
- Static Detectors
- Turbine Locations

TITLE: Static Detector Locations 2022	
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Data Analysis

All recordings were made in full spectrum, retaining all amplitude and harmonic information from the original bat call for subsequent analysis. Bat calls were analysed using Kaleidoscope Pro (5.3.9) Software. All files were split to a maximum duration of 15 seconds and automatically identified to species level, or genus level as appropriate, using auto-ID bat classifiers (Bats of Europe 5.2.1).

For the data from 2022 static detector surveys, Kaleidoscope Pro (5.3.9) Software auto-ID was used as per industry standard.

For the 2023 static detector data was manually verified in order to provide an additional layer of quality assurance. Files with pulse matches of 3 or less , as well as a match ratio of 70% or less were manually checked as well as all NoID files and a minimum 10% of Noise files. All files with auto-ID for Nathusius' pippistrelle and brown long eared bat were manually checked, as they are often misidentified by Kaleidoscope Pro (5.3.9).

Bat activity during static detector surveys 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). For our analysis, a bat pass is defined as the detection of sound calls from a single bat species within a 15 second sound file. If several species are detected within the same sound file, Kaleidoscope auto-id will choose as label the most predominant species present in the sound file, while during manual verification, the rarest species recorded in the checked file was chosen as label. Where recorded bat calls did not clearly match the call of a specific species, the calls were identified to genus level.

2.3.4 Roost Surveys

Searches for potential roosting features (PRFs) were conducted during summer 2022, summer 2023 and winter/spring/autumn 2024. Habitats and features with potential to contain bat roosting features were searched for and examined. This included preliminary roost assessment (PRA) for structures and ground-level tree assessment (GLTA) conducted in accordance with Collins (2023) and SNH (2019).

The core survey area was 300m around proposed turbines, which exceeds the requirement set out in SNH (2019; 2021) and NIEA Guidelines (Version 1.1) (2024) of 200m plus rotor radius (265m). A GLTA survey focused on trees potentially affected by the TDR and PRA encompassing the northern site access route were also conducted in September 2024.

Searches were conducted across both summer and winter seasons. Summer surveys focused on a preliminary assessment of potential for trees in areas around proposed turbines to host PRFs, and PRA of farms to the south and south-west of T4/T5 (outside 300m core survey area). All structures potentially suitable for bats within the survey area were surveyed. Bat boxes in the northern part of the site were also checked. The surveys encompassed checks of PRFs previously identified in 2018 surveys which are within the potential ZoI of the current layout.

Ground-level assessment of trees was carried out during the winter season/early spring when the absence of leaves gives optimal visibility of trees allowing detection of PRFs from the ground. This survey included ground-level checks of trees with PRFs and bat boxes recorded during previous surveys to confirm their presence, in addition to full ground-level resurvey of trees within the 300m turbine survey area and any trees which could potentially be affected by other elements of the projects (i.e. substation, access roads).

The schedule for 2022-2024 roost surveys is detailed in Table 2-5 below.

Table 2-5: Roost survey schedule

Date	Survey	Weather	Surveyor
PRA	28/07/2022	Dry; visibility excellent	Tom O'Donell
PRA	29/07/2022	Dry; visibility excellent	Tom O'Donell
PRA	20/06/2023	Dry; 50% cloud cover; F2; visibility excellent	David Daly
Preliminary GLTA	20/06/2023	Dry; 50% cloud cover; F2; visibility excellent	David Daly Chandra Walter
Bat Box Checks	20/06/2023	Dry; 50% cloud cover; F2; visibility excellent	Chandra Walter
Bat Box Checks	06/03/2024	Dry; 75% cloud cover; F1; visibility excellent	Ben O'Dwyer
GLTA	06/03/2024	Dry; 75% cloud cover; F1; visibility excellent	Ben O'Dwyer
GLTA	20/03/2024	Dry; 87% cloud cover; F2; visibility excellent	Ben O'Dwyer
GLTA	03/04/2024	Dry; 100% cloud cover; F3; visibility excellent	Ben O'Dwyer
GLTA/PRA	30/09/2024	Dry; 100% cloud cover; F2; visibility excellent	Ben O'Dwyer
PRA (TDR)	22/10/2024	Dry; 50% cloud cover; F1; visibility excellent	Ben O'Dwyer

*Transect Surveys are also relevant to the results of the roost surveys.

2.3.4.1 Visual Survey for Potential Roost Sites (Buildings/Structures)

Visual inspections of structures were assisted with high powered directional torchlight, close-focusing binoculars, and an endoscope as needed (use of endoscopes, torches and any potentially invasive investigation of PRFs were only carried out under licence). The interior (where possible) and exterior of potential roost structures were undertaken during the hours of daylight, searching for signs of bat roosting, including for example;

- Bats, dead or alive
- Bat droppings: these can accumulate under established roosting and access locations.
- Feeding remains: discarded insects parts such as moth wings under feeding perches.
- Fur oil/grease staining: natural oils in bats' fur rubs onto regularly used surfaces.
- Urine staining, or splashes on windows.
- Scratch marks: from bats movements in and out of perching/roosting locations.
- Lack of spider webs in holes and crevices: may indicate bats passing.
- Characteristic smells of bats may sometimes be detectable.
- Audible daytime roost bat chatter.

Potential roost sites were categorised with respect to their potential roosting suitability to bats (negligible, low, moderate, high) according to Table 2-6, taken from Collins, J. (ed) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.) The Bat Conservation Trust, London.

Wherever a bat lives or rests is a bat roost. However bats need different roosting conditions at different times of the year, and they will often move around to find a roost that meets their needs. Summer maternity roosts, where females gather to give birth and rear pups, are of greater conservation significance than a night roost or an occasional roost used by a single or small number of bats. This survey also aimed to establish the type of roosts present, if any, using the roost definitions in Table 2-7 from the Collins (2023) survey guidelines.

Table 2-6: Categorisation of potential roost site suitability from Collins (2023) survey guidelines

Potential suitability	Description	
	Roosting habitats in structures	Potential flight-paths and foraging habitats
None	No habitat features on site likely to be used by any roosting bats at any time of the year (i.e. a complete absence of crevices/suitable shelter at all ground/underground levels).	No habitat features on site likely to be used by any commuting or foraging bats at any time of the year (i.e. no habitats that provide continuous lines of shade/protection for flight-lines, or generate/shelter insect populations available to foraging bats).
Negligible[a]	No obvious habitat features on site likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion.	No obvious habitat features on site likely to be used as flight-paths or by foraging bats; however, a small element of uncertainty remains in order to account for non-standard bat behaviour.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[b] 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 and not a classic cool/stable hibernation site, but could be used by individual hibernating bats[c]).	Habitat that could be used by small numbers of bats as flight-paths 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 as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[b] and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only, such as maternity and hibernation – the categorisation described in this table is 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 flight-paths 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 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[b] and surrounding habitat. These structures have the potential to support high conservation status roosts, e.g. maternity or classic cool/stable hibernation site.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by bats for flight-paths 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, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

Table 2-7: Bat roost types from Collins (2023) survey guidelines

Roost type	NE definition
Day roost	A place where individual bats, or small groups, rest or shelter in the day during the summer.
Night roost	A place where bats rest or shelter in the night but are not found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony.
Feeding roost	A place where individual bats, or a few individuals, rest or feed for short periods during the night but are not present by day.
Transitional roost	A place used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.
Maternity roost	A place where female bats give birth and raise their young to independence. In some species males may also be present in the maternity roost.
Hibernation roost	A place where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.
Satellite roost	An alternative roost found in close proximity to the main nursery colony used by a few individuals to small groups of breeding females throughout the breeding season.

2.3.4.2 Visual survey for Potential Roost Sites in Trees

Potential tree roosts were surveyed from ground level with binoculars, searching for the presence of bats or bat evidence, and any Potential Roost Features (i.e. PRFs) identified by the Bat Tree Habitat Key Project (Andrews & BTHK 2020), such as rot holes, hazard beams, frost cracks and splits, partially detached bark, knot holes, tear outs, gaps between overlapping branches, and woodpecker holes. When assessing the suitability of a particular PRF to hold bats, a sliding scale of potentiality from low, through moderate, and up into high is sometimes used as recommended by Collins (2023) guidelines, but this is subjective between surveyors. Bats sometimes roost in very inconspicuous tree roosts (Andrews & BTHK 2020) and can be there one day and not the next. Leisler's bat are the Irish bat species for which the most tree roosts have been identified (Roche et al. 2014), and this species roosted an average of 19 m from the ground in tree roosts in a study in Poland for example (Ruczyński & Bogdanowicz 2005). A basic ground level search for PRFs is therefore a survey constraint.

Table 2-8 below from Collins (2023) outlines the initial approach to assessing the suitability of trees for use by bats; this guidance document further notes that 'the assessment of suitability will be further refined for roosts during a GLTA'.

Table 2-8: Guidelines for assessing suitability of trees for use by bats (Collins, 2023)

Suitability	Description
NONE	Either no PRFs in the tree or highly unlikely to be any
FAR	Further assessment required to establish if PRFs are present in the tree
PRF	A tree with at least one PRF present

2.4 Limitations

Some Irish bat species have much higher intensity of echolocation than others, and can thus be detected from greater distances, e.g. Leisler's bat (by far the loudest of all the Irish bat species), followed by relatively intense echolocation of common pipistrelle and soprano pipistrelle. Bat species with quieter echolocation, such as brown long-eared bat and Natterer's bat, must fly much closer to the microphone to be detected. Information taken from the UK Bat Conservation Trust's bat survey guidelines indicates that brown long-eared bat and Natterer's bat are among the most difficult to detect bat species. These differences in acoustic detectability are important for interpreting the results of passive detector monitoring.

It is not always possible to identify a bat call to species level due to the recorded call not being clear. Recorded files from automated detectors may contain only fragments of a call, or the bat may be calling from a distance (from the detector) in which case it may not be clear enough to assign the call to a specific species. In these cases, where manual verification was used, the call was assigned to genus level.

Some caution must be taken when comparing activity levels between species, as bias can be shown towards those species with 'louder' or 'lower frequency' echolocation calls. For example, Nyctalus species have louder and lower frequency echolocation calls which carry further than the quieter and more broad-band brown long-eared bat echolocation calls.

Brown long-eared bat is present on-site, but this species is very quiet and sometimes hunts without echolocating, so it may be under-recorded by the static detectors. However, the extent of surveys provides a robust baseline of bat species activity within the study area.

For the purposes of this analysis, if more than one species was present within the recorded file, Kaleidoscope chooses the prominent species to label the file. During manual verification, if a checked file contained calls from more than one species, the file was labelled as the rarest species in the recording file for the specific data set. Due to the way Kaleidoscope labels data, some species numbers may be under recorded. However with the extent of surveys a robust baseline of bat species within the study area is presented.

Activity transect surveys in 2022 were limited to two rounds, covering the summer and autumn windows. However, three rounds of activity surveys were undertaken in summer 2023, providing a robust baseline for assessment of bat activity at the proposed development site.

It is not considered that any of these survey specific constraints represent a significant limitation or data gap to adequately assessing the impacts of the Proposed Development on bat species within and surrounding the site.

2.5 Ecological Evaluation

2.5.1 Ecobat

The nightly number of bat passes recorded per species on the statics units were analysed using the website-based tool Ecobat (http://www.ecobat.org.uk/) which was designed by the University of Exeter, and is hosted by the Mammal Society UK.

"Acoustic surveys using bat detectors are widely used to determine species' presence and to quantify the activity of foraging bats as they are cost-effective, can be automated to run for long time periods, and are non-intrusive. Activity levels are dependent on a number of factors including seasonality, weather conditions and location, with the type of bat detector used during the survey also affecting detection rates.

Using bat passes to assess the relative importance of a site for policymakers therefore requires practitioners to account for how these multiple factors may have influenced the number of bat passes recorded at a site. Although professional opinion is valuable, it can often be based on intuition, is context dependent and can vary considerably between practitioners (Hulme, 2014).

It is therefore likely that an assessment of the ecological value of a site (and the impacts of any proposed action) will vary between practitioners based upon their own level of experience and knowledge of the region and/or species.

Ecobat compares surveys submitted by the user with a national reference dataset and objectively quantifies bat activity levels. It offers a web-based interface for depositing data rapidly and securely, automatically generating a numerical indicator of the relative importance of a night's worth of activity, by contrasting with a comparable reference range. The output can be used by ecologists to accurately quantify what bat activity means for use during ecological impact assessments.

Ecobat uses percentiles to provide a numerical representation of activity levels relative to the surrounding landscape for each night of surveying. Percentiles can then be assigned to activity categories (low, moderate, high) to provide a quantifiable measure of bat activity. Percentiles provide a numerical indicator of the relative importance of a nights' worth of bat activity by comparing it with a national database. For example, activity data in the 80th percentile would indicate that the recorded data were in the top 20% of activity for the reference range". (Ecobat, 2020).

The Ecobat analysis was undertaken for each survey period separately. The reference range datasets were stratified to include:

- Only national-level records.
- Records using any make of bat detector.

Categorisation of activity level is based on the following table:

Table 2-9: Percentile Score and Categorised Level of Bat Activity

Percentile	Bat Activity
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

2.5.2 Site Risk Assessment & Impact Assessment

According to SNH (2021) wind farms can affect bats in the following ways:

1. Collision mortality, barotrauma and other injuries (although it is important to consider these in the context of other forms of anthropogenic mortality)
2. Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat);
3. Loss of, or damage to, roosts;
4. Displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).

According to the SNH, 2021 to ensure that bats are protected by minimising the risk of collision, an assessment of impact at a site requires an appraisal of:

- The level of activity of all bat species recorded at the site assessed both spatially and temporally.
- The risk of turbine-related mortality for all bat species recorded at the site during bat activity surveys.
- The effect on the species' population status if predicted impacts are not mitigated.

In addition, it is recommended to consider the relevant factors in the assessment process:

- Is the bat species at the edge of its range
- Cumulative effects
- Presents of protected sites
- Proximity of maternity roosts
- Key foraging areas
- Key flight lines
- Possible migration routes.

Using the SNH guidelines outlined in Table 2-10, a site risk assessment for the individual turbines in relation to each bat species recorded was completed using the following values:

- Project Size
- Habitat Risk

Table 2-10: stage 1 - Initial site risk assessment (SNH, 2021)

Site Risk Level (1-5)*	Project Size			
		Small	Medium	Large
Habitat Risk	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5

Key: Green (1-2) - low/lowest site risk; Amber (3) - medium site risk; Red (4-5) - high/highest site risk.

* Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

Habitat Risk	Description
Low	Small number of potential roost features, of low quality. Low quality foraging habitat that could be used by small numbers of foraging bats. Isolated site not connected to the wider landscape by prominent linear features.
Moderate	Buildings, trees or other structures with moderate-high potential as roost sites on or near the site. Habitat could be used extensively by foraging bats. Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.
High	Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. Extensive and diverse habitat mosaic of high quality for foraging bats. Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. At/near edge of range and/or on an important flyway. Close to key roost and/or swarming site.

Project Size	Description
Small	Small scale development (≤10 turbines). No other wind energy developments within 10km. Comprising turbines <50m in height.
Medium	Larger developments (between 10 and 40 turbines). May have some other wind developments within 5km. Comprising turbines 50-100m in height.
Large	Largest developments (>40 turbines) with other wind energy developments within 5km. Comprising turbines >100m in height.

2.5.3 Habitat Assessment

Habitats adjacent to the development may be considered in terms of extent, diversity, naturalness, rarity, fragility, typicalness, recorded history, position, potential value and intrinsic appeal (Regini, 2000). The potential of these habitats for bat fauna is considered in this framework also.

- Bats may use trees with heavy ivy growth as occasional roosts. Bats may use mature trees with tree holes etc., as roosting sites all year around. However, in general, there is a paucity of these two types of mature trees within the survey area. They are present in the adjacent landscape or within the blocks of agricultural land enclosed by the survey area.
- Foraging and commuting areas are available to bats adjacent to and within the development areas along scrub habitats, treeline tracks and riparian linear features. There is less foraging and commuting capacity over bare peat and similar low height vegetation habitats. The exception to this is Leisler's bats and Nathusius' pipistrelles, which are bat species that fly high over the landscape. They are not as reliant on linear habitats to traverse through the landscape.

3. RESULTS

3.1 Desktop Survey

The UBSS Cave Database for the Republic of Ireland, Ordnance Survey Ireland Karst Landscapes, National Monuments Service, and National Inventory of Architectural Heritage GIS layers did not indicate that there were underground caves or monuments with bat roost potential within or near the site.

There are eight 2km grid squares which encompass the site: N73G , N73H, N73L, N73M, N73N, N73P, N73T and N73U. These held previous bat records as detailed in Table 3-1 below (NBDC maps, most recent data search 04/03/2025).

The 10 km grid square in which the site lies (N73) held records for brown long-eared bat (4 records, most recent 24/07/2019), common pippistrelle (61 records, most recent 26/08/2019), Daubenton's bat (2 records, most recent 08/09/2018), Leisler's bat (27 records, most recent 24/07/2019), Natterer's bat (3 records, most recent 25/05/2019), soprano pipistrelle (48 records, most recent 08/11/2019), *Pipistrellus* sp. *sensu lato* (1 records, most recent 08/11/2021), and whiskered bat (2 records, most recent 24/08/2017) (NBDC maps, most recent data search 11/04/2024).

Records in the NBDC maps reflect survey effort or data input, and do not necessarily reflect bat presence in a given area.

Table 3-1: Bat records in 10km Grid square N73 and 2km Grid squares N73G, N73H, N73L, N73M, N73N, N73P, N73T, N73U.

Species	N73	N73G	N73H	N73L	N73M	N73N	N73P	N73T	N73U
Brown long-eared bat	4	0	0	0	0	1	0	2	0
Common pipistrelle	61	1	14	2	5	8	0	6	0
Soprano pipistrelle	48	0	0	0	3	15	0	17	1
Pipistrellus sp. *sensu lato*	1	0	0	0	0	0	0	0	0
Leisler's bat	27	0	1	0	3	8	0	11	0
Daubenton's bat	2	0	0	0	0	0	0	1	0
Natterer's bat	3	0	0	0	1	0	0	2	0
Whiskered bat	2	0	0	0	0	0	0	2	0

3.1.1 Bat Landscapes

Bat landscapes are plotted in 5 km grid squares, of which two overlap the proposed development.

For the southern turbines (T1 - T3), the bat landscape association model (Lundy et al., 2011) suggests that the development is part of a landscape that is of low-moderate suitability for all bats. These southern turbines and their environs are of moderate suitability for common pipistrelle, and low-moderate suitability for brown long-eared bat, soprano pipistrelle, Leisler's bat, whiskered bat, Daubenton's bat, whiskered bat and Natterer's bat. This area (landscape encompassing T1-T3) is of low suitability for Nathusius' pipistrelle and lesser horseshoe bat.

For the northern turbines (T4 - T11), the bat landscape characterisation is moderate for all bats. The landscape in this area is of moderate-high suitability for common pipistrelle, moderate suitability for brown long-eared bat, soprano pipistrelle, Leisler's bat, Daubenton's bat and Natterer's bat, and of low-moderate suitability for whiskered bat. The landscape encompassing T4-T11 is of low suitability for lesser horseshoe bat and for Nathusius' pipistrelle.

3.1.2 Drehid Bat Assessment (2019)

A previous report was produced for the proposed Drehid Wind Farm in 2019 by Dr. Tina Aughney. The summary of this assessment presented here summary links the 2019 survey and assessment results to the finalised turbine locations, rather than the 2019 layout which has been superseded.

In 2019, seven out of the nine Irish bat species were identified on site: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat, Daubenton's bat, Natterer's bat and whiskered bat.

This report identified commuting corridors used by common pipistrelles and soprano pipistrelles along hedgerows and woodland edges to the west and north-west of T6-T8, with potential for forestry tracks to provide links between these commuting routes at T6-T8. Commuting corridors as well as foraging activity of common and soprano pipistrelles was observed along field boundaries and the wooded 'Coolree Nature Reserve' access track to the north of T11, indicating potential for these routes to connect with forestry access tracks leading towards T11.

During the 2019 surveys, potential tree roosts and actively used bat boxes in the vicinity of the Proposed Development and Proposed Substation were identified (locations are detailed in Figure 3-3). The bat box inspections recorded one adult soprano pipistrelle in bat box No.4, three adult soprano pipistrelles each in box No.5 and No.6, five adult soprano pipistrelles in box no. 7 on one occasion and two adults of the same species during a subsequent inspection of the same box. *Pipistrellus* spp. bat droppings were observed in box No.10.

A number of roosts within the local area were also identified during this survey. A tree roost for soprano pipistrelle (satellite roost) was recorded c. 1.5 km from T1. Common pipistrelle roosts (2 no.) were identified in houses to the east of T6-T8: a potential roost (type unknown) c. 500m from T8 and a satellite roost c. 900m from T7. Further satellite roosts in houses were identified along local roads, with 2 no. for common pipistrelle located 1.1 km and 1.9 km from T1, and 1 no. satellite roost for soprano pipistrelles c. 900m from T1.

2019 Ecobat analysis of static detector data at/near proposed turbine locations identified overall risk levels for (2019) proposed turbine locations in the absence of mitigation measures based on static detector data from 2019. This identified a high risk level for proposed turbines T7, T9-T12, medium-high risk level for proposed turbines T4-T6, T8, and moderate risk level for T1-T3. The 2019 assessment identified Leisler's bat as the species most affected by potential operational impacts.

3.2 Bat Activity Surveys

3.2.1 Bat Activity 2023

Weather conditions for each of the survey dates are presented in Table 3-2.

Overall, five species of bat were noted during these surveys: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat and Daubenton's bat, as well as genus *Myotis* and *Pipistrellus*. Survey results are presented in Table 3-3, and individual records are mapped in Appendix 1.

Incidental bat records recorded while walking/driving between transects are presented in Table 3-4.

TR1 and TR1a traverse forestry paths, forestry edges and bog in the northern part of the site near T10 and T11. TR1a covers all tracks walked during TR1 but also covers additional forestry paths. This transect had consistently high activity of common pipistrelles throughout each survey window with the peak activity of 70 passes of this species in August 2023. Soprano pipistrelle was also represented at TR1 during each survey window with the highest activity of this species in September 2023. Leisler's bat was noted along this transect in August 2023 only and was picked up in closed as well as more open areas. Foraging as well as commuting was observed along this transect.

TR3 traverses hedgerows in agricultural fields and TR3a additionally traverses a field (both transects are within farmland in the vicinity of T1 - T3). These partially overlapping transects had low activity during May and August 2023, but medium activity during September 2023. Species recorded along this transect were common pipistrelle, soprano pipistrelle and Leisler's bat.

TR2 and TR2a traverse hedgerows dividing agricultural fields in the vicinity of T4-T5. These partially overlapping transects had high activity in May 2023 and medium activity in September 2023 (not surveyed in August 2023). The most commonly recorded species along these transects was Leisler's bat, followed by common pipistrelle in May 2023, while there was also one record of Nathusius' pipistrelle and one record of Daubenton's bat. In September 2023, there were four recorded passes of bats belonging to the genus *Myotis* which were all along the road near a farm building.

Table 3-2: Bat activity survey conditions 2023

Date	Sunset	Weather	Transects	Start - End Times
30/05/2023	21:40	14°C to 9°C, no rain, F1, 0 Oktas	TR1	21:37 - 22:25
			TR2	22:46 - 23:44
			TR3	23:52 - 00:30
08/08/2023	21:10	18°C to 12°C, no rain	TR3a	21:12 - 21:53
			TR1a	22:13 - 23:10
20/09/2023	19:31	14°C to 7°C, no rain	TR2a	19:35 - 20:31
			TR3	20:34 - 21:13
			TR1	21:26 - 22:20

Table 3-3: Analysis BatLogger M2 Data - Survey Results 2023 (bat passes)

	30/05/2023			08/08/2023		20/09/2023		
	TR1	TR2	TR3	TR3a	TR1	TR2a	TR3	TR1
Common pipistrelle	28	25	5	0	70	1	5	24
Soprano pipistrelle	3	3	1	9	11	0	14	21
Leisler's bat	0	32	2	2	6	26	5	0
Nathusius' pipistrelle	0	1	0	0	0	0	0	0
Daubenton's bat	0	1	0	0	0	0	0	0
Pipistrellus Sp.	0	0	0	0	0	1	12	6

	30/05/2023			08/08/2023		20/09/2023		
	TR1	TR2	TR3	TR3a	TR1	TR2a	TR3	TR1
Myotis sp.	0	0	0	0	0	4	0	1
Total	31	62	8	11	87	32	36	52

Table 3-4: Analysis BatLogger M2 Data - Incidental Results 2023 (bat passes)

	30/05/2023		08/08/2023	20/09/2023	
	TR1 - TR2	TR2 - TR3	TR3a - TR1	TR2a - TR3	TR3 - TR1
Common pipistrelle	11	0	0	0	0
Soprano pipistrelle	5	1	0	0	10
Leisler's bat	1	0	0	0	0
Pipistrellus Sp.	0	0	0	0	2
Total	17	1	0	0	12

3.2.2 Bat Activity 2022

Weather conditions for each of the survey dates are presented in Table 3-5.

Overall, five species of bat were noted during these surveys: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat and a bat in the genus *Myotis*. Survey results are presented in Table 3-6, and individual records are mapped in Appendix 1.

At Transect A, high activity was noted on the 29th of August 2022 with common pipistrelle dominating. At Transect B on the 28th of July 2022 there was little activity with small numbers of soprano pipistrelle foraging locally. Transect C had limited bat activity across both survey dates with Leisler's bat commuting overhead. Transect D had limited activity across both survey dates with activity limited to vegetation features where localised feeding took place. Transect D was the only location where a *Myotis sp*. was noted.

An unidentified bat (visual observation only) was noted before the beginning of transect surveys 15 minutes after sunset on the 28th of July 2022 on a forestry path near Kilshanroe (53.38028946, -6.88710930), potentially indicating the presence of a roost near this location, correlating with observations of roosts to the west of T6-T8 during 2019 surveys.

Table 3-5: Bat activity survey conditions 2022

Date	Sunset	Weather	Transects	Start - End Times
28/07/2022	21:30	13°C, F0-1, No rain, 3 Oktas	B	21:52-22:12
			C	22:32-22:48
			D	22:53-23:13
29/08/2022	20:24	17°C, F1-2, No rain, 2 Oktas	D	20:34-21:04
			C	21:09-21:29
			A	21:54-22:38

Table 3-6: Analysis - Survey Results 2022 (bat passes)

Date	28/07/2022			29/08/2022		
Transect	B	C	D	D	C	A
Common pipistrelle	2	2	12	5	0	47
Soprano pipistrelle	10	1	1	4	1	12
Leisler's bat	0	4	1	3	11	2
Brown long-eared bat	0	1	0	0	0	0
Myotis Sp.	0	0	1	0	0	0
Total	12	8	15	12	12	61

3.3 Static Detector Bat Surveys

3.3.1 2023 Static Surveys

Table 3-7 below summarises the results, in relation to bat species, recorded on the static detectors deployed in 2023. A total of 11 static units were deployed during each survey period. Overall, eight bat species were recorded (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat, Natterer's bat, Daubenton's bat and whiskered bat). Manual verification of acoustic data ensured accurate species identification.

Table 3-7: Summary results of Static Bat Detectors deployed during 2023 survey rounds 1 to 3

Static Detector No. and location habitats	Species detected during Round 1 May 22nd to June 20th 2023	Species detected during Round 2 8th to 30th August 2023	Species detected during Round 3 20th September to 24th October 2023
T1	*Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus*
T2	*Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus*
T3	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
T4	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*

Static Detector No. and location habitats	Species detected during Round 1 May 22nd to June 20th 2023	Species detected during Round 2 8th to 30th August 2023	Species detected during Round 3 20th September to 24th October 2023
T5	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
T6	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
T7	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
T8	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*

Static Detector No. and location habitats	Species detected during Round 1 May 22nd to June 20th 2023	Species detected during Round 2 8th to 30th August 2023	Species detected during Round 3 20th September to 24th October 2023
T9	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
T10	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
T11	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis Sp.* *Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus Sp.* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*

Common Pipistrelle

The total number of recordings for common pipistrelle at the Proposed Development was 58,082 no. recordings; 52.39% of total recordings. These were recorded over 86 no. nights which gives an average of 675.37 no. recordings per night.

Soprano Pipistrelle

The total number of recordings of soprano pipistrelle recorded at the Proposed Development was 26,959 no. recordings; 24.31% of total recordings. These were recorded over 86 no. nights. This gives an average of 313.48 no. recordings per night.

Leisler's Bat

The total number of recordings for Leisler's bat at the Proposed Development was 22,685 no. recordings; 20.46% of total recordings. These were recorded over 86 no. nights which gives an average of 263.78 no. recordings per night.

Brown Long-Eared Bat

The total number of recordings for brown long-eared bat at the Proposed Development was 486 no. recordings; 0.44% of total recordings. These were recorded over 86 no. nights which gives an average of 5.65 no. recordings per night.

Daubenton's Bat

The total number of recordings for Daubenton's bat at the Proposed Development was 484 no. recordings; 0.44% of total recordings. These were recorded over 86 no. nights which gives an average of 5.63 no. recordings per night.

Whiskered Bat

The total number of recordings for whiskered bat at the Proposed Development was 461 no. recordings; 0.42% of total recordings. These were recorded over 86 no. nights which gives an average of 5.36 no. recordings per night.

Natterer's Bat

The total number of recordings for Natterer's bat at the Proposed Development was 226 no. recordings; 0.20% of total recordings. These were recorded over 86 no. nights which gives an average of 2.63 no. recordings per night.

Nathusius' Pipistrelle

The total number of recordings for Nathusius' pipistrelle at the Proposed Development was 11 no. recordings; 0.01% of total recordings. These were recorded over 86 no. nights which gives an average of 0.13 no. recordings per night.

Genus level Bats

The total number of recordings for bats identified to Myotis level only (could not be identified to species level) at the Proposed Development was 755 no. recordings; 0.68% of total recordings. These are likely a combination of whiskered bat, Daubenton's bat and Natterer's bat.

The total number of recordings for bats identified to Pipistrelle level only (could not be identified to species level) at the Proposed Development was 726 no. recordings; 0.65% of total recordings. These are likely a combination of common, soprano and Nathusius' pipistrelle.

The graphs within Plate 3-1 to Plate 3-10 below show the number of bat passes (per species) recorded at each static detector location over the three surveillance periods.

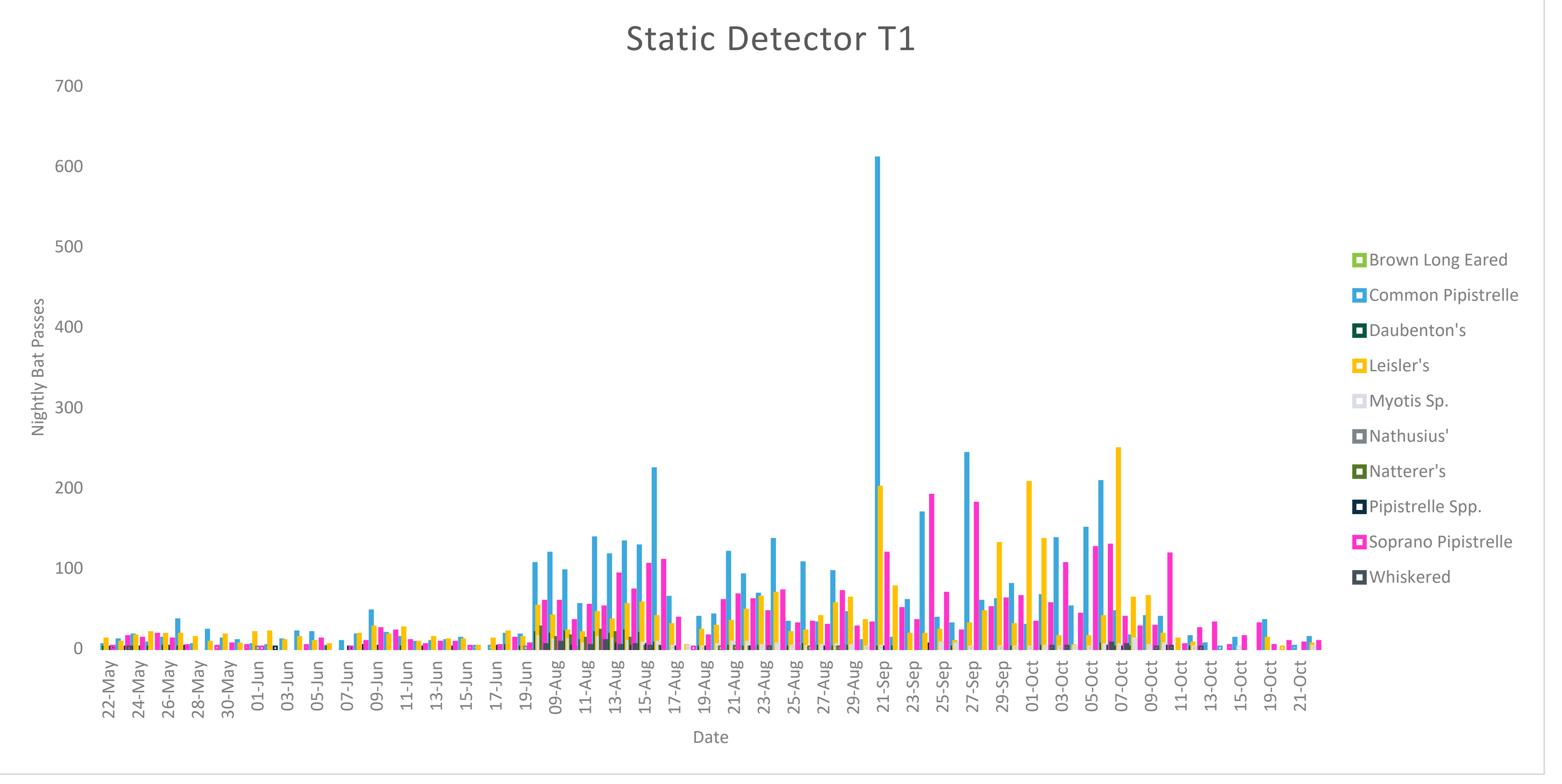


Plate 3-1: Total number of nightly passes recorded at static location T1 (2023)

The static unit T1 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. Higher levels of activity were recorded in periods 2 and 3 (08/08 - 30/08/2023 and 19/09 - 24/10/2023). Common pipistrelle spiked in activity on night 3 of round 3 (21/09/2023) with 610 passes. Leisler's bat and Soprano pipistrelle had more pronounced spikes in activity during period 3 vs periods 1 and 2.

All other species/groups had lower activity levels.

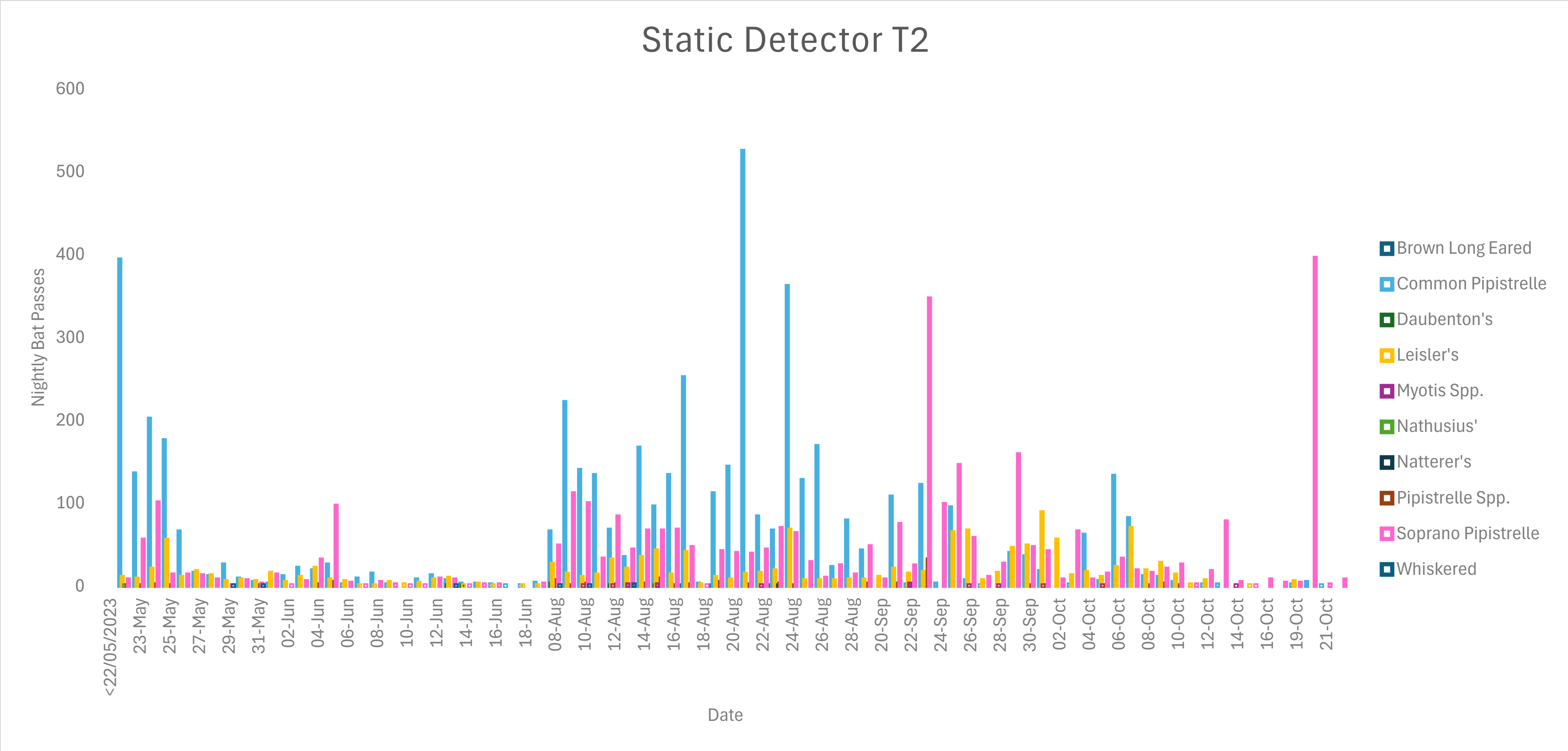


Plate 3-2: Total number of nightly passes recorded at static location T2 (2023)

The static unit T2 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. The majority of activity was recorded in periods 2 and 3 (08/08 - 30/08/2023 and 19/09 - 24/10/2023). There was a spike in activity around the beginning of period 1 (22/05/23 - 20/06/23). Common pipistrelle spiked in activity on night 14 of round 2 (21/08/2023) with 525 passes. Activity for this species was highest during period 2. Soprano pipistrelle had more pronounced spikes in activity during period 3 vs periods 1 and 2.

All other species/groups had lower activity levels.

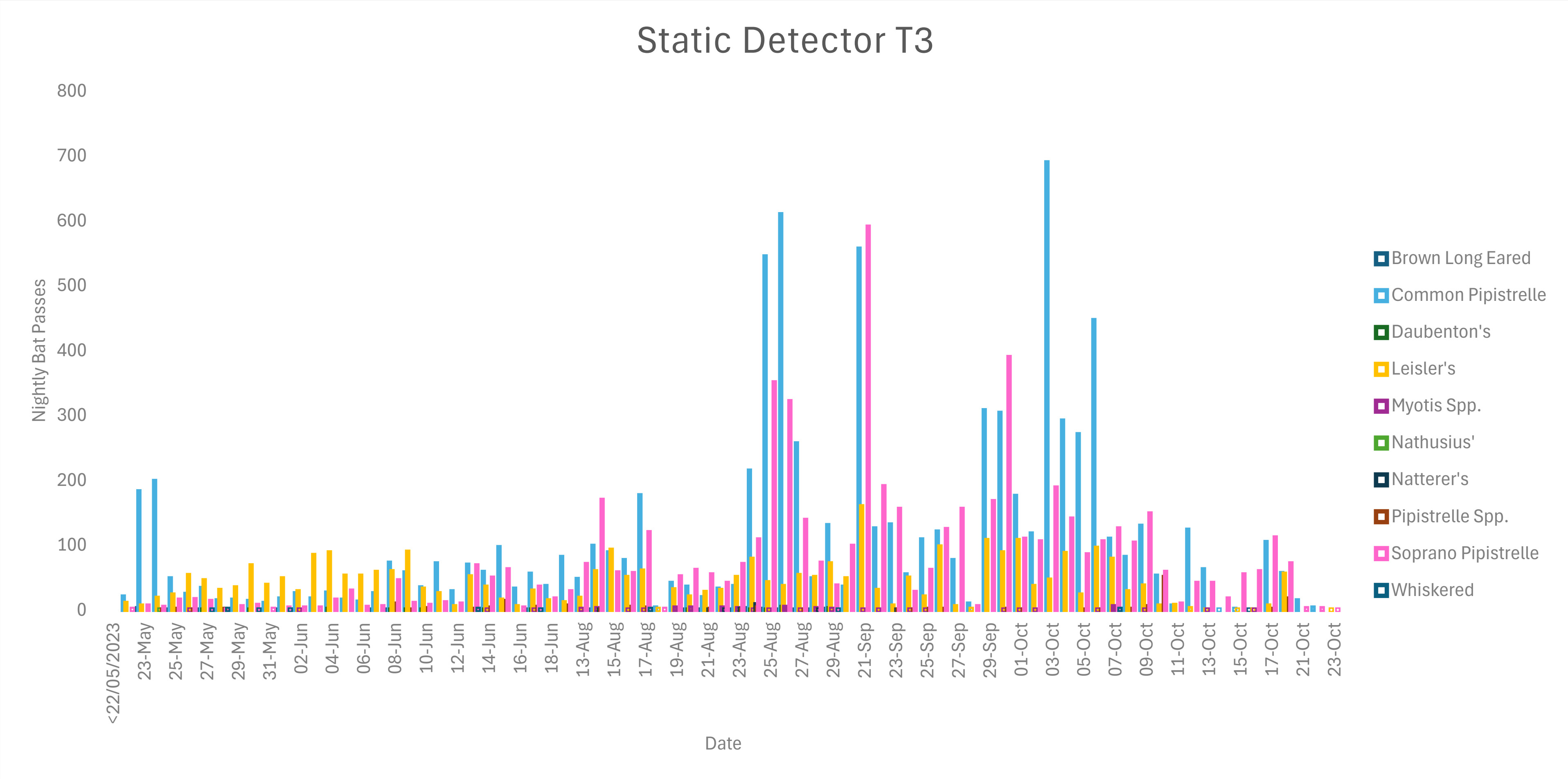


Plate 3-3: Total number of nightly passes recorded at static location T3 (2023)

The static unit T3 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. The majority of activity was recorded in periods 2 and 3 (08/08 - 30/08/2023 and 19/09 - 24/10/2023). The highest amount of activity occurred during survey period 3 (19/09 - 24/10/2023). Both common and soprano pipistrelle had higher levels of activity than other species, and common pipistrelle had a the highest number of pronounced spikes in activity during all survey periods. Leisler's bat activity occurred across all survey periods, but no pronounced spikes in activity occurred for this species.

All other species/groups had lower activity levels.

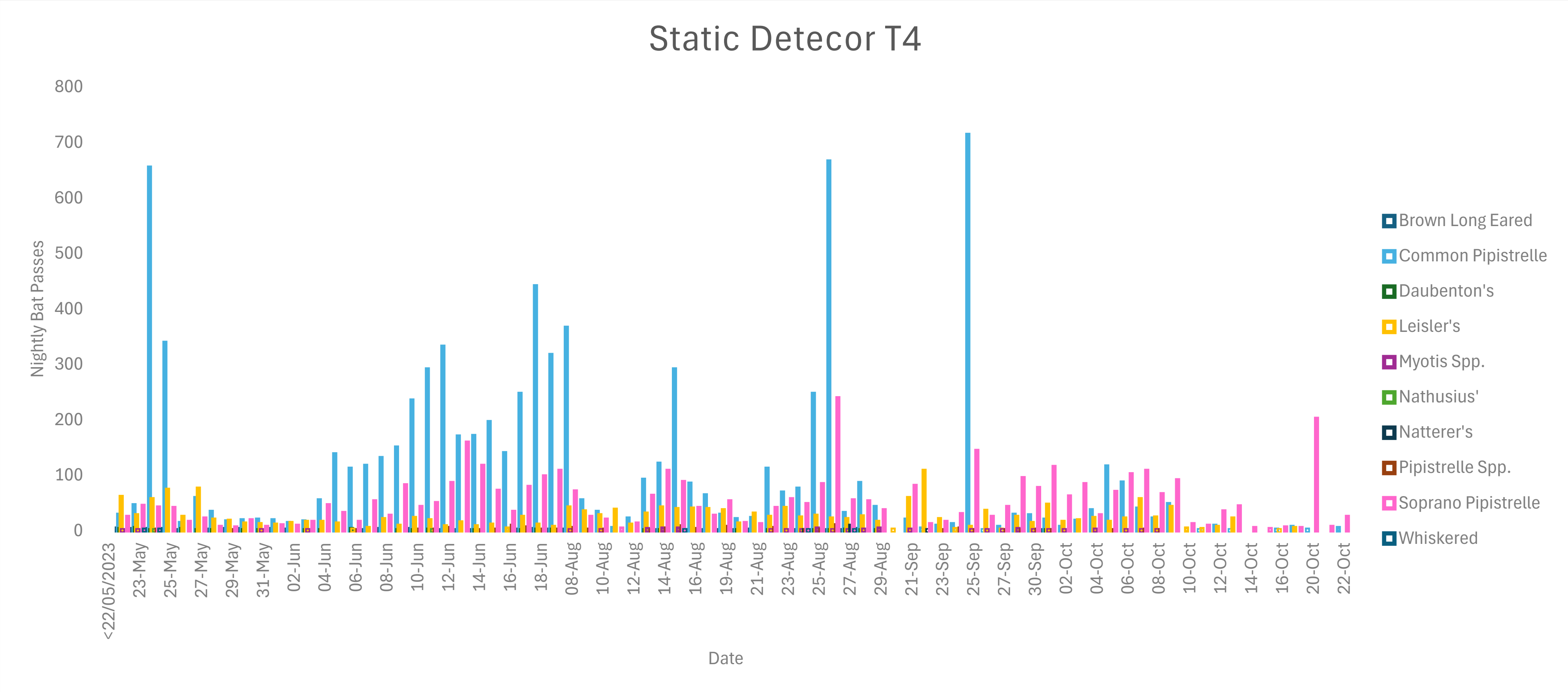


Plate 3-4: Total number of nightly passes recorded at static location T4 (2023)

The static unit T4 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. The majority of activity was recorded in period 1 (22/05/23 - 20/06/23), due to higher levels of common pipistrelle activity. The most consistent occurrence of common pipistrelle activity is within survey period 1, although larger but more isolated activity spikes for this species occur in periods 2 and 3 (the highest recorded number of passes, 714, for common pipistrelle was on 25/09/2023 during period 3). Soprano pipistrelle were active across all survey periods; this species had lower levels of activity than common pipistrelle but similar frequency of occurrence and activity spike patterns during periods 1 and 2. Soprano pipistrelle was more frequently active during period 3. Leisler's bat activity occurred across all survey periods, but spikes in activity for this species were not as pronounced as common and soprano pipistrelle.

All other species/groups had lower activity levels.

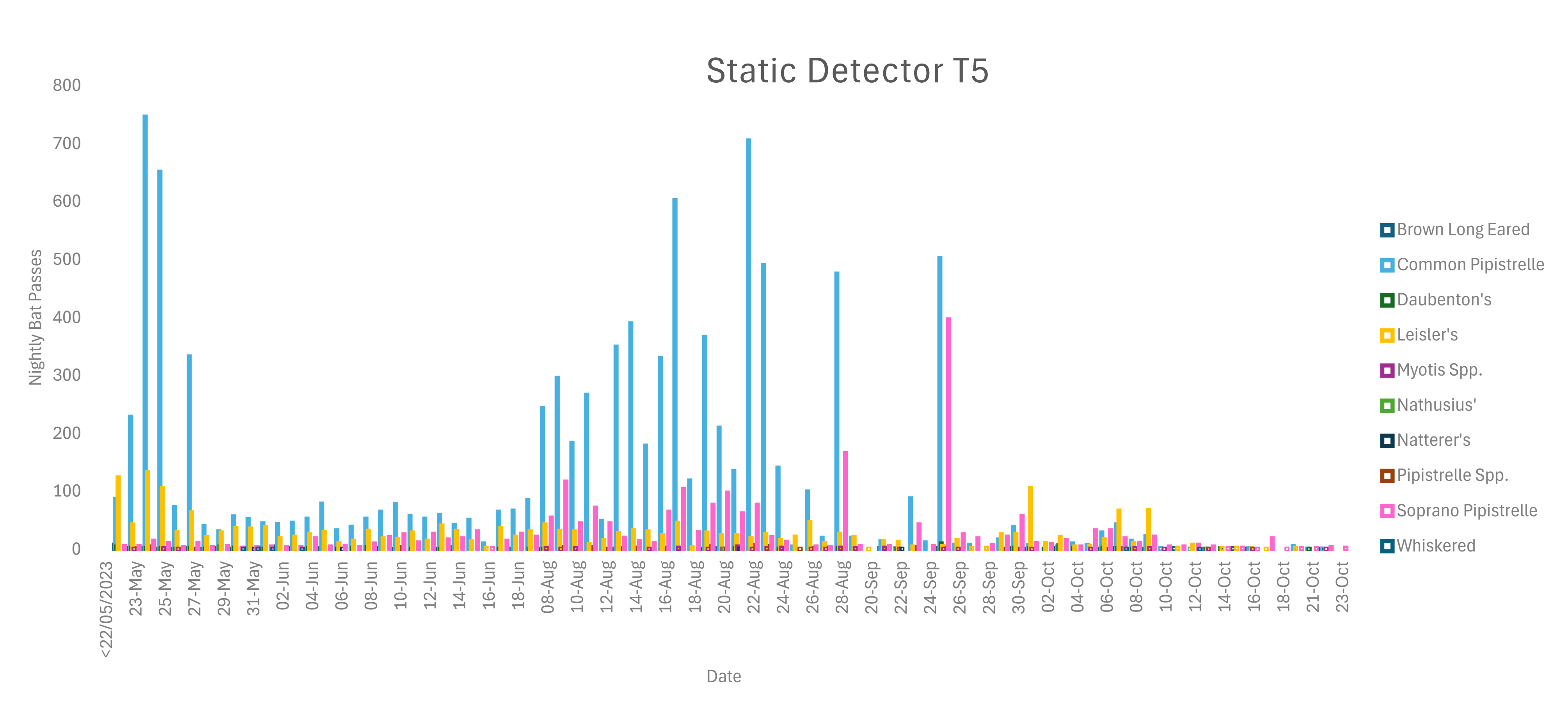


Plate 3-5: Total number of nightly passes recorded at static location T5 (2023)

The static unit T5 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. The highest activity levels at this location were recorded during survey period 2 (08/08/23 - 30/08/23), due to large spikes in common pipistrelle activity. There were also notable spikes in activity for this species at the start of period 1, but these dropped off for the remainder of period 1. Higher activity nights for soprano pipistrelle were focused in survey period 2; however the highest activity spike for this species was an outlier during survey period 3 (397 passes on 25/09/2023). Leisler's bat were more active at this location during period 1, but occurred at this location throughout surveys and had three spikes in activity late in the season (October2023).

All other species/groups had lower activity levels.

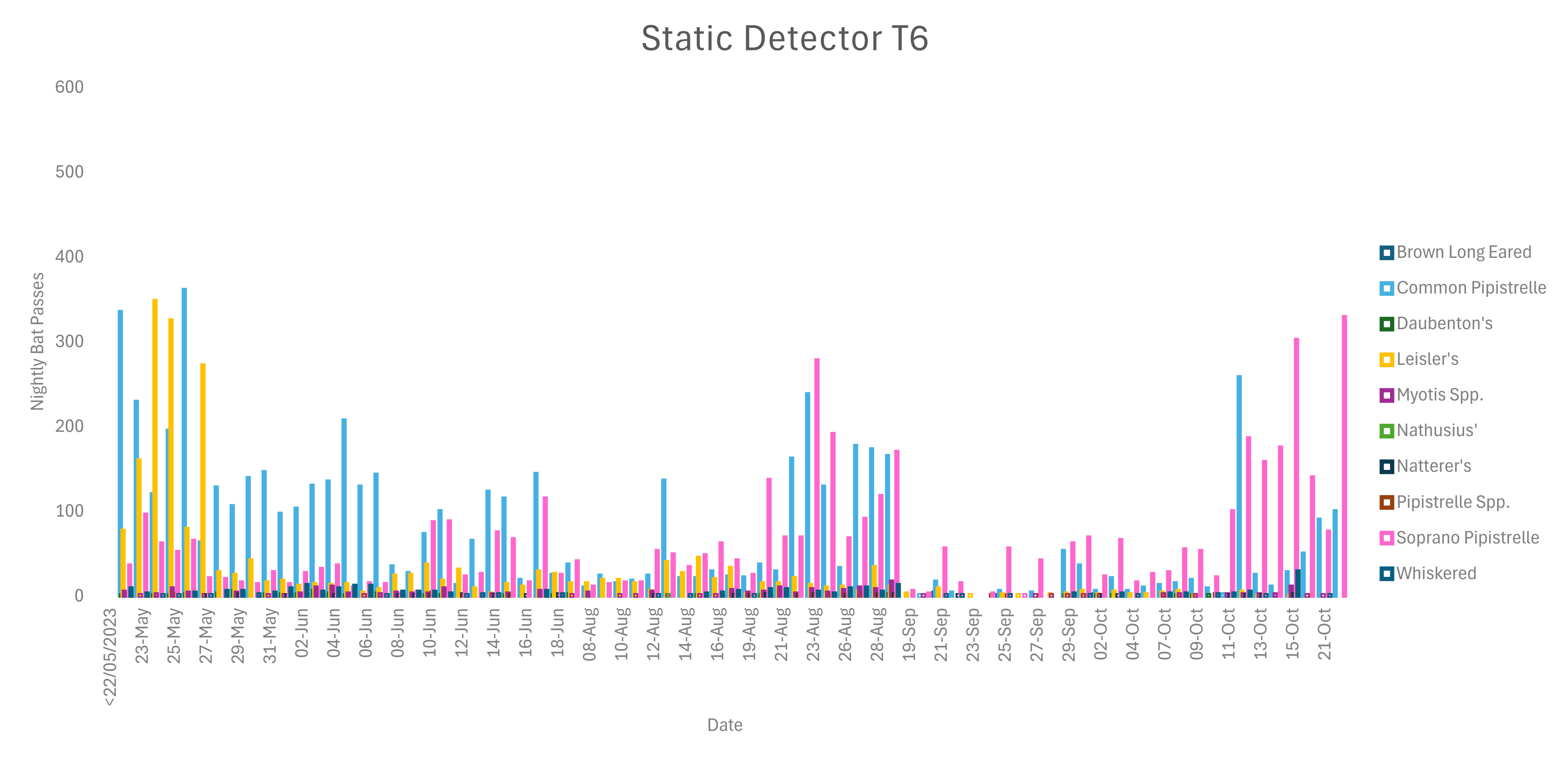


Plate 3-6: Total number of nightly passes recorded at static location T6 (2023)

The static unit T6 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. There were periods of high activity recorded across all survey periods; however, higher activity was recorded more consistently during survey period 1. The highest periods of common pipistrelle activity were during survey periods 1 and 2, while the highest periods of soprano pipistrelle were later in the season during periods 2 and 3. Leisler's bat activity during the beginning of survey period 1 was far higher than the remainder of period 1 and all of periods 2 and 3.

All other species/groups had lower activity levels.

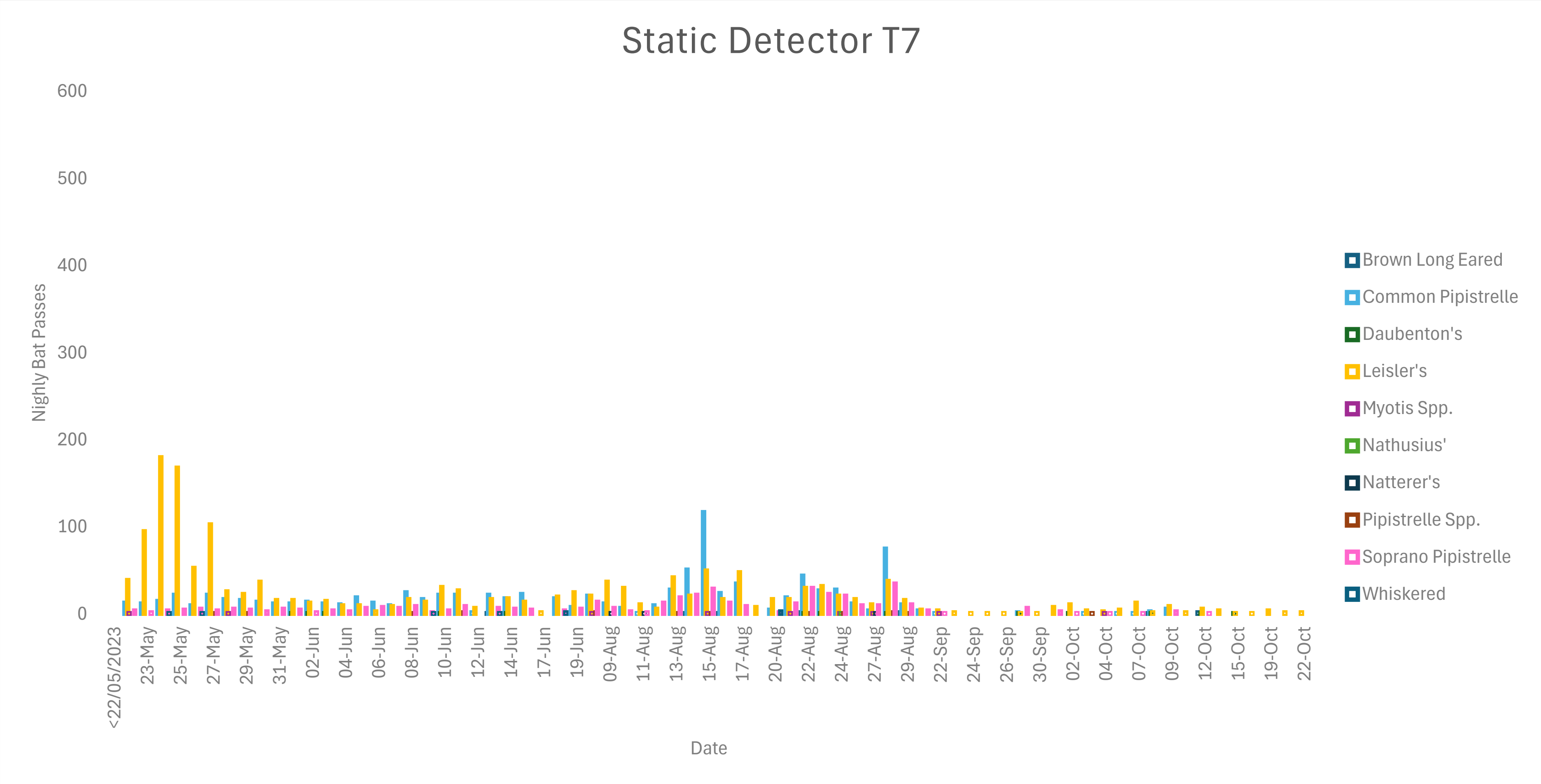


Plate 3-7: Total number of nightly passes recorded at static location T7 (2023)

The static unit T7 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. This location is notable in that it generally did not record activity spikes as high as other locations, although there were spikes in Leisler's activity around the start of period 1, with a peak of 180 Leisler's bat passes on 24/05/2023. Isolated spikes in common pipistrelle activity were recorded during survey period 2; however, these remained relatively lower (peak activity was 117 passes on 15/08/2023) than the activity spikes for this species observed at other locations.

All other species/groups had lower activity levels.

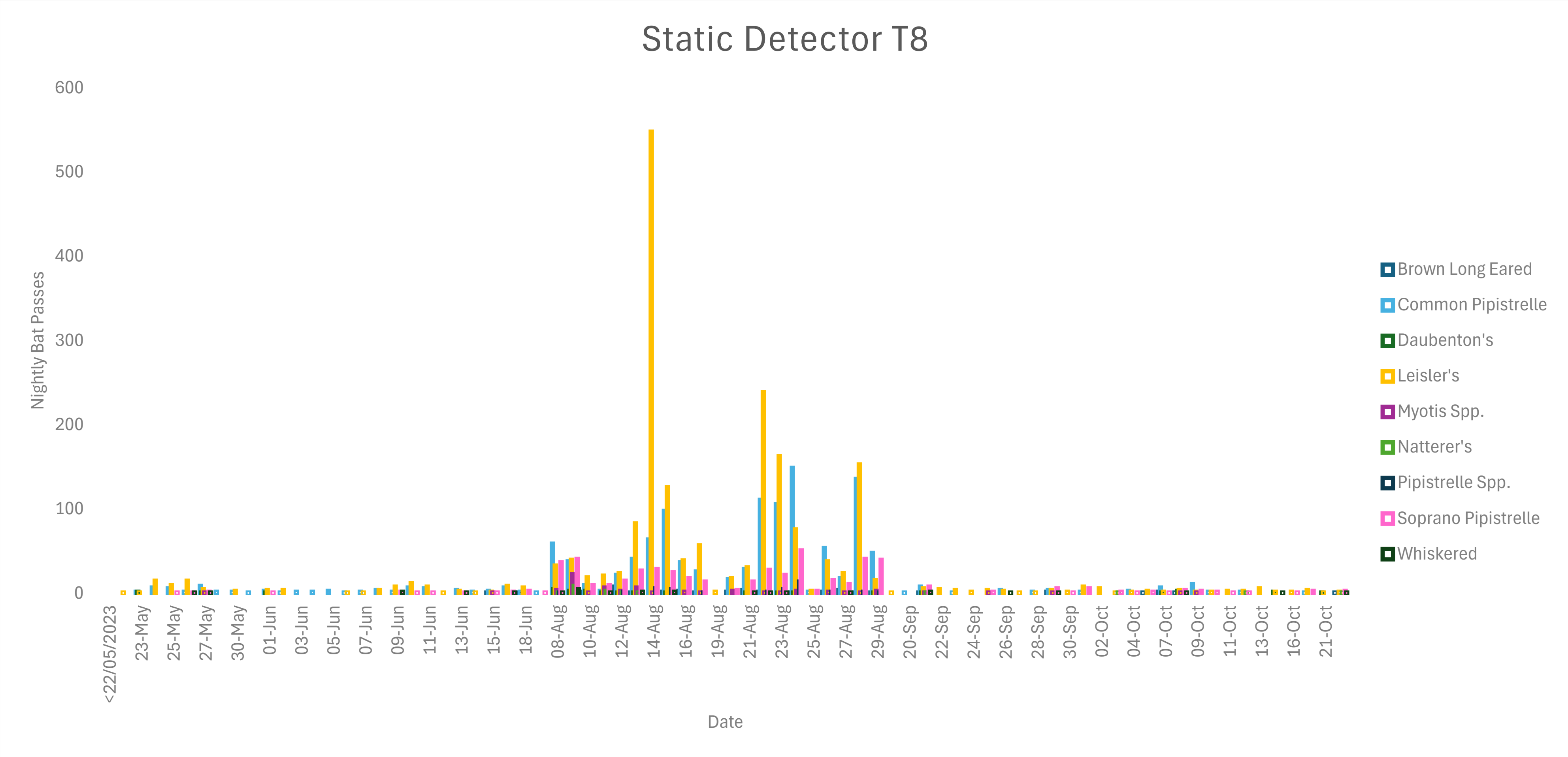


Plate 3-8: Total number of nightly passes recorded at static location T8 (2023)

The static unit T8 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. Activity at this location was focused survey period 2, with relatively low levels recorded during the periods 1 and 3. Activity was dominated by Leisler's bat, with a number of activity spikes for this species during survey period 2 (peak activity was 548 bat passes on 14/08/2023; this was also the highest number of Leisler's bat passes recorded across all locations and survey periods). Common ad soprano pipistrelle were also more active at this location during period 2, although at relatively lower levels versus Leisler's bat.

All other species/groups had lower activity levels.

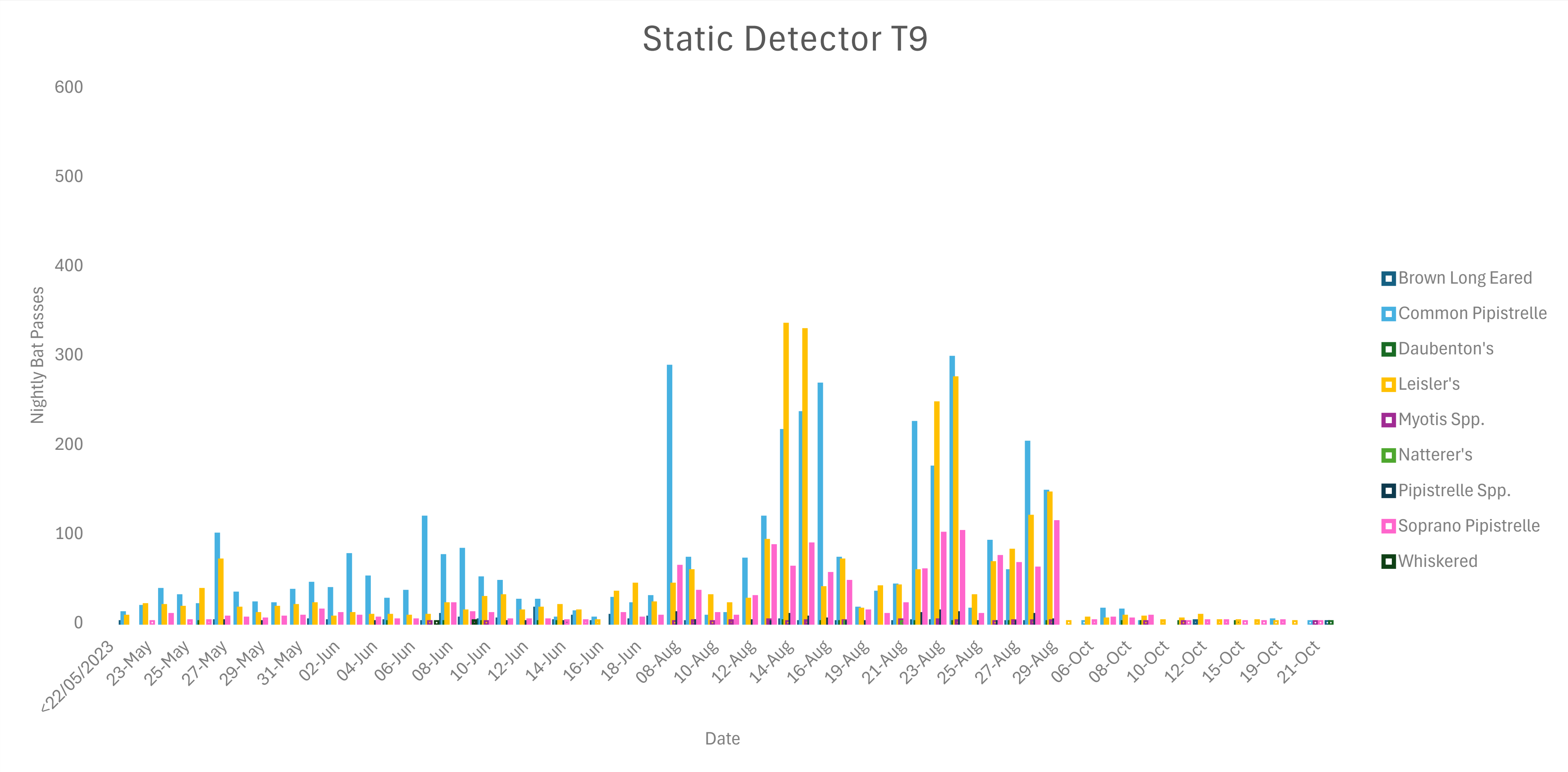


Plate 3-9: Total number of nightly passes recorded at static location T9 (2023)

The static unit T9 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. Activity at this location was highest during survey period 2, followed by period 1. Survey period 3 had relatively lower activity levels. Most of the bat activity was comprised of Leisler's bat and common pipistrelle passes, while soprano pipistrelle also comprised a relatively higher proportion of overall activity versus all other species.

All other species/groups had lower activity levels.

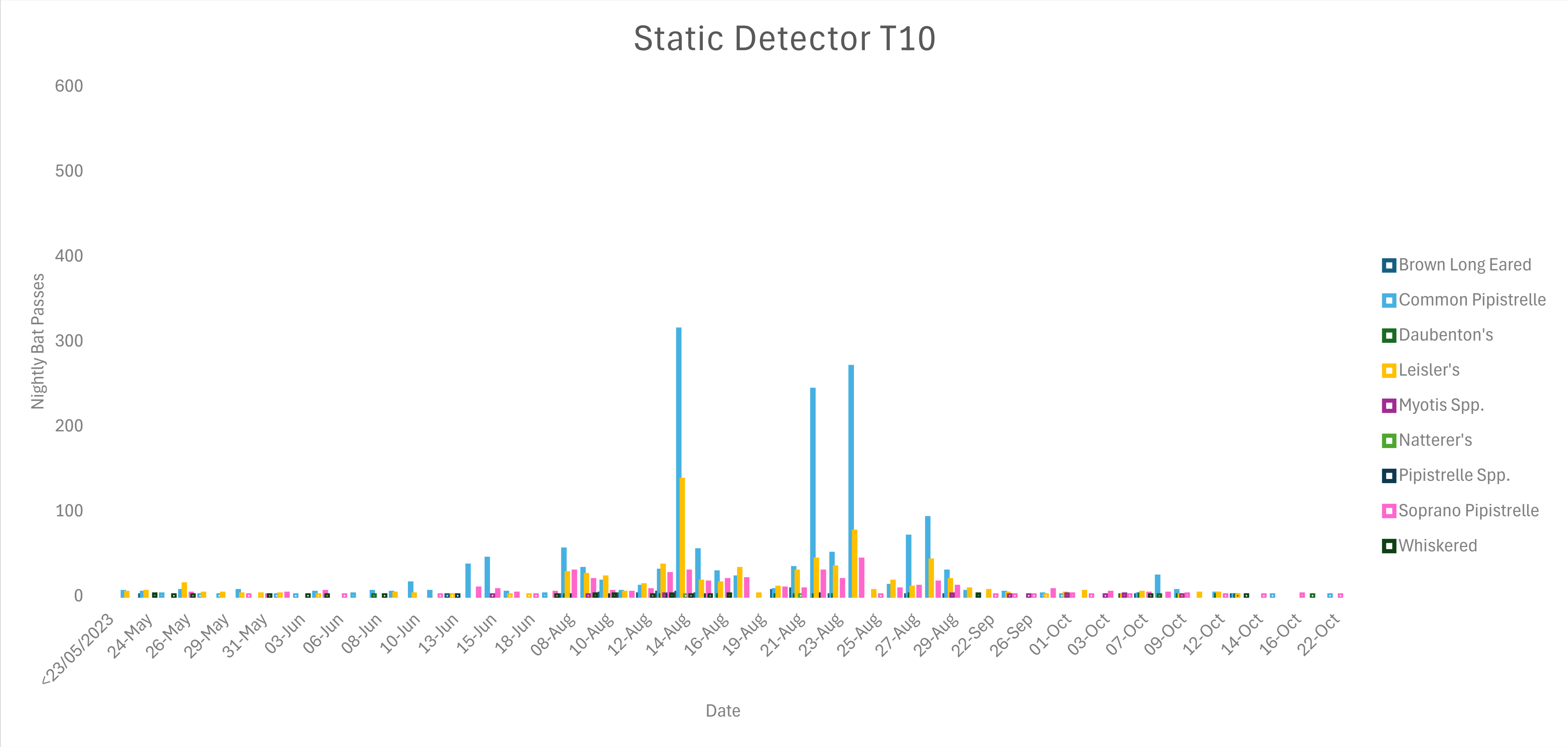


Plate 3-10: Total number of nightly passes recorded at static location T10 (2023)

The static unit T10 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. Activity across all species at this location followed a similar pattern to T8, with most activity focused in period 2; however, at T10 common pipistrelle rather than Leisler's bat accounted for the bulk of activity. Leisler's bat and soprano pipistrelle were also active at relatively higher levels during period 2 vs. periods 1 and 3.

All other species/groups had lower activity levels.

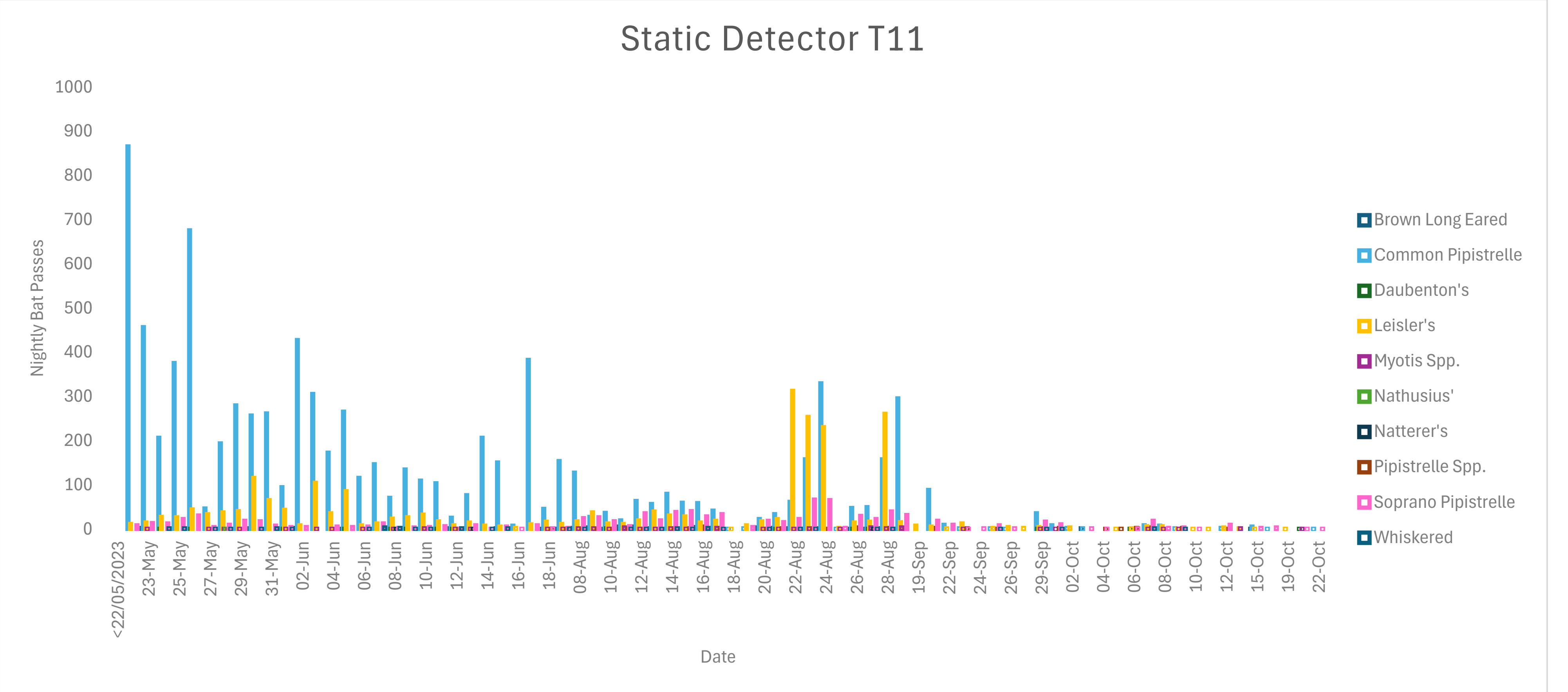


Plate 3-11: Total number of nightly passes recorded at static location T11 (2023)

The static unit T11 recorded eight species of bat, in addition to *Myotis* Spp. and *Pipistrellus* Spp. The highest activity at this location was recorded during survey period 1, and this was largely due to high common pipistrelle activity with regular spikes. The highest number of common pipistrelle passes (866) across all locations and periods was recorded here on 22/05/2023 (survey period 1). There were also common pipistrelle activity spikes during period 2. Leisler's bat activity spikes also occurred in period 1 and period 2, with higher spikes in period 2 (highest number of passes for Leisler's bat at this location was 313 on 22/08/2023). The next most active species at this location was soprano pipistrelle, although activity for this species was relatively lower than Leiser's bat and common pipistrelle.

All other species/groups had lower activity levels.

The graphs within Plate 3-12 to Plate 3-21 show the number of passes for individual species (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat, Daubenton's bat, Natterer's bat and whiskered bat) at each static detector location for the full survey period of 2023. Location T5 had the highest number of passes for common pipistrelle. T3 had the highest number of passes for soprano pipistrelle.T1 had the highest number of passes of Nathusius' pipistrelle. T3 had the highest levels for Leisler's bat. Location T1 had the highest numbers of Daubenton's and Natterers' bat passes. T6 had the highest number of whiskered bat passes.

In terms of genus level records, T3 had the highest number of *Pipistrellus* Spp. passes, while T6 had the highest number of *Myotis* Spp. passes.

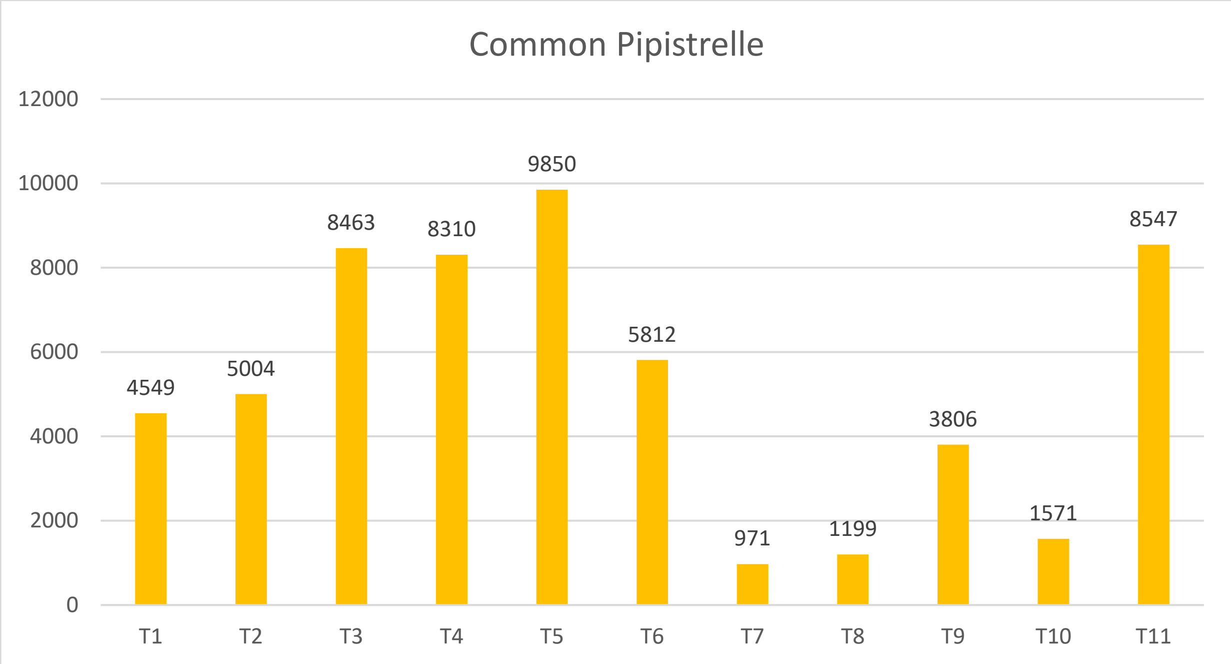


Plate 3-12: Total number of bat passes recorded for common pipistrelles at each of the static detector locations during 2023

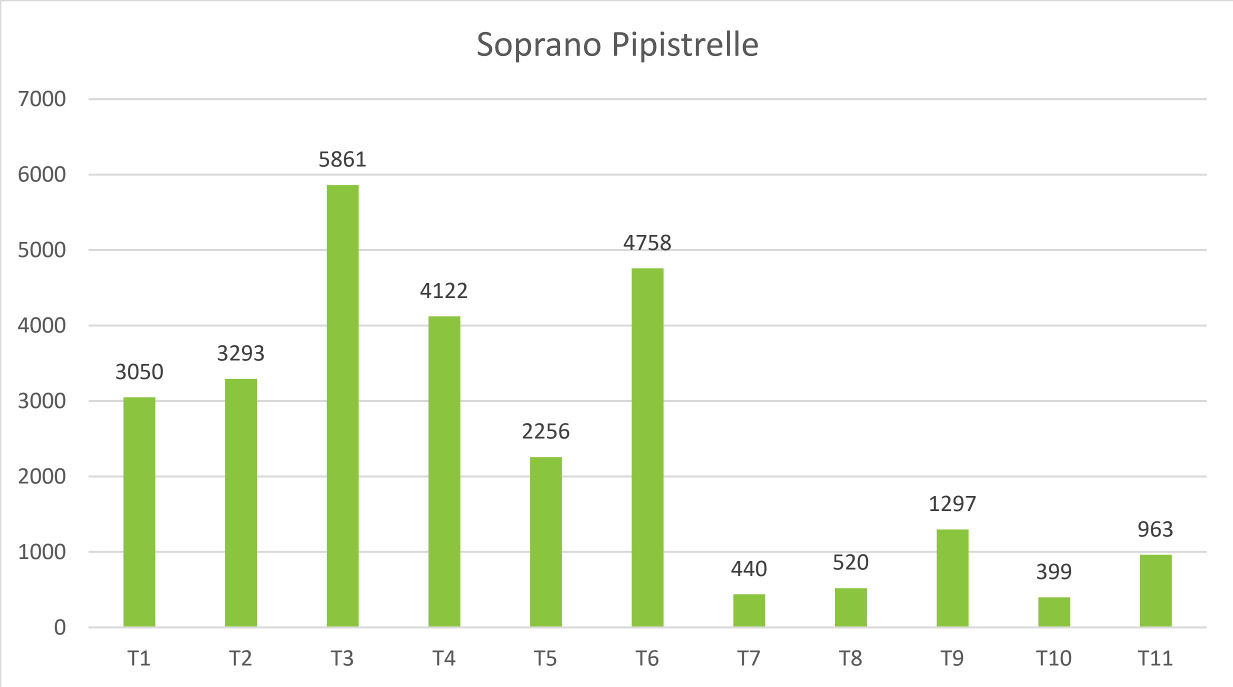


Plate 3-13: Total number of bat passes recorded for soprano pipistrelles at each of the static detector locations during 2023

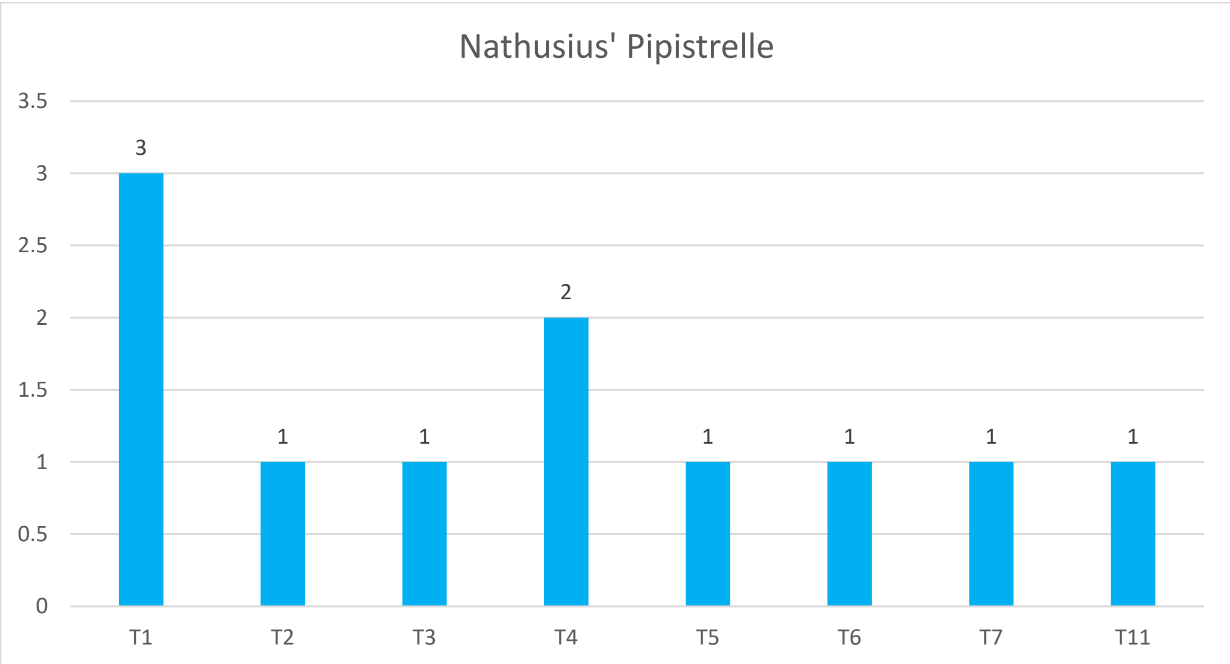


Plate 3-14: Total number of bat passes recorded for Nathusius' pipistrelles at each of the static detector locations during 2023

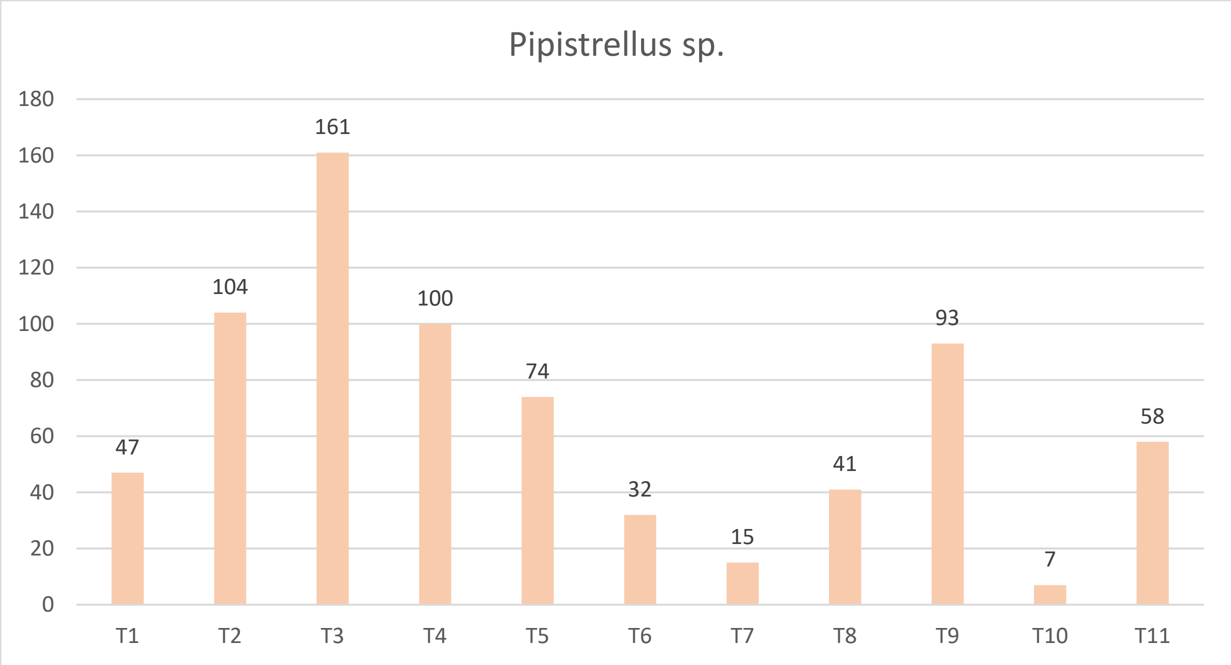


Plate 3-15: Total number of bat passes recorded for pipistrellus sp. at each of the static detector locations during 2023

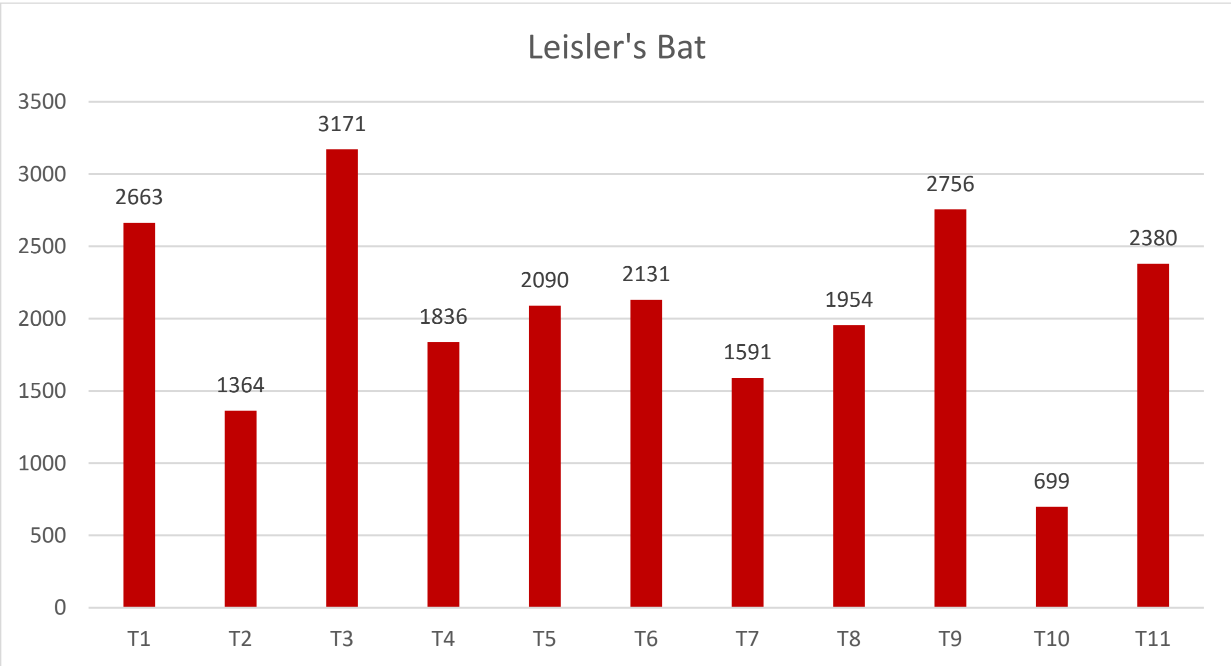


Plate 3-16: Total number of bat passes recorded for Leisler's bat at each of the static detector locations during 2023

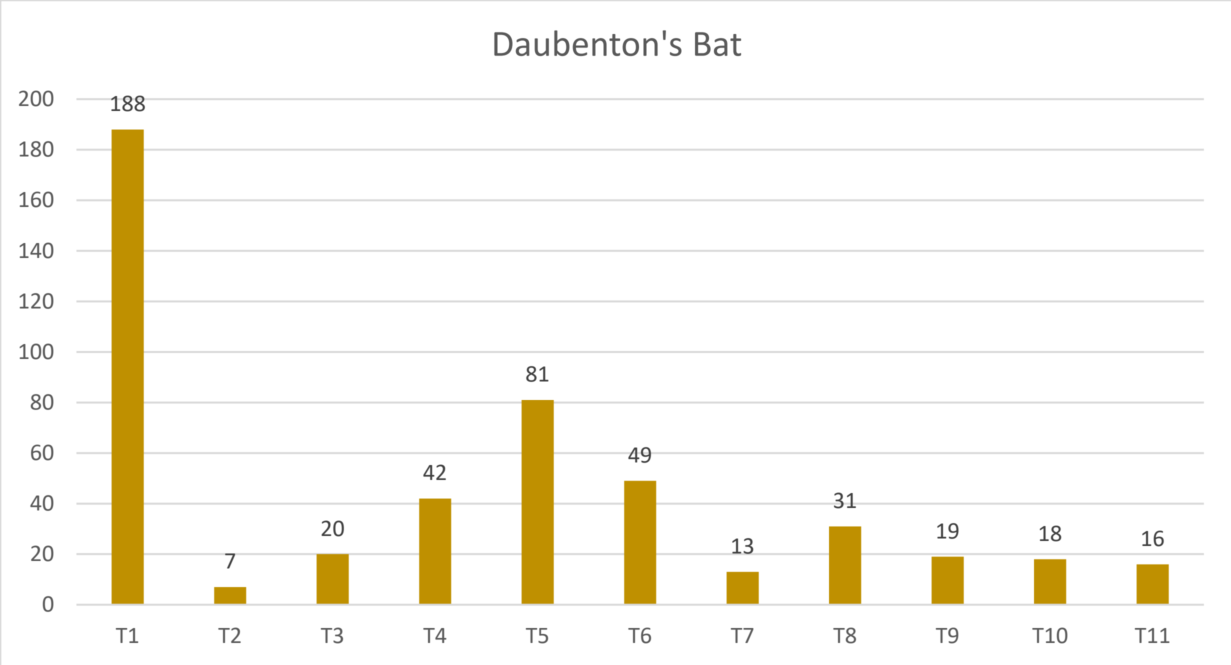


Plate 3-17: Total number of bat passes recorded for Daubenton's bat at each of the static detector locations during 2023

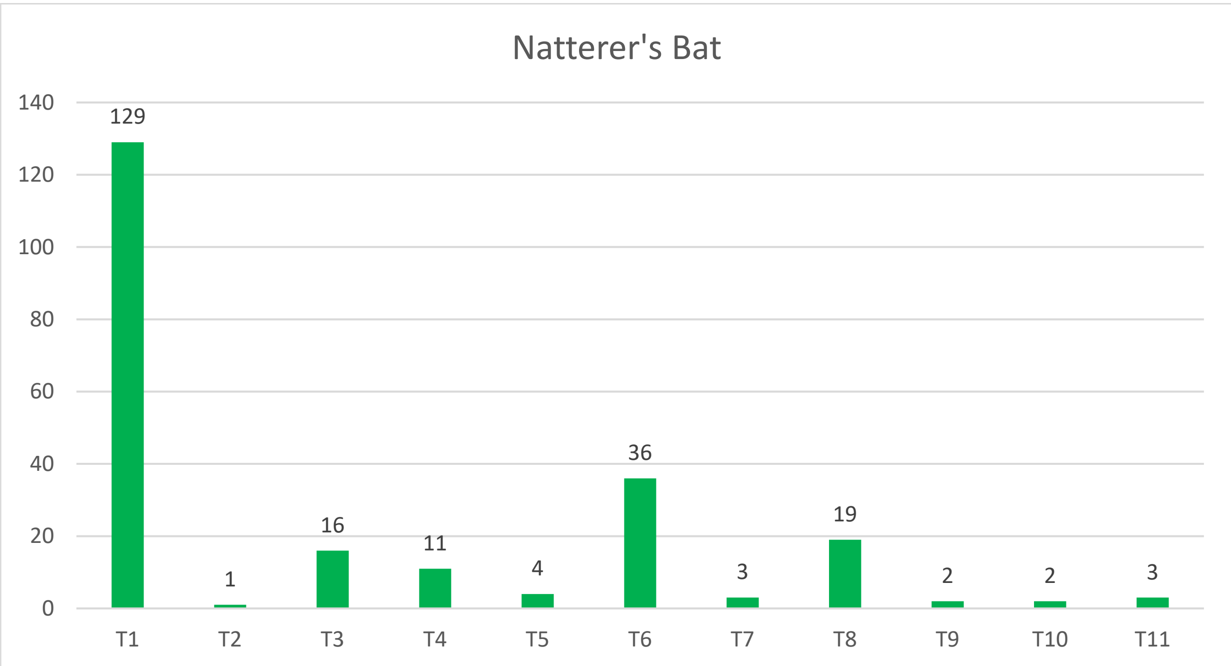


Plate 3-18: Total number of bat passes recorded for Natterer's bat at each of the static detector locations during 2023

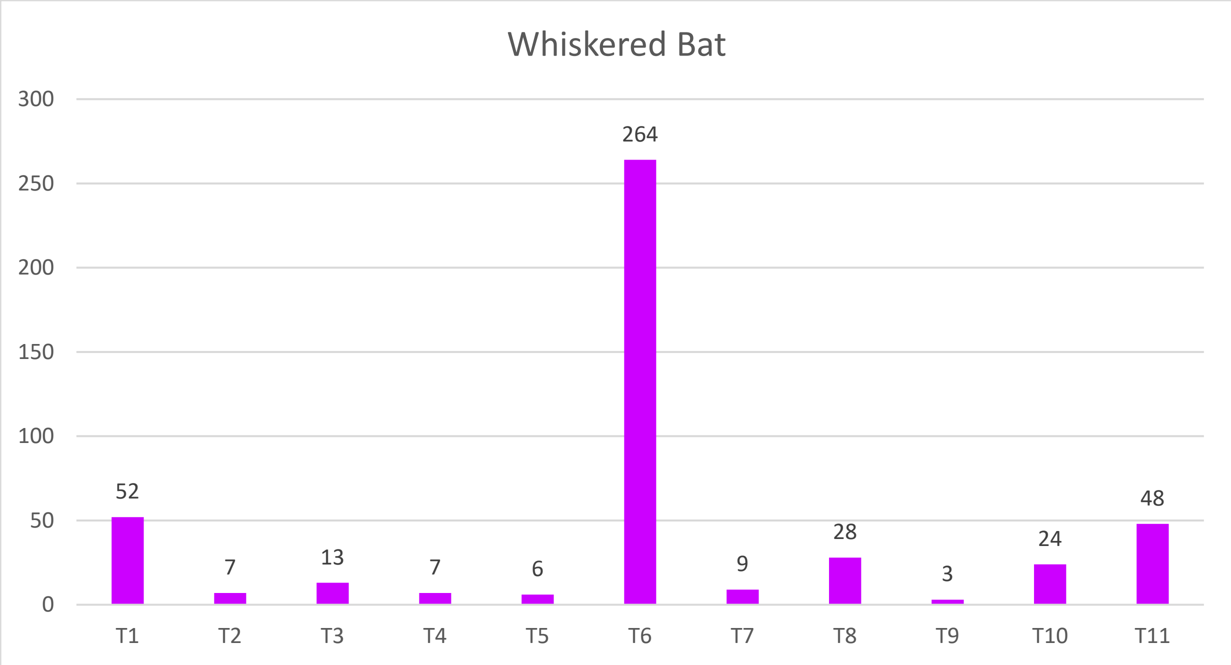


Plate 3-19: Total number of bat passes recorded for Whiskered bat at each of the static detector locations during 2023

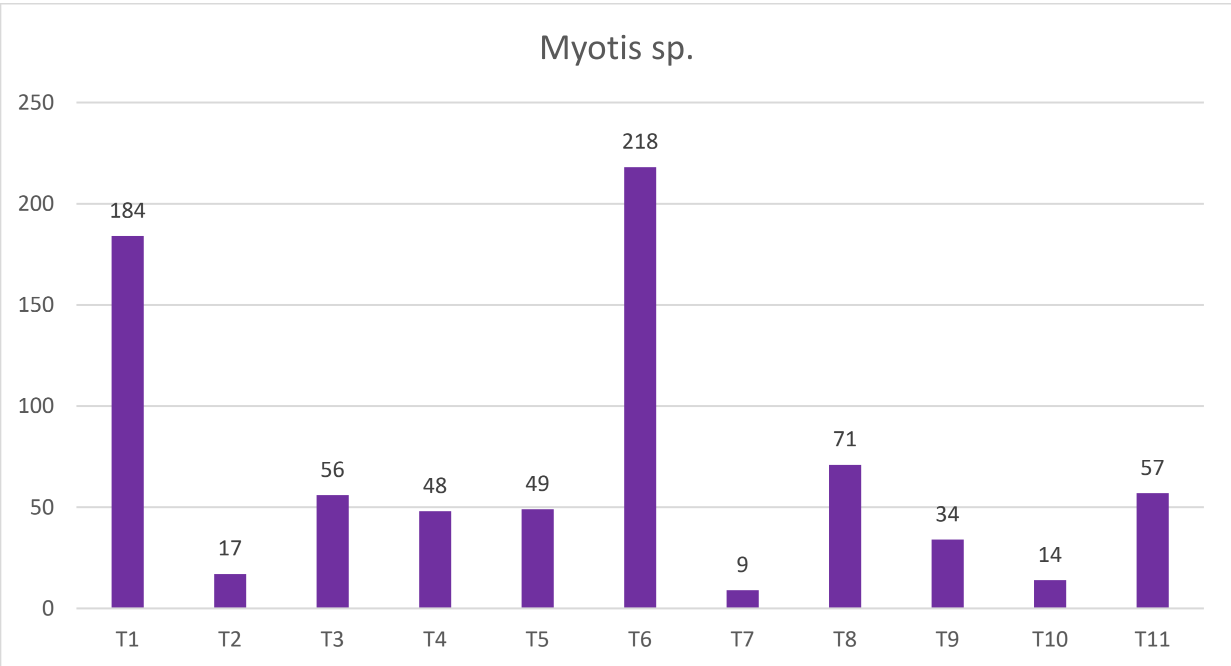


Plate 3-20: Total number of bat passes recorded for myotis sp. at each of the static detector locations during 2023

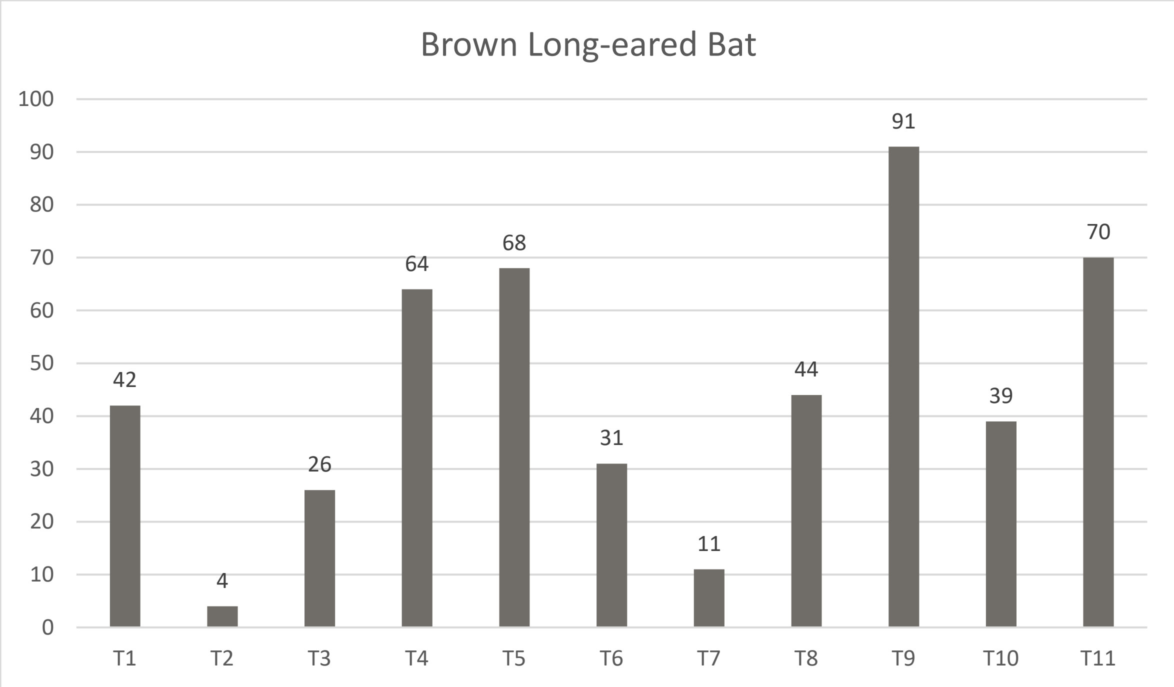


Plate 3-21: Total number of bat passes recorded for brown long-eared bat at each of the static detector locations during 2023

3.3.2 2022 Static Surveys

Table 3-8 below summarises the results, in relation to bat species, recorded on the static detectors deployed in 2022. A total of 11 static units were deployed during each survey period. Overall, eight bat species were recorded (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat, Natterer's bat, Daubenton's bat and whiskered bat).

Table 3-8: Summary results of Static Bat Detectors deployed during 2022 survey periods 1 to 3

Static Detector No. and location habitats	*Species detected during Round 1 9th to 23rd May 2022*	*Species detected during Round 2 22nd June to 2nd August 2022*	*Species detected during Round 3 16th August to 22nd September 2022*
Dr01 Agricultural grassland/ hedgerow	*Myotis daubentonii* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
Dr02 Agricultural grassland/ Tilled land	*Myotis daubentonii* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
Dr04 Agricultural grassland/ Bog woodland edge	*Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
Dr05 Agricultural grassland/ hedgerow	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*

Static Detector No. and location habitats	*Species detected during Round 1 9th to 23rd May 2022*	*Species detected during Round 2 22nd June to 2nd August 2022*	*Species detected during Round 3 16th August to 22nd September 2022*
Dr06 Agricultural grassland/ Treeline	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
Dr07 Conifer plantation	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
Dr08 Conifer plantation/Access track	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
Dr09 Scrub/Raised bog	*Myotis daubentonii* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
Dr10 Conifer plantation/Access track	*Myotis daubentonii* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus*	*Myotis daubentonii* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus*

Static Detector No. and location habitats	*Species detected during Round 1 9th to 23rd May 2022*	*Species detected during Round 2 22nd June to 2nd August 2022*	*Species detected during Round 3 16th August to 22nd September 2022*
	Plecotus auritus	*Pipistrellus pygmaeus* *Plecotus auritus*	*Plecotus auritus*
Dr11 Conifer plantation (2nd rotation/immature)	*Myotis daubentonii* *Nyctalus leisleri* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*
Dr12 Conifer plantation/Edge	*Myotis daubentonii* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*	*Myotis daubentonii* *Myotis mystacinus* *Myotis nattereri* *Nyctalus leisleri* *Pipistrellus nathusii* *Pipistrellus pipistrellus* *Pipistrellus pygmaeus* *Plecotus auritus*

Common Pipistrelle

The total number of recordings for common pipistrelle at the Proposed Development was 51,398 no. recordings; 50.15% of total recordings. These were recorded over 92 no. nights, which gives an average of 558.67 no. recordings per night.

Soprano Pipistrelle

The total number of recordings of soprano pipistrelle recorded at the Proposed Development was 31,178 no. recordings; 30.42% of total recordings. These were recorded over 92 no. nights, which gives an average of 338.89 no. recordings per night.

Nathusius' Pipistrelle

The total number of recordings for Nathusius Pipistrelle at the Proposed Development was 232 no. recordings; 0.23% of total recordings. These were recorded over 92 nights, which gives an average of 2.52 no. recordings per night.

Leisler's Bat

The total number of recordings for Leisler's bat at the Proposed Development was 16,775 no. recordings; 16.37% of total recordings. These were recorded over 92 no. nights, which gives an average of 182.34 no. recordings per night.

Brown Long-Eared Bat

The total number of recordings for Brown Long-Eared Bat at the Proposed Development was 983 no. recordings; 0.96% of total recordings. These were recorded over 92 no. nights, which gives an average of 10.68 no. recordings per night.

Daubenton's Bat

The total number of recordings for Daubenton's Bat at the Proposed Development was 1,559 no. recordings; 1.52% of total recordings. These were recorded over 92no. nights, which gives an average of 16.95 no. recordings per night.

Whiskered Bat

The total number of recordings for Whiskered Bat at the Proposed Development was 211 no. recordings; 0.20% of total recordings. These were recorded over 92 no. nights, which gives an average of 2.28 no. recordings per night.

Natterer's Bat

The total number of recordings for Natterers Bat at the Proposed Development was 157 no. recordings; 0.15% of total recordings. These were recorded over 92 nights, which gives an average of 1.71 no. recordings per night.

The graphs within Plate 3-22 to Plate 3-29 show the number of passes for individual species (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat, Daubenton's bat, Natterer's bat and whiskered bat) at each static detector location for the full survey period of 2022. Location Dr08 had the highest number of passes for common pipistrelle. Dr08 also had the highest number of passes for soprano pipistrelle, closely followed by Dr04. Dr02 had the highest number of passes of Nathusius' pipistrelle. Dr04 had the highest number of for Leisler's bat passes; Dr05, Dr07 and Dr08 also had similar numbers of Leisler's bat passes (all above 2000). Dr08 and Dr11 had the highest numbers of brown long-eared bat passes. Dr12 had the highest number of Daubenton's bat passes. Dr06 and Dr08 both had the highest numbers of Natterers' bat passes. Dr08 had the highest number of whiskered bat passes.

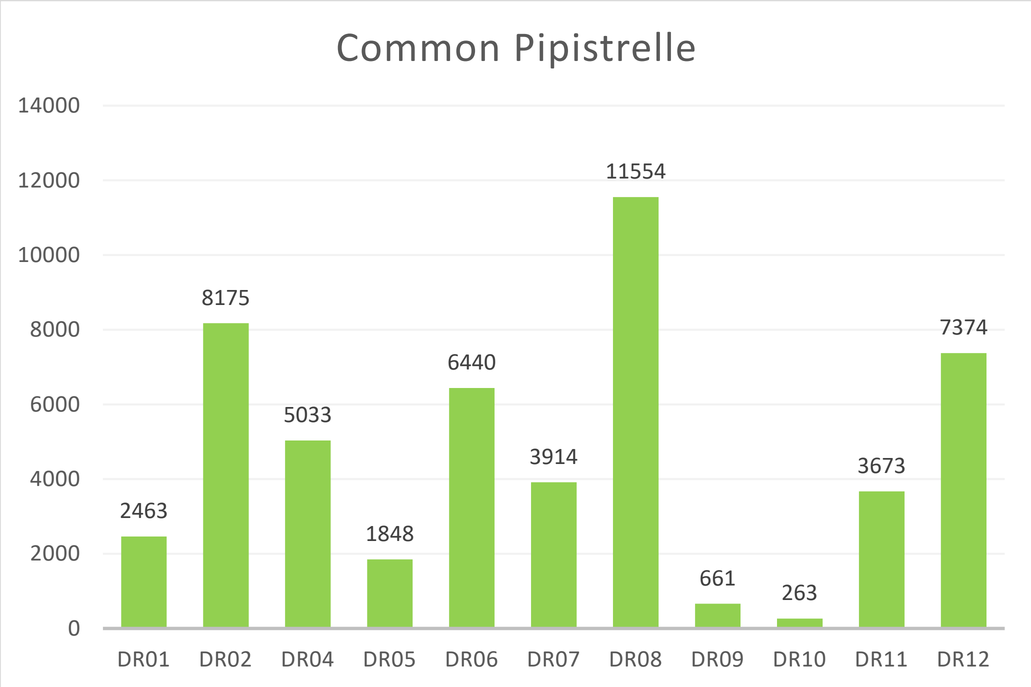


Plate 3-22: Total number of bat passes recorded for common pipistrelles at each of the static detector locations during 2022

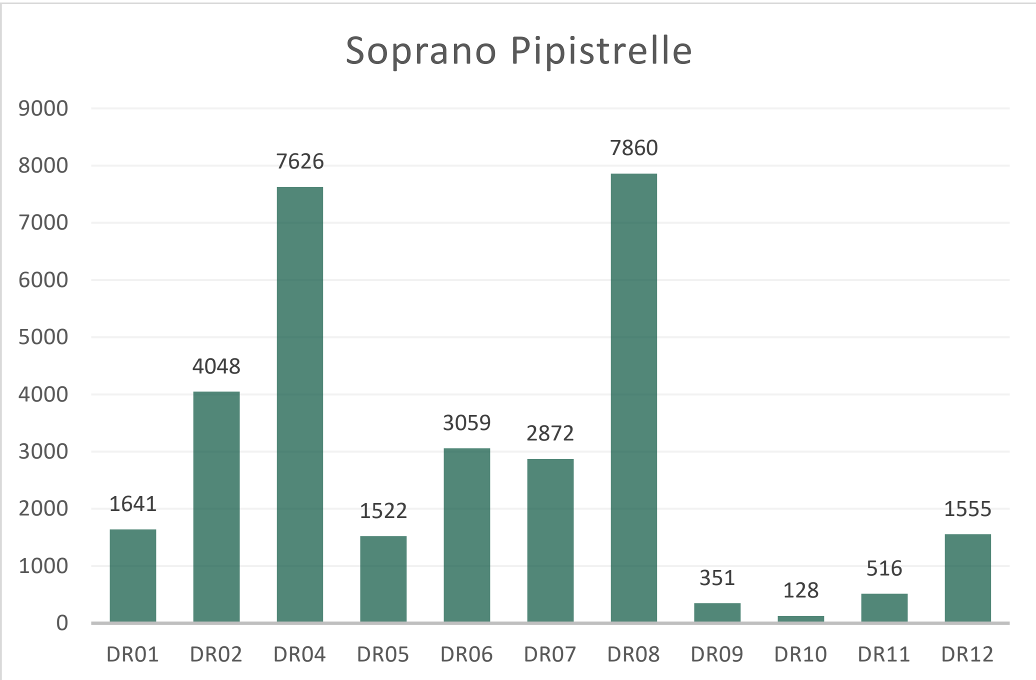


Plate 3-23: Total number of bat passes recorded for soprano pipistrelles at each of the static detector locations during 2022

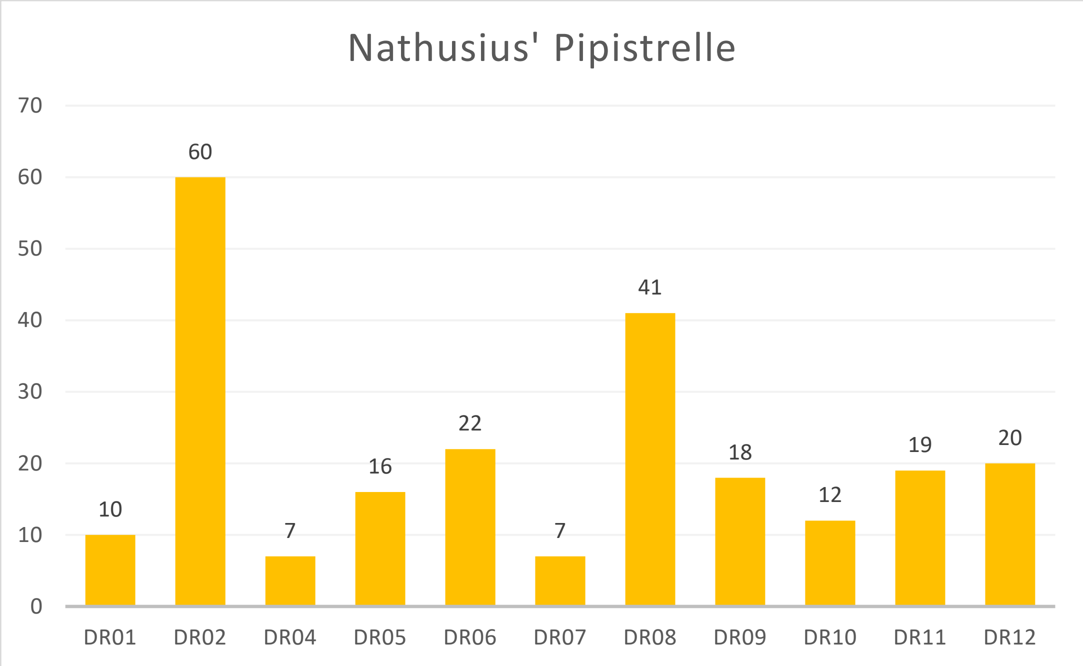


Plate 3-24: Total number of bat passes recorded for Nathusius' pipistrelles at each of the static detector locations during 2022

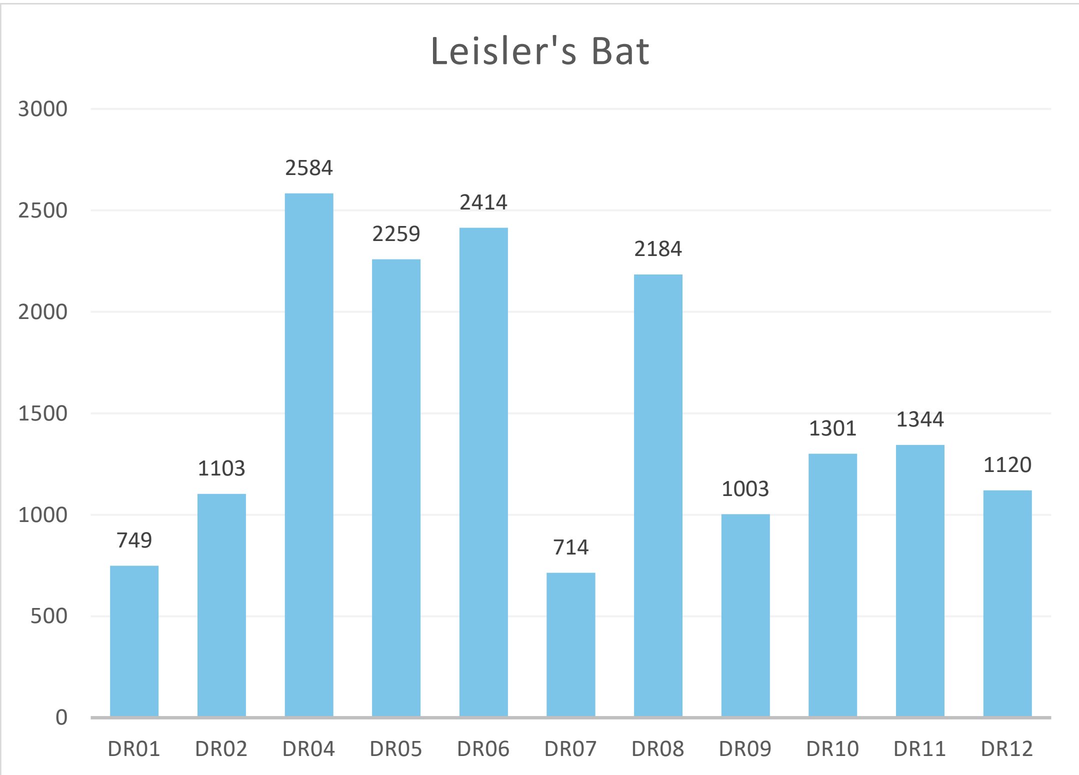


Plate 3-25: Total number of bat passes recorded for Leisler's bat at each of the static detector locations during 2022

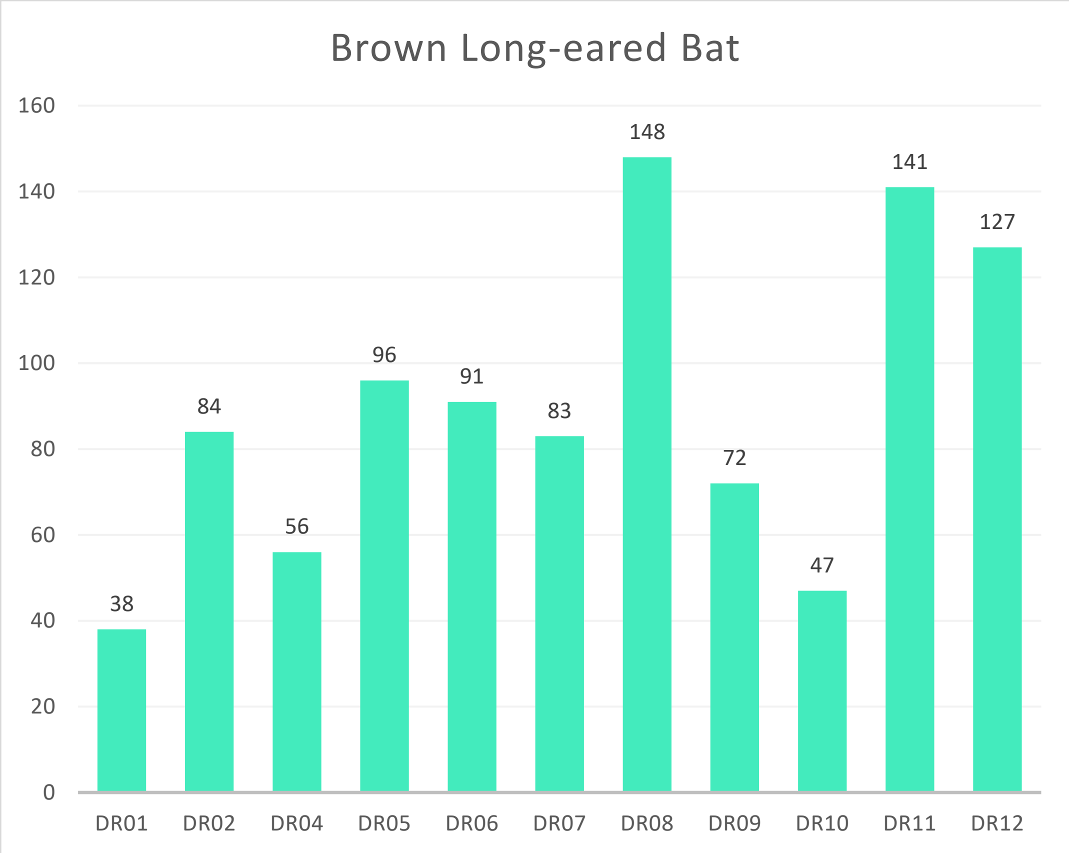


Plate 3-26: Total number of bat passes recorded for brown long-eared bat at each of the static detector locations during 2022

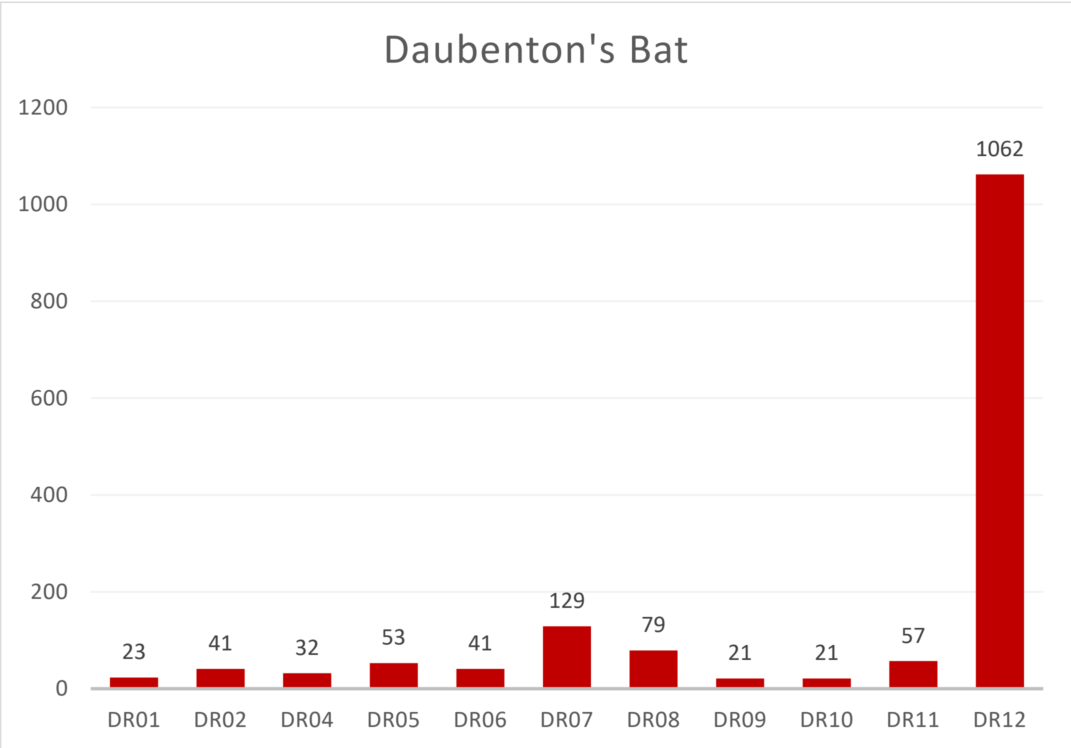


Plate 3-27: Total number of bat passes recorded for Daubenton's bat at each of the static detector locations during 2022

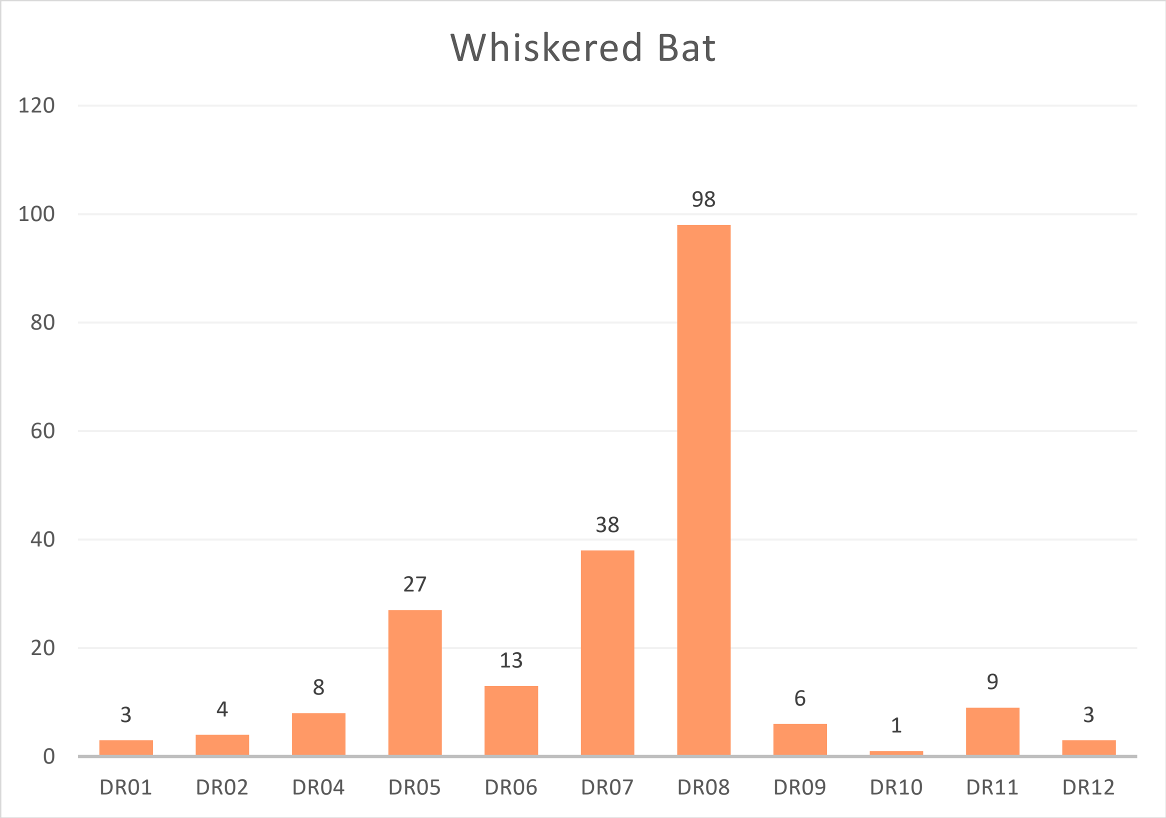


Plate 3-28: Total number of bat passes recorded for Whiskered bat at each of the static detector locations during 2022

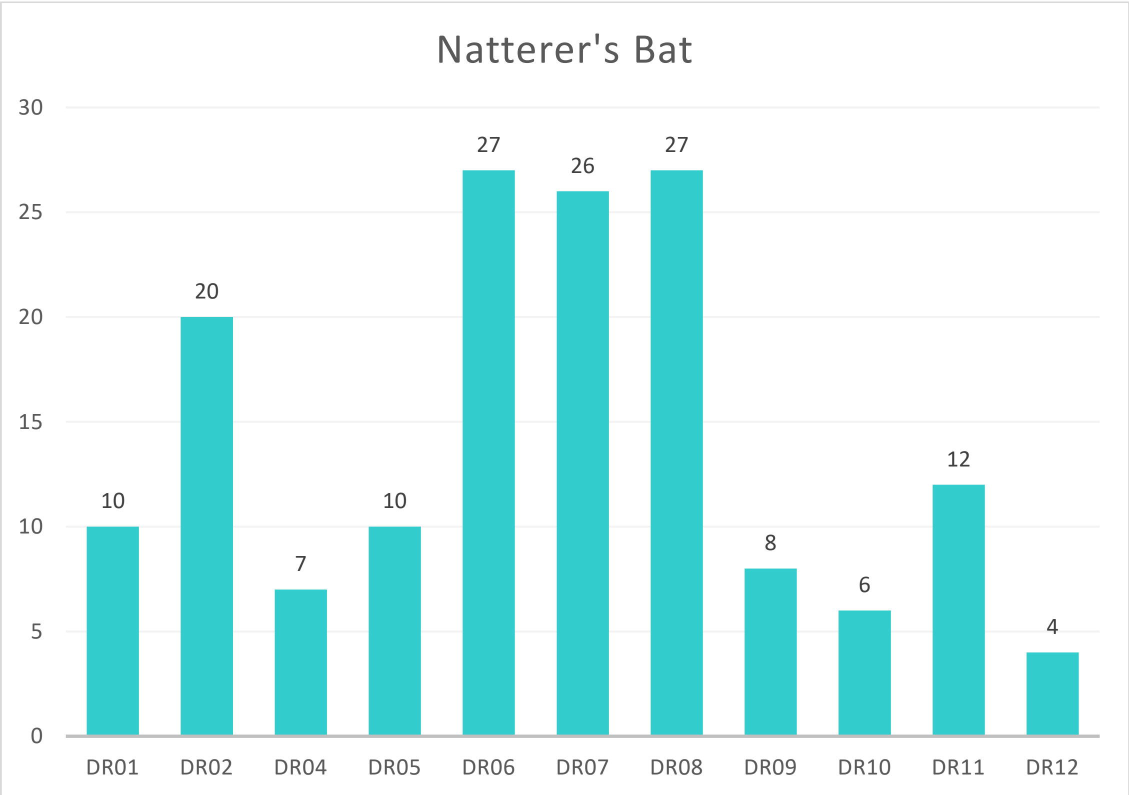


Plate 3-29: Total number of bat passes recorded for Natterer's bat at each of the static detector locations during 2022

3.4 Roost Survey Results

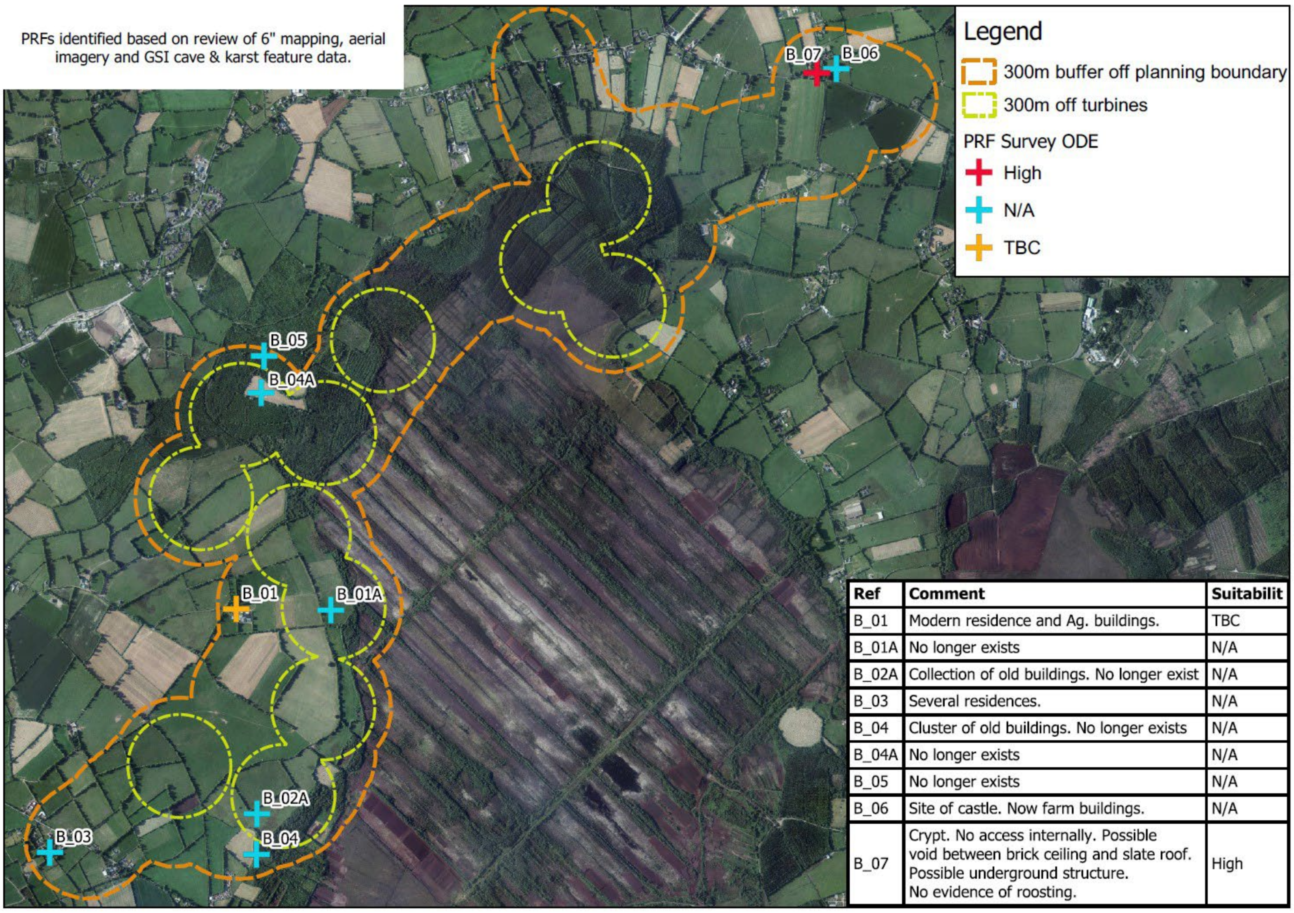
3.4.1 Preliminary Roost Assessment 2022

A total of five boxes were identified in desk study (BCI data) and these were inspected by Tom O'Donnell under his bat survey license. Four of the five bat boxes were surveyed in 2022, the fifth having fallen to the ground at that time. One adult male Soprano Pipistrelle was found in bat box No. 5. No bats were present in remaining boxes but all showed signs of previous use by bats.

Roost features checked are detailed in Table 3-9 and pictured in Figure 3-1 below.

Table 3-9: PRA 2022

Reference	Survey Date	Comment	Suitability
B_01	29/08/2022	Modern residence and series of steel agricultural buildings. Private residence not formally assessed as COVID restrictions still applied at time of surveys. (Located c. 650m from both T3 and T4)	Low (ag. Sheds), TBC (House)
B_01A	29/08/2022	Historically mapped building. No longer exists.	N/A
B_02A	29/08/2022	Historically mapped building. No longer exists.	N/A
B_03	29/08/2022	Historically mapped building. No longer exists.	N/A
B_04	29/08/2022	Historically mapped building. No longer exists.	N/A
B_04A	29/08/2022	Historically mapped building. No longer exists.	N/A
B_05	29/08/2022	Historically mapped building. No longer exists.	N/A
B_06	29/08/2022	Former castle. No longer exists, now farm sheds.	N/A
B_07	29/07/2022	Stonework crypt. Internal access not possible. Abundant stonework crevices along walls. Possible void between brick ceiling and slate roof. Possible underground portion. No evidence of roosting noted.	High



Ref	Comment	Suitabilit
B_01	Modern residence and Ag. buildings.	TBC
B_01A	No longer exists	N/A
B_02A	Collection of old buildings. No longer exist	N/A
B_03	Several residences.	N/A
B_04	Cluster of old buildings. No longer exists	N/A
B_04A	No longer exists	N/A
B_05	No longer exists	N/A
B_06	Site of castle. Now farm buildings.	N/A
B_07	Crypt. No access internally. Possible void between brick ceiling and slate roof. Possible underground structure. No evidence of roosting.	High

Figure 3-1: Roost Survey 2022

3.4.2 Re-checks of Potential Roost Features identified in 2018

The majority of tree PRFs recorded in 2018 are still present in the same condition. The exceptions are a new knothole identified on tree No.3, and tree No.11 which has fallen, lowering the PRF to an un-useable height for bats. The results of this survey are detailed in Table 3-10, and locations are shown in Figure 3-1.

A number of bat boxes which were present in 2018 are no longer attached to trees: bat boxes 2, 3, 7, 8 and 9. No signs of box 7 were found. Remnants of the other boxes were present at the bases of trees.

Harvesting of conifers has recently occurred in a number of areas adjacent to trees with bat boxes, removing connectivity and shelter and thereby reducing suitability for bats. This has occurred at boxes 6 and 10. Bird droppings were also noted on the landing strips of these boxes, indicating more recent use by birds rather than bats.

Inspections of the bat boxes in 2022 noted evidence of use by bats, and an adult male soprano pipistrelle was observed roosting in box 5. It is noted that the inspection panels are now missing from boxes 4 and 5, reducing their suitability for roosting bats. Taking into account the bat boxes which have fallen down, those which have sub-optimal landscape conditions due to tree felling and those with missing inspection panels, bat box 1 is the only box of the original ten boxes which remains in good condition with suitable surrounding landscape features. As such, this box has potential to be used by roosting bats. Boxes 4 and 5 have negligible suitability due to missing inspection panels, and boxes 6 and 10 have low potential due to declines in shelter and/or connectivity conditions but cannot be ruled out as potentially being of occasional use on a precautionary basis.

Table 3-10: Status of Roost Features identified in 2018

ID	Name	Category	PRF	Current Status	Infrastructure
1	Ash	Moderate	Lifting bark and broken limbs	Present	Adjacent to existing northern Coillte forestry access/amenity track
2	Ash	Moderate	Broken limb	Present	Adjacent to existing northern Coillte forestry access/amenity track
3	Bat box 1 and Ash	Moderate	Bat box 1 on ash with cracked limb	Present. Knothole present above box also identified.	Adjacent to existing northern Coillte forestry access/amenity track
4	Ash	Moderate	Knot holes	Present	Adjacent to existing northern Coillte forestry access/amenity track
5	Oak	Moderate	Knot holes, broken limbs	Present	Adjacent to existing northern Coillte forestry access/amenity track
6	Ash	Moderate	Broken limbs	Present	Adjacent to existing northern Coillte forestry access/amenity track
7	Bat boxes 2 & 3	No Suitability	Boxes 2 & 3 on beech	Boxes have fallen down; now on ground	Adjacent to existing northern Coillte forestry access/amenity track
8	Bat boxes 4 & 5	Negligible	Boxes 4 & 5 on conifer	Both have inspection panels missing.	Adjacent to existing northern Coillte forestry access/amenity track
9	Birch	Low	Lifting bark	Present. Corrected tree species.	In treeline near substation compound
10	Birch	Moderate	Mod pot in trunk and cracked limb	Present	In treeline near substation compound
11	Willow	Negligible	Crack in main stem	Present but has fallen, PRF is now low down	In treeline near substation compound
12	Ash	Moderate	Knot holes, broken limbs and hole in stem	Not inspected in 2024	No proposed infrastructure nearby
13	N/A	N/A	No.13 not included in original survey	N/A	N/A

ID	Name	Category	PRF	Current Status	Infrastructure
14	Oak	Moderate	Broken limbs	Present	In woodland between substation and grid connection
15	Oak	Moderate	Broken limbs	Present	In woodland between substation and grid connection
16	Oak	Moderate	Broken limbs	Present	In woodland between substation and grid connection
17	Oak	Moderate	Broken limbs	Present	In woodland between substation and grid connection
18	Oak	Moderate	Broken limbs	Present	In woodland between substation and grid connection
19	Oak	Moderate	4 oak in corner of boundary with broken limbs, ivy, cracks in stem	Present	Adjacent to grid connection
20	Oak	Moderate	Group of 6 oak with knot holes, broken limbs	Present	In woodland between substation and grid connection
21	Oak	Moderate	Lifting bark, knot holes	Present	In woodland between substation and grid connection
22	Box 6	Low	Box 6 on beech	Has hole in front panel & open exposed situation after surrounding conifer felling is suboptimal for bats. Appears to have bird droppings	Adjacent to grid connection
23	Box 7	No Suitability	Box 7 on beech	Gone. No signs of this bat box	N/A
24	Beech	Low	Cracked limb	Not inspected in 2024	No proposed infrastructure nearby
25	Boxes 8 & 9	No Suitability	Boxes 8 & 9 on oak	Both boxes fallen down & destroyed. Also situation too exposed for bats after conifer felling.	Within T11 bat felling buffer
26	Box 10	Low	Box 10 on birch	Present. Some bird droppings present. Situation too exposed	No proposed infrastructure nearby. Located 196m away from T11.

ID	Name	Category	PRF	Current Status	Infrastructure
				for bats after conifer felling.	
27	Willow	Unknown	Couldn't access closely (2018) but may be of potential	Present	No proposed infrastructure nearby
28	Ash	Low	Heavy ivy growth	Present	Adjacent to construction access track
29	Ash	Low	Heavy ivy growth	Present	Adjacent to construction access track
30	Ash	Moderate	Moderate potential in crack in branch	Not inspected in 2024	No proposed infrastructure nearby
31	Ash	Low	Line of semi mature ash with relatively heavy ivy growth	Not inspected in 2024	No proposed infrastructure nearby
32	Ash	Low	Line of semi mature ash with relatively heavy ivy growth	Present	Near construction access track
33	Ash	Low	Line of semi mature ash with relatively heavy ivy growth	Not inspected in 2024	No proposed infrastructure nearby
34	Ash	Low	Heavy ivy growth	Present	No proposed infrastructure nearby
35	Ash	Low	Heavy ivy growth	Present	No proposed infrastructure nearby
36	Ash	Low	Heavy ivy growth	Present	No proposed infrastructure nearby
37	Ash	Low	Heavy ivy growth	Present	No proposed infrastructure nearby
38	Ash	Low	Heavy ivy growth	Not inspected in 2024	No proposed infrastructure nearby
39	Ash	Low	Heavy ivy growth	Not inspected in 2024	No proposed infrastructure nearby
40	Ash	Low	Heavy ivy growth	Present	Construction access along public laneway
41	Oak	Moderate	Cracked limb and ivy cover	Present	Construction access along public laneway
42	Oak	Moderate	Damaged limbs	Present	Construction access along public laneway
43	Ash	Low	Ivy cover	Present	Construction access along public laneway

ID	Name	Category	PRF	Current Status	Infrastructure
44	Sycamore	Low	Ivy cover	Present	Construction access along public laneway
45	Ash	Low	2 ash ivy cover	Present	No proposed infrastructure nearby
46	Willow	Moderate	Crack in main stem	Present	Adjacent to access track
47	Ash	Low	Ivy cover	Present	No proposed infrastructure nearby
48	Hawthorn	Moderate	Holes in limbs, potentially old wound from cutting	Not inspected in 2024	No proposed infrastructure nearby
49	Ash	Moderate	Knot hole and ivy cover	Not inspected in 2024	No proposed infrastructure nearby
50	Ash	Low	Ivy cover	Not inspected in 2024	No proposed infrastructure nearby
51	Ash	Low	Ivy cover	Present	No proposed infrastructure nearby
52	Ash	Moderate	Butt rot and ivy cover	Present	No proposed infrastructure nearby
53	Ash	Low	Treeline with several ash and one hawthorn of with heavy ivy	Present	No proposed infrastructure nearby
54	Ash	Low	Ivy cover	Present	No proposed infrastructure nearby
55	Ash	Low	Ivy cover	Present	No proposed infrastructure nearby
56	Ash	Moderate	Knot holes	Present	No proposed infrastructure nearby
57	Ash	Low	Ivy cover	Present	No proposed infrastructure nearby
58	Ash	Moderate	Tear out	Present	No proposed infrastructure nearby
59	Ash	Low	Line of ash trees all with heavy ivy cover but no specific PRFs identified	Present	27m from T1 bat felling buffer
60	Ash	Low	Ivy cover	Present	No proposed infrastructure nearby

3.4.3 Additional Potential Roosting Features identified in 2024 (Proposed wind farm & Substation)

A total of 17 additional trees with potential for bat roosting were identified during surveys of the Proposed Wind Farm and Substation in March-April 2024. These are detailed below in Table 3-11 and shown on Figure 3-2.

Table 3-11: Potential tree roosting features (Proposed Wind Farm and Substation)

ID	Name	Category	PRF	Status/Location
A	Ash	Low - Moderate	Mature ash with rot in many places. 2 knotholes visible from ground & dense ivy may obscure others	Within T4 bat felling buffer
B	Ash	Low	Ivy covered ash. Potential for PRFs obscured by ivy	Within T5 bat felling buffer
C	Ash	Moderate	Knothole c.3 m up trunk, potentially with room for several bats. No signs of use observed from ground level. Mature ash with rot.	Within T5 bat felling buffer
D	Ash	Low	Dense ivy, potential for crevices behind large fused ivy stems	16m from T5 bat felling buffer
E	Ash	Low	Dense ivy, potential for crevices behind large fused ivy stems	7m from T3 bat felling buffer
F	Hawthorn	Low	Very dense ivy, potential for large ivy stems to form crevices	Within T2 bat felling buffer
G	Ash	Low	Dense ivy, potential for PRFs obscured by ivy	Within T2 bat felling buffer
H	Ash	Low	Dense ivy, potential for crevices behind large fused ivy stems	Within T2 bat felling buffer
I	Ash	Low	Dense ivy, potential for PRFs obscured by ivy	Within T2 bat felling buffer
J	Ash	Low	Potential for crevices formed by ivy stems and tree branches growing together. Also some rot visible lower down so potential for obscured rot features higher up	At edge of T2 bat felling buffer
K	Ash	Low	Dense ivy, potential for PRFs obscured by ivy	8m from T2 bat felling buffer
L	Ash	Low	Dense ivy, potential for PRFs obscured by ivy	14m from T2 bat felling buffer
M	Ash	Low	Dense ivy, potential for PRFs obscured by ivy	7m from T1 bat felling buffer; 10m from access track
N	Ash	Low	Dense ivy, potential for crevices behind large fused ivy stems	Within T1 bat felling buffer
O	Ash	Low	Dense ivy, potential for PRFs obscured by ivy	Within T1 bat felling buffer

ID	Name	Category	PRF	Status/Location
P	Ash	Low	Dense ivy, potential for crevices behind large fused ivy stems	Within T1 bat felling buffer
Q	Ash	Low	Dense ivy, potential for PRFs obscured by ivy	Within T1 bat felling buffer
R	Scots Pine	Low	Trunk snapped 3m above ground. Upper half of trunk horizontal. potential for PRFs at break point.	15m west of substation compound.

3.4.4 Potential Roosting Features (TDR)

A total of 12 trees with potential for occasional use by individual or low numbers of bats were identified along the TDR in areas where tree trimming is likely to be required to permit the passage of turbine components. Details of these features and location coordinates are included in Table 3-12.

Table 3-12: Potential tree roosting features (TDR)

ID	Species	Category	PRF Details/Location	Status
TDR-1	Ash x 3	Low	3 Mature ash with dense ivy. ITM 671104.9651 735678.923	No potential for PRFs over road/within potential ZoI
TDR-2	Ash	Low	Ivy covered mature ash. Low potential for PRFs in branches higher up closer to trunk. ITM 671206.9425 735499.9708	No potential for PRFs over road/within potential ZoI
TDR-3	Ash	Low	Ivy covered mature ash. Low potential for PRFs in ivy on trunk. ITM 671255.5922 735340.9953	No potential for PRFs over road/within potential ZoI
TDR-4	Ash	Low	Dense ivy on trunk and limb. No confirmed PRFs. ITM 671756.9492 734777.7934	Potential for ivy-covered limb to be affected by trimming
TDR-5	Ash	Low	Ivy-covered ash, limb extends over road. Parts over verge have low potential for obscured PRFs. Sections over road have no potential. ITM 671708.0452 734827.1371	Potential for ivy-covered limb to be affected by trimming
TDR-6	Ash	Low	Ivy-covered ash; tree has severe ash dieback. 2x limbs extend high over road. Low potential for obscured PRFs.	Potential for limbs to be affected by trimming

ID	Species	Category	PRF Details/Location	Status
			ITM 671793.4526 734734.0131	
TDR-7	Ash	Negligible	Low height crevice facing road; formed at joint where branch re-grew upward after historical pruning. Negligible due to disturbance, openness and lack of surrounding cover. ITM 674163.3012 737966.7739	Potential for limb to be affected by trimming
TDR-8	Elm & Ash	Negligible	Ivy-covered elm main stem and ash branches leaning towards road. Potential for obscured PRFs, however lack of connectivity reduces suitability. ITM 675085.0239 738228.3364	Potential for trees to be affected by trimming
TDR-9	Ash	Negligible	Dead ash tree with branch extending over road. Branch has lifting bark and cracks. Small crevice sizes and lack of cover/shelter reduce suitability. ITM 675566.1019 738333.3761	Potential for limb to be affected by trimming
TDR-10	Oak	Negligible	Limb over road includes a rotted branch. Currently negligible but suitability may increase if rotted branch remnants dislodge. ITM 675628.1653 738353.2615	Potential for limb to be affected by trimming
TDR-11	Ash	Low	Potential for PRFs in main trunk. Lower & middle part of trunk covered in ivy, cracking bark visible in some spots, may be more cracked bark under ivy. Ivy could both obscure and also create PRFs. ITM 675747.7619 738421.7238	No potential for main trunk to be affected
TDR-12	Oak	Low	Overhanging limbs. Rot visible on various limbs, hazard beams creating some small spaces, and potentially others not visible from ground; also some lifting bark. No confirmed high-quality PRFs but conditions for them likely to be present throughout tree including non visible areas. Possible PRFs in hazard beam over road but not confirmed. ITM 675791.1378 738434.2169	Potential for limbs to be affected by trimming

3.4.5 Derelict Building (northern turbine delivery site access route)

A small derelict brick-built shed is present within the footprint of the northern internal access track. Part of the corrugated roof is missing. A chimney is present. There are no PRFs in the roof, and no gaps are present in the brickwork of the shed including the chimney. The shed is surrounded by plantation woodland.

No PRFs or signs of use by bats were observed.

A disused swallow's nest was present in a corner covered by the roof.

Plate 3-30: Derelict Shed Along Northern Site Access Track

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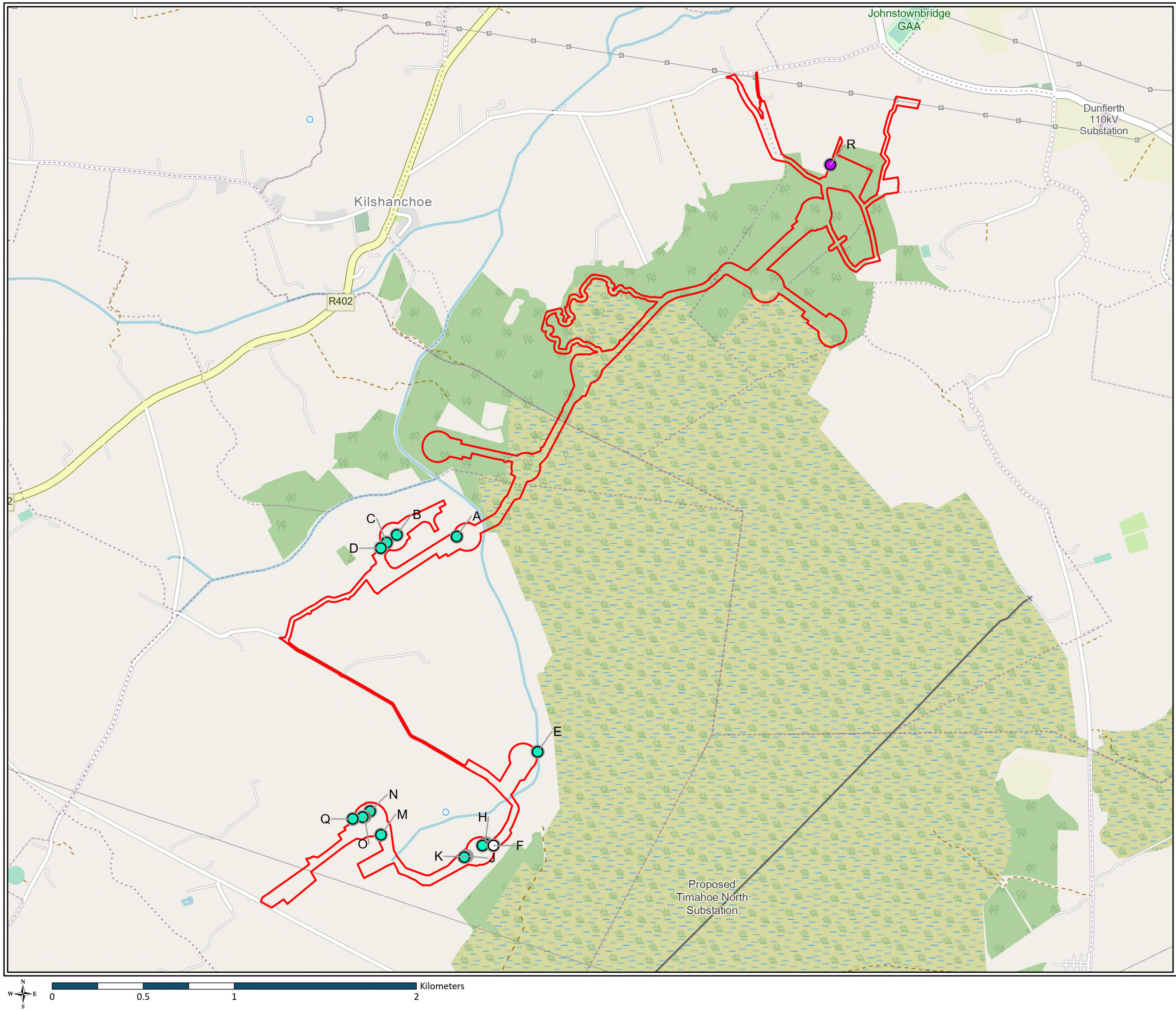

Legend

Proposed Development Boundary

Potential Bat Roosts Examined

- Ash
- Hawthorn
- Scots Pine

TITLE: Additional PRF's Identified in 2024	
PROJECT: Drehid Wind Farm and Substation	
FIGURE NO: 3.2	
CLIENT: North Kildare Wind Farm Ltd.	
SCALE: 1:20,000	**REVISION:** 0
DATE: 01/05/2025	**PAGE SIZE:** A3

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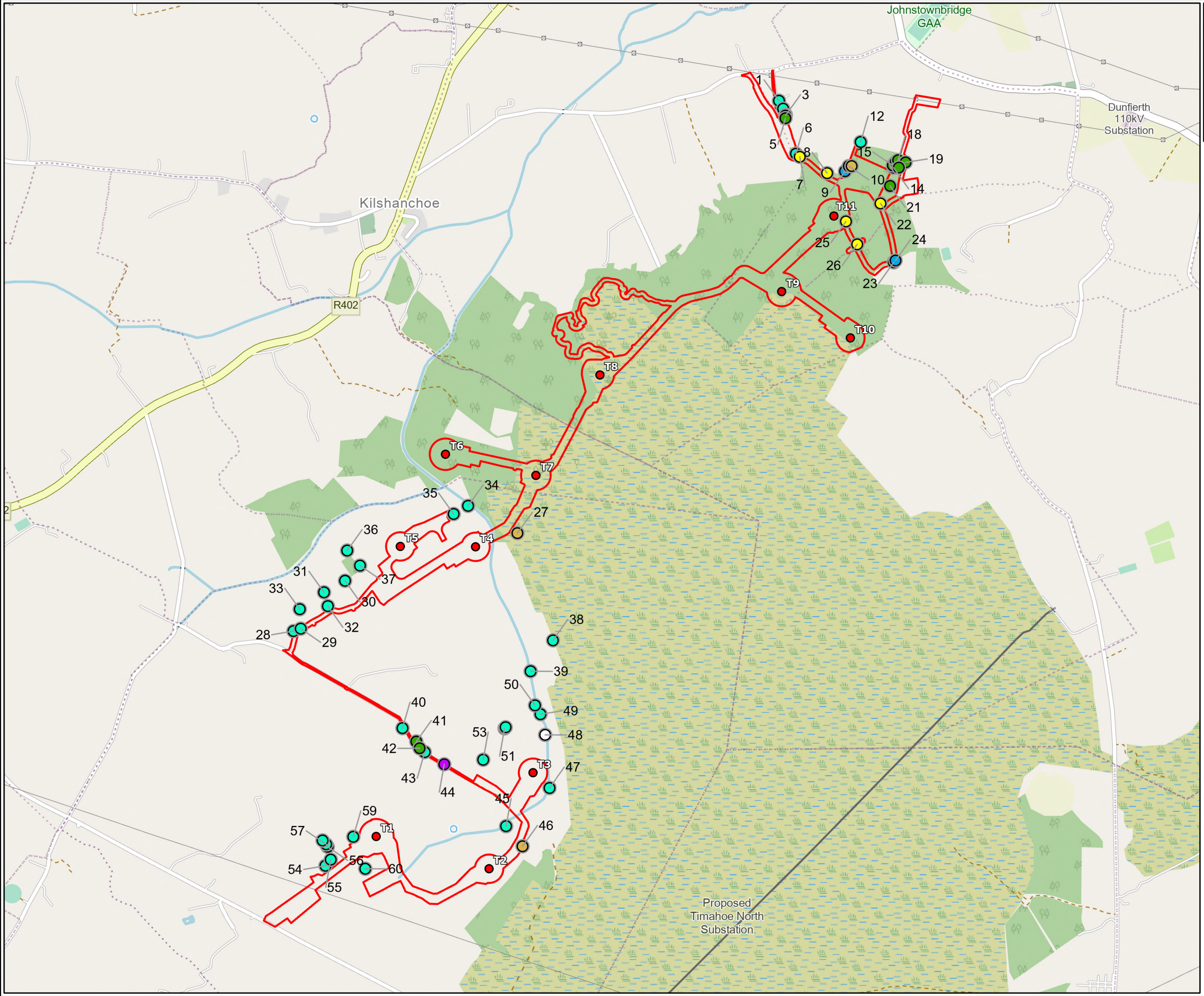
Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Report_Figures\P20_326_Report_Figures.aprx



Legend

Proposed Development Boundary

Potential Bat Roosts Examined

- Ash
- Bat Box
- Beech
- Birch
- Hawthorn
- Oak
- Sycamore
- Willow
- Turbine Locations

TITLE:	PRF's Identified in 2018
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	3.3
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:20,000	REVISION: 0
DATE: 01/05/2025	PAGE SIZE: A3

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3.5 Summary of the results of 2022, 2023 and 2024 bat surveys

No lesser horseshoe bat was noted at the site during any of the surveys. There are no records of this species at this site, and this species is not known to occur in Co. Kildare.

Table 3-13 provides a summary of the bat survey results. It outlines whether a bat species identified for the desktop study was subsequently recorded within the study area during the bat surveys that took place in 2022-2023.

Table 3-13: Bat Survey Summary Results

Bat Species	Desktop Study	Roost Surveys	Activity Surveys	Static Detectors
Pipistrellus sp.	✓	X	✓	✓
Myotis sp.	X	X	✓	✓
Common pipistrelle	✓	X	✓	✓
Soprano pipistrelle	✓	✓	✓	✓
Nathusius' pipistrelle	X	X	✓	✓
Leisler's bat	✓	X	✓	✓
Daubenton's bat	✓	X	X	✓
Whiskered bat	✓	X	X	✓
Natterer's bat	✓	X	X	✓
Brown long-eared bat	✓	X	✓	✓

4. ECOBAT

The Ecobat tool provides are series of summary tables to enable analysis of the bat activity level at each static location. These are presented below.

4.1 2023 Ecobat Results

4.1.1 Survey Period 1 (2023)

A summary table extracted from the EcoBat report showing the number of nights recorded bat activity fell into each activity band per species/detector location during Survey Period 1 (2023) is presented below.

Location T6 had three nights of exceptional Leisler's bat activity, and three nights of high Leisler's bat activity.

Location T5 had two nights of high Leisler's bat activity, and Location T7 had three nights of high Leisler's bat activity.

Location T6 had seven nights of high/moderate activity, and eight nights of moderate activity for whiskered bat.

The remainder of species did not generate activity levels above moderate. Across all species and locations, a total of 87% of nights had low activity. The number of nights with low/moderate activity (all species/locations) was 8%, while this statistic for moderate activity was 3%. As such, nights of Moderate./High activity and above made up only 2% of total activity.

Bat surveys were conducted at T1-T11 for 29 nights between 22/05/2023 and 19/06/2023, using Song Meter SM4BAT bat detectors.

Table 4-1: Ecobat summary table detailing number of nights within each activity category per detector/species during Survey Period 1 2023

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T1	*Myotis daubentonii*	0	0	0	0	0	9
T1	*Myotis mystacinus*	0	0	0	0	0	1
T1	*Nyctalus leisleri*	0	0	0	0	0	28
T1	*Pipistrellus Sp.*	0	0	0	0	7	5
T1	*Pipistrellus nathusii*	0	0	0	0	0	2
T1	*Pipistrellus pipistrellus*	0	0	0	0	0	29
T1	*Pipistrellus pygmaeus*	0	0	0	0	0	24

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T1	*Plecotus auritus*	0	0	0	0	0	4
T2	*Myotis daubentonii*	0	0		0	0	2
T2	*Myotis mystacinus*	0	0	0	0	0	3
T2	*Nyctalus leisleri*	0	0	0	0	2	26
T2	*Pipistrellus Sp.*	0	0	0	2	2	3
T2	*Pipistrellus nathusii*	0	0	0	0	0	1
T2	*Pipistrellus pipistrellus*	0	0	0	0	0	28
T2	*Pipistrellus pygmaeus*	0	0	0	0	0	27
T3	*Myotis Sp.*	0	0	0	0	0	4
T3	*Myotis daubentonii*	0	0	0	0	0	8
T3	*Myotis mystacinus*	0	0	0	0	0	6
T3	*Nyctalus leisleri*	0	0	0	4	15	10
T3	*Pipistrellus Sp.*	0	0	2	2	8	0
T3	*Pipistrellus nathusii*	0	0	0	0	0	1
T3	*Pipistrellus pipistrellus*	0	0	0	0	0	29
T3	*Pipistrellus pygmaeus*	0	0	0	0	0	29
T3	*Plecotus auritus*	0	0	0	0	0	9
T4	*Myotis Sp.*	0	0	0	0	0	4
T4	*Myotis daubentonii*	0	0	0	0	0	18
T4	*Myotis mystacinus*	0	0	0	0	2	0
T4	*Nyctalus leisleri*	0	0	0	0	5	24
T4	*Pipistrellus Sp.*	0	0	0	5	3	4

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T4	*Pipistrellus nathusii*	0	0	0	0	0	2
T4	*Pipistrellus pipistrellus*	0	0	0	2	4	23
T4	*Pipistrellus pygmaeus*	0	0	0	0	2	27
T4	*Plecotus auritus*	0	0	0	0	0	19
T5	*Myotis Sp.*	0	0	0	0	0	3
T5	*Myotis daubentonii*	0	0	0	0	0	18
T5	*Myotis mystacinus*	0	0	0	0	0	4
T5	*Myotis nattereri*	0	0	0	0	0	2
T5	*Nyctalus leisleri*	0	2	0	1	3	23
T5	*Pipistrellus Sp.*	0	0	0	1	2	1
T5	*Pipistrellus pipistrellus*	0	0	0	2	2	25
T5	*Pipistrellus pygmaeus*	0	0	0	0	0	29
T5	*Plecotus auritus*	0	0	0	0	2	17
T6	*Myotis Sp.*	0	0	0	0	0	23
T6	*Myotis daubentonii*	0	0	0	0	0	18
T6	*Myotis mystacinus*	0	0	7	8	8	3
T6	*Myotis nattereri*	0	0	0	0	0	12
T6	*Nyctalus leisleri*	3	3	1	0	0	22
T6	*Pipistrellus*	0	0	0	1	2	2
T6	*Pipistrellus pipistrellus*	0	0	0	0	0	29
T6	*Pipistrellus pygmaeus*	0	0	0	0	0	29
T6	*Plecotus auritus*	0	0	0	0	0	14

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T7	*Myotis*	0	0	0	0	0	2
T7	*Myotis daubentonii*	0	0	0	0	0	5
T7	*Myotis mystacinus*	0	0	0	0	1	4
T7	*Nyctalus leisleri*	0	3	1	1	2	21
T7	*Pipistrellus*	0	0	0	0	0	4
T7	*Pipistrellus pipistrellus*	0	0	0	0	0	27
T7	*Pipistrellus pygmaeus*	0	0	0	0	0	26
T7	*Plecotus auritus*	0	0	0	0	0	2
T8	*Myotis*	0	0	0	0	0	2
T8	*Myotis daubentonii*	0	0	0	0	0	3
T8	*Myotis mystacinus*	0	0	0	0	1	4
T8	*Nyctalus leisleri*	0	0	0	0	0	21
T8	*Pipistrellus pipistrellus*	0	0	0	0	0	25
T8	*Pipistrellus pygmaeus*	0	0	0	0	0	12
T8	*Plecotus auritus*	0	0	0	0	0	2
T9	*Myotis*	0	0	0	0	0	2
T9	*Myotis daubentonii*	0	0	0	0	0	6
T9	*Myotis mystacinus*	0	0	0	0	0	2
T9	*Nyctalus leisleri*	0	0	0	2	2	25
T9	*Pipistrellus*	0	0	0	0	3	3
T9	*Pipistrellus pipistrellus*	0	0	0	0	0	29
T9	*Pipistrellus pygmaeus*	0	0	0	0	0	26

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T9	*Plecotus auritus*	0	0	0	4	0	13
T10	*Myotis*	0	0	0	0	0	1
T10	*Myotis daubentonii*	0	0	0	0	0	1
T10	*Myotis mystacinus*	0	0	0	0	1	7
T10	*Nyctalus leisleri*	0	0	0	0	0	14
T10	*Pipistrellus*	0	0	0	0	0	1
T10	*Pipistrellus pipistrellus*	0	0	0	0	0	19
T10	*Pipistrellus pygmaeus*	0	0	0	0	0	12
T10	*Plecotus auritus*	0	0	0	0	0	2
T11	*Myotis*	0	0	0	0	0	14
T11	*Myotis daubentonii*	0	0	0	0	0	8
T11	*Myotis mystacinus*	0	0	0	0	12	4
T11	*Myotis nattereri*	0	0	0	0	0	2
T11	*Nyctalus leisleri*	0	0	2	5	4	18
T11	*Pipistrellus*	0	0	0	0	0	3
T11	*Pipistrellus nathusii*	0	0	0	0	0	1
T11	*Pipistrellus pipistrellus*	0	0	0	0	8	21
T11	*Pipistrellus pygmaeus*	0	0	0	0	0	28
T11	*Plecotus auritus*	0	0	0	0	0	12

Differences in activity between static detector locations split by species and location are presented in below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity). The dots indicate outlier values.

Note: Myotis daubentonii = Daubenton's bat, Myotis mystacinus = whiskered bat, Myotis nattereri = Natterer's bat, Nyctalus leisleri = Leisler's bat, Pipistrellus nathusii = Nathusius' bat, Pipistrellus pipistrellus = common pipistrelle, Pipistrellus pygmaeus = soprano pipistrelle, Plecotus auritus = brown long-eared bat.

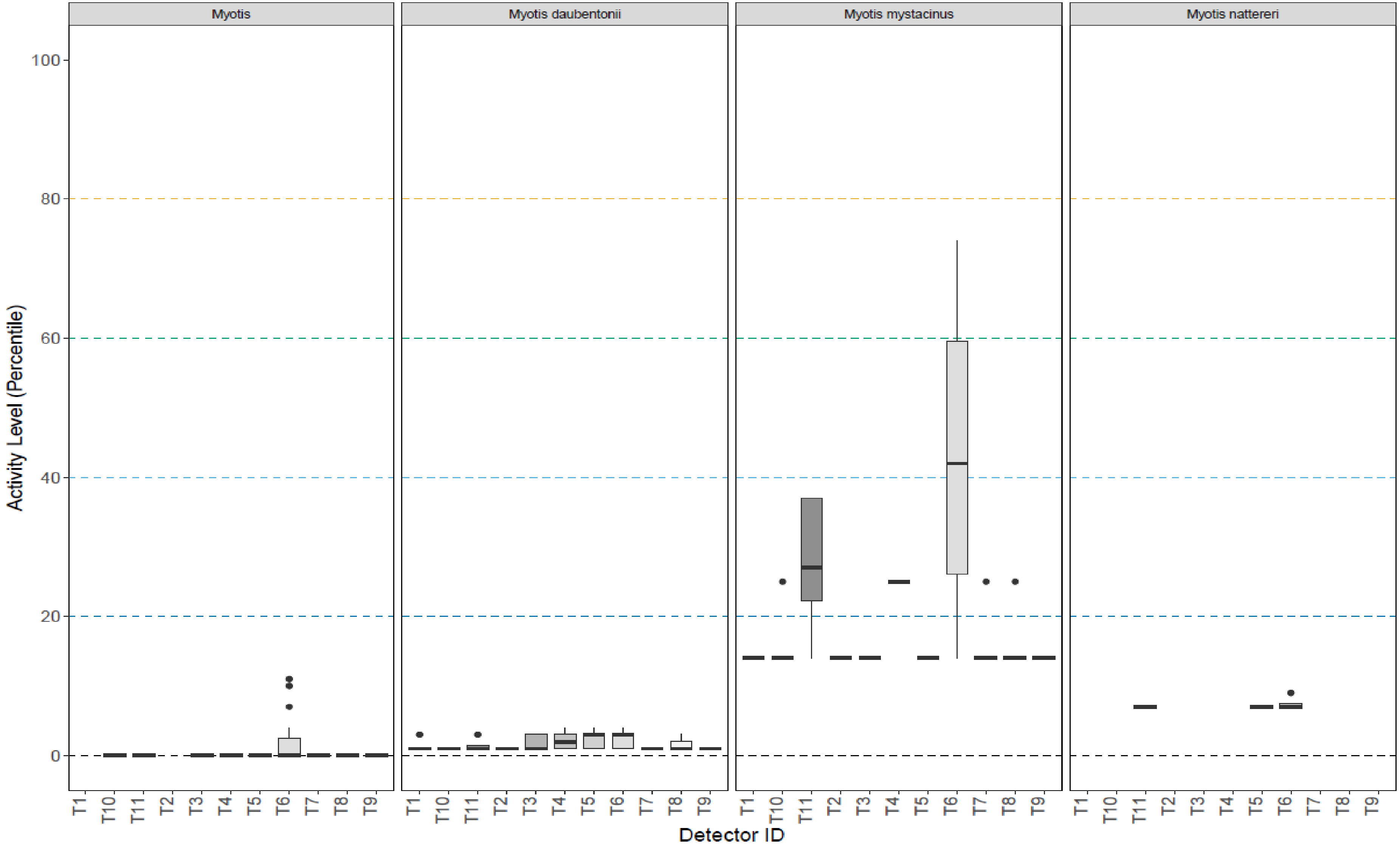


Figure 4-1: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 1 2023 at Drehid (Myotis spp., Myotis daubentonii, Myotis mystacinus and Myotis nattereri)

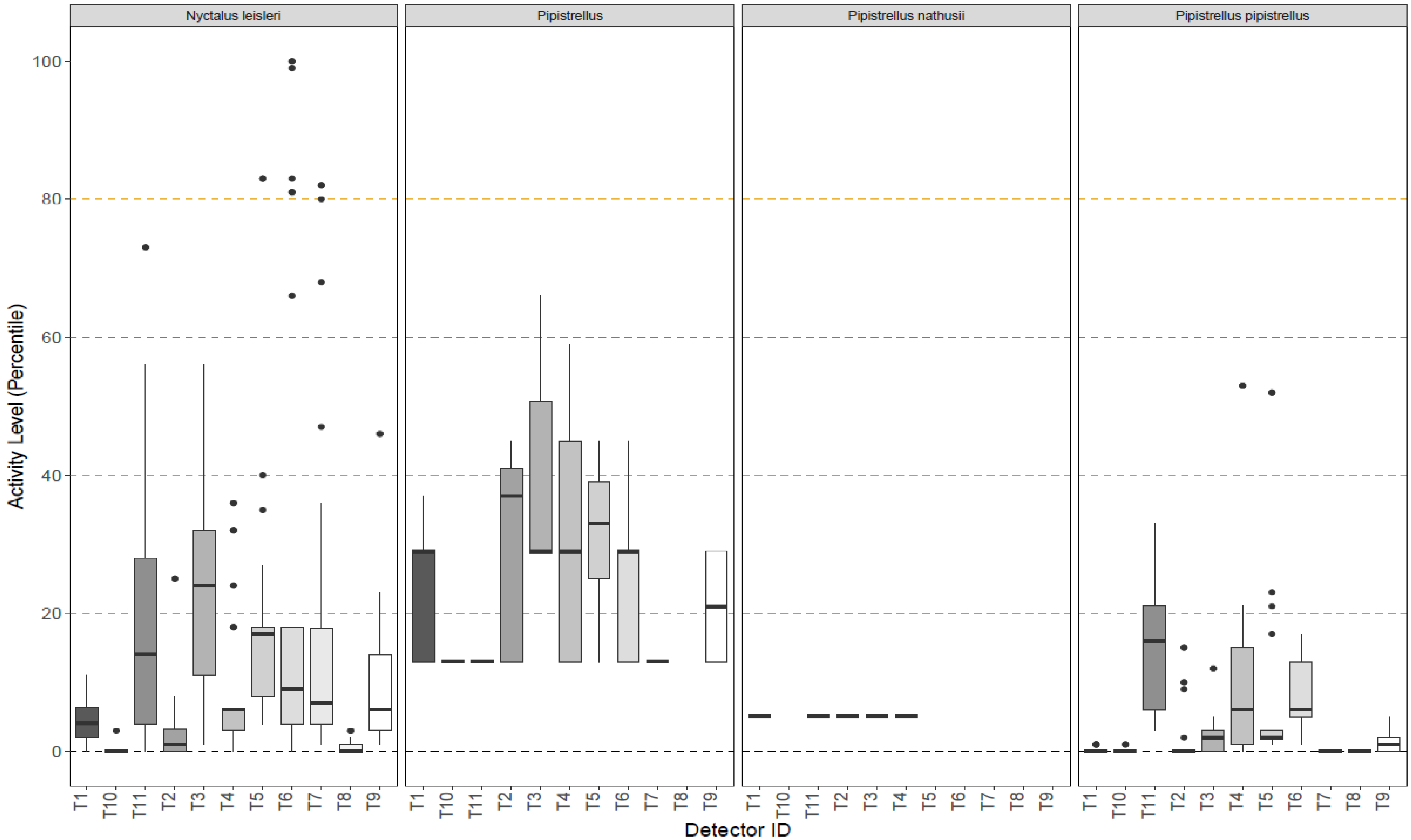


Figure 4-2: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 1 2023 at Drehid (Nyctalus leisleri, Pipistrellus Spp., Pipistrellus nathusii and Pipistrellus pipistrellus)

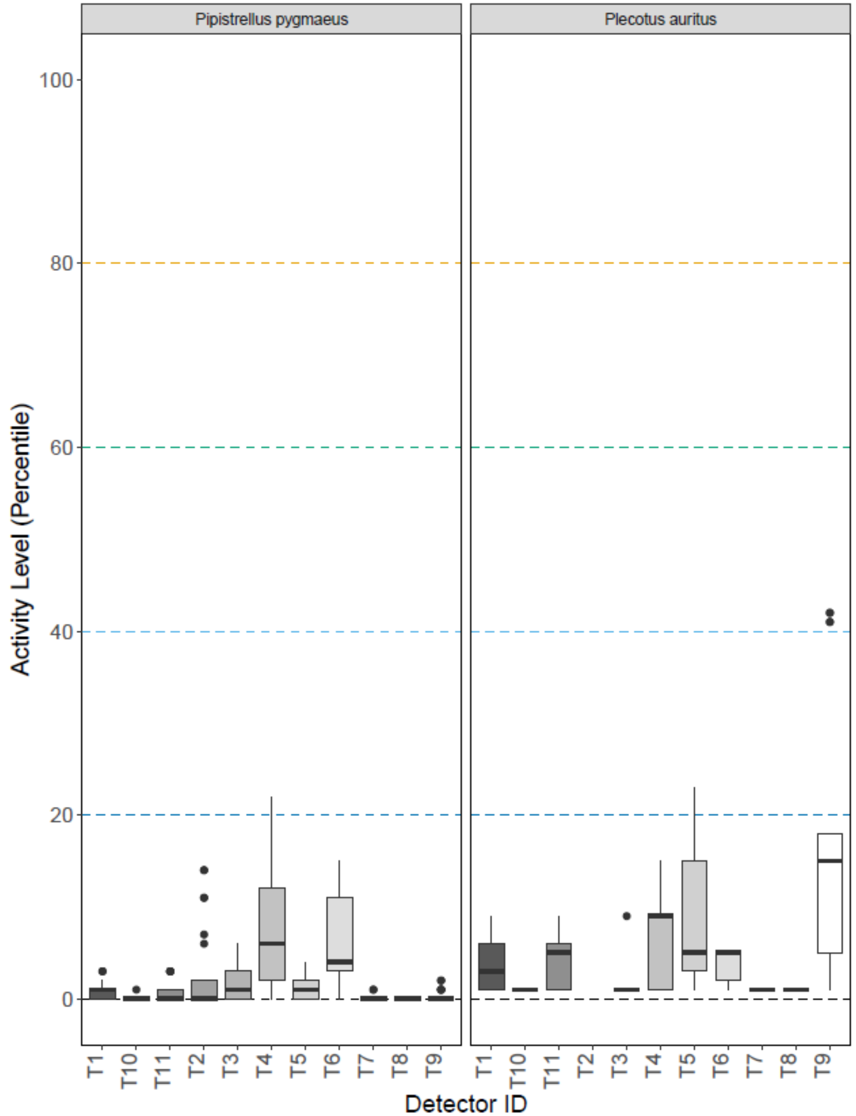


Figure 4-3: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 1 2023 at Drehid (Pipistrellus pygmaeus and Plecotus auritus)

4.1.2 Survey Period 2 (2023)

A summary table extracted from the EcoBat report showing the number of nights recorded bat activity fell into each activity band per species/detector location during Survey Period 2 (2023) is presented below.

During this period, exceptional activity for Leisler's bat was recorded for five nights at T9, four nights at T1, and two nights at T11. Locations T8 and T9 had one night of high activity, and location T11 had three nights of high activity for this species.

Location T1 had four nights of exceptional Natterer's bat activity, one night of high activity and one night of high/moderate activity for his species.

Location T9 had two nights of high *Pipistrellus* Spp. Activity, and seven nights of moderate/high activity for this genus-level grouping.

Across all species and locations, nights of high and exceptional activity each made up 1% of the total. This statistic was 3% each for nights of high/moderate activity and moderate activity. Nights of low moderate activity made up 14% of the total, while nights of low activity represented 78% of the assessed activity across all species and detector locations.

Bat surveys were conducted at T1-T2 and T4-T11 for 22 nights between 08/08/2023 and 30/08/2023, and at T3 between 13/08/2023 and 30/08/2023 for 17 nights using Song Meter SM4BAT bat detectors.

Table 4-2: Ecobat summary table detailing number of nights within each activity category per detector/species during Survey Period 2 2023

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T1	*Myotis Sp.*	0	0	0	0	0	22
T1	*Myotis daubentonii*	0	0	0	0	0	18
T1	*Myotis mystacinus*	0	0	2	1	4	1
T1	*Myotis nattereri*	4	2	1	0	0	7
T1	*Nyctalus leisleri*	0	0	0	0	13	9
T1	*Pipistrellus Sp.*	0	0	0	3	2	4
T1	*Pipistrellus nathusii*	0	0	0	0	0	1
T1	*Pipistrellus pipistrellus*	0	0	0	0	0	21
T1	*Pipistrellus pygmaeus*	0	0	0	0	0	22
T1	*Plecotus auritus*	0	0	0	0	2	10

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T2	*Myotis Sp.*	0	0	0	0	0	5
T2	*Myotis daubentonii*	0	0	0	0	0	3
T2	*Myotis mystacinus*	0	0	0	0	1	2
T2	*Myotis nattereri*	0	0	0	0	0	1
T2	*Nyctalus leisleri*	0	0	0	0	2	20
T2	*Pipistrellus Sp.*	0	0	2	1	8	3
T2	*Pipistrellus pipistrellus*	0	0	0	0	2	20
T2	*Pipistrellus pygmaeus*	0	0	0	0	0	22
T2	*Plecotus auritus*	0	0	0	0	0	4
T3	*Myotis Sp.*	0	0	0	0	0	14
T3	*Myotis daubentonii*	0	0	0	0	0	5
T3	*Myotis mystacinus*	0	0	0	0	1	1
T3	*Myotis nattereri*	0	0	0	2	0	4
T3	*Nyctalus leisleri*	0	0	0	2	11	4
T3	*Pipistrellus Sp.*	0	0	0	2	2	3
T3	*Pipistrellus pipistrellus*	0	0	0	0	4	13
T3	*Pipistrellus pygmaeus*	0	0	0	2	4	11
T3	*Plecotus auritus*	0	0	0	0	0	10
T4	*Myotis Sp.*	0	0	0	0	0	13
T4	*Myotis daubentonii*	0	0	0	0	0	9
T4	*Myotis mystacinus*	0	0	0	0	0	3
T4	*Myotis nattereri*	0	0	0	1	0	1

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T4	*Nyctalus leisleri*	0	0	0	0	6	15
T4	*Pipistrellus Sp.*	0	0	2	4	4	2
T4	*Pipistrellus pipistrellus*	0	0	0	0	2	19
T4	*Pipistrellus pygmaeus*	0	0	0	0	3	18
T4	*Plecotus auritus*	0	0	0	0	0	11
T5	*Myotis Sp.*	0	0	0	0	0	15
T5	*Myotis daubentonii*	0	0	0	0	0	4
T5	*Myotis nattereri*	0	0	0	0	0	1
T5	*Nyctalus leisleri*	0	0	0	0	4	18
T5	*Pipistrellus Sp.*	0	0	2	3	10	1
T5	*Pipistrellus nathusii*	0	0	0	0	0	1
T5	*Pipistrellus pipistrellus*	0	0	0	2	7	13
T5	*Pipistrellus pygmaeus*	0	0	0	0	2	19
T5	*Plecotus auritus*	0	0	0	0	0	4
T6	*Myotis Sp.*	0	0	0	0	0	18
T6	*Myotis daubentonii*	0	0	0	0	0	3
T6	*Myotis mystacinus*	0	0	3	5	3	3
T6	*Myotis nattereri*	0	0	0	0	2	7
T6	*Nyctalus leisleri*	0	0	0	0	2	18
T6	*Pipistrellus Sp.*	0	0	0	0	4	4
T6	*Pipistrellus nathusii*	0	0	0	0	0	1
T6	*Pipistrellus pipistrellus*	0	0	0	0	0	20

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T6	*Pipistrellus pygmaeus*	0	0	0	0	6	14
T6	*Plecotus auritus*	0	0	0	0	0	3
T7	*Myotis Sp.*	0	0	0	0	0	5
T7	*Myotis daubentonii*	0	0	0	0	0	3
T7	*Myotis mystacinus*	0	0	0	0	1	0
T7	*Myotis nattereri*	0	0	0	0	0	3
T7	*Nyctalus leisleri*	0	0	0	0	2	18
T7	*Pipistrellus Sp.*	0	0	0	0	2	5
T7	*Pipistrellus nathusii*	0	0	0	0	0	1
T7	*Pipistrellus pipistrellus*	0	0	0	0	0	19
T7	*Pipistrellus pygmaeus*	0	0	0	0	0	19
T7	*Plecotus auritus*	0	0	0	0	0	4
T8	*Myotis Sp.*	0	0	0	0	0	17
T8	*Myotis daubentonii*	0	0	0	0	0	11
T8	*Myotis mystacinus*	0	0	0	0	5	4
T8	*Myotis nattereri*	0	0	0	1	1	3
T8	*Nyctalus leisleri*	2	1	5	2	5	6
T8	*Pipistrellus Sp.*	0	0	1	3	3	4
T8	*Pipistrellus pipistrellus*	0	0	0	0	0	20
T8	*Pipistrellus pygmaeus*	0	0	0	0	0	20
T8	*Plecotus auritus*	0	0	0	0	2	12
T9	*Myotis Sp.*	0	0	0	0	0	15

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T9	*Myotis daubentonii*	0	0	0	0	0	7
T9	*Myotis nattereri*	0	0	0	0	0	2
T9	*Nyctalus leisleri*	5	1	1	4	6	4
T9	*Pipistrellus Sp.*	0	2	7	1	3	4
T9	*Pipistrellus pipistrellus*	0	0	0	0	0	21
T9	*Pipistrellus pygmaeus*	0	0	0	0	0	21
T9	*Plecotus auritus*	0	0	0	0	0	9
T10	*Myotis Sp.*	0	0	0	0	0	3
T10	*Myotis daubentonii*	0	0	0	0	0	8
T10	*Myotis mystacinus*	0	0	0	0	4	3
T10	*Myotis nattereri*	0	0	0	0	0	2
T10	*Nyctalus leisleri*	0	0	2	2	2	15
T10	*Pipistrellus Sp.*	0	0	0	0	1	4
T10	*Pipistrellus pipistrellus*	0	0	0	0	0	19
T10	*Pipistrellus pygmaeus*	0	0	0	0	0	20
T10	*Plecotus auritus*	0	0	0	0	2	10
T11	*Myotis Sp.*	0	0	0	0	0	17
T11	*Myotis daubentonii*	0	0	0	0	0	4
T11	*Myotis mystacinus*	0	0	0	0	6	7
T11	*Myotis nattereri*	0	0	0	0	0	1
T11	*Nyctalus leisleri*	2	3	1	0	1	15
T11	*Pipistrellus*	0	0	2	0	10	3

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T11	*Pipistrellus pipistrellus*	0	0	0	0	0	22
T11	*Pipistrellus pygmaeus*	0	0	0	0	0	21
T11	*Plecotus auritus*	0	0	0	0	4	14

Differences in activity between static detector locations split by species and location are presented in below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity). The dots indicate outlier values.

Note: Myotis daubentonii = Daubenton's bat, Myotis mystacinus = whiskered bat, Myotis nattereri = Natterer's bat, Nyctalus leisleri = Leisler's bat, Pipistrellus nathusii = Nathusius' bat, Pipistrellus pipistrellus = common pipistrelle, Pipistrellus pygmaeus = soprano pipistrelle, Plecotus auritus = brown long-eared bat.

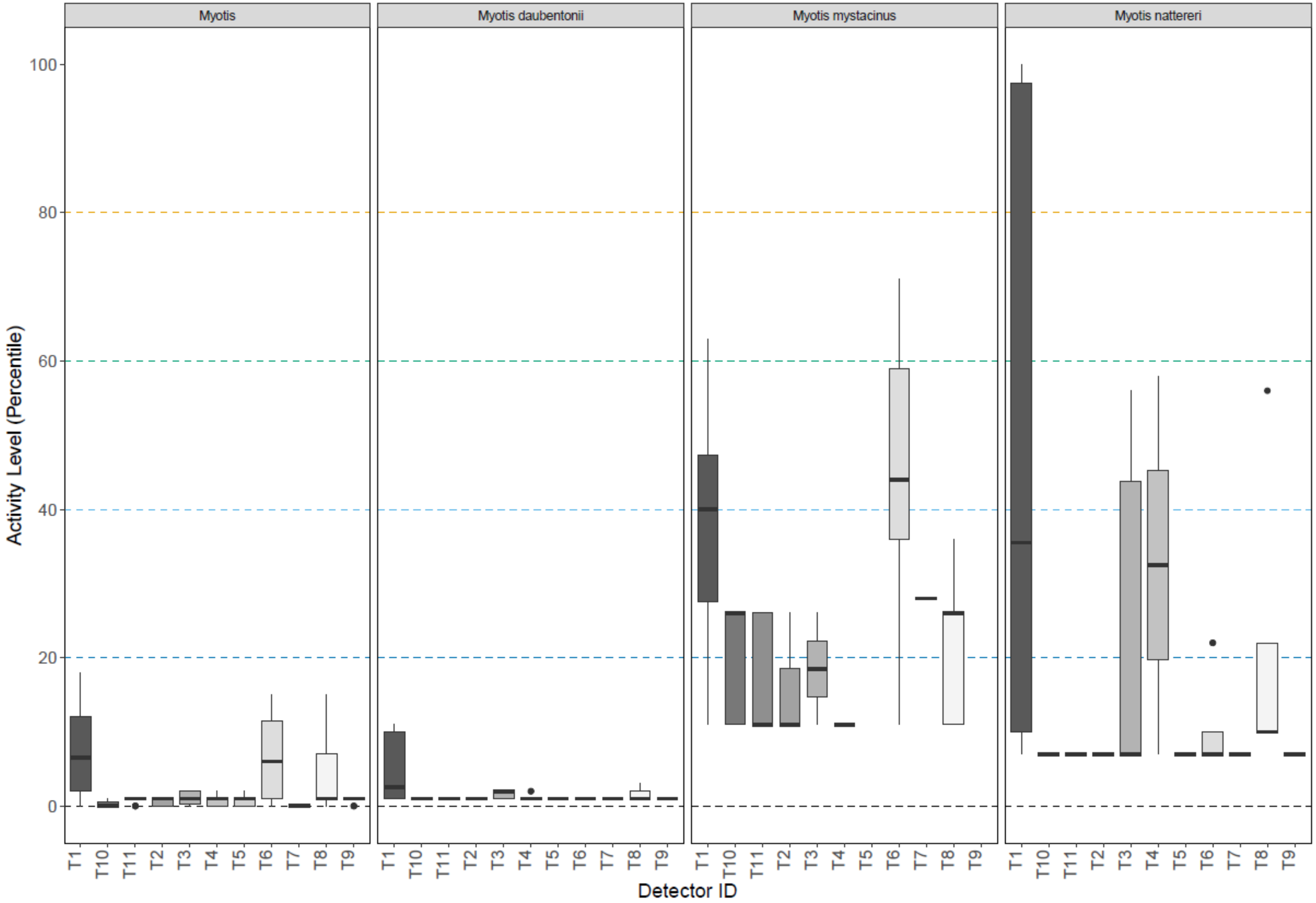


Figure 4-4: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 2 2023 at Drehid (Myotis spp., Myotis daubentonii, Myotis mystacinus and Myotis nattereri)

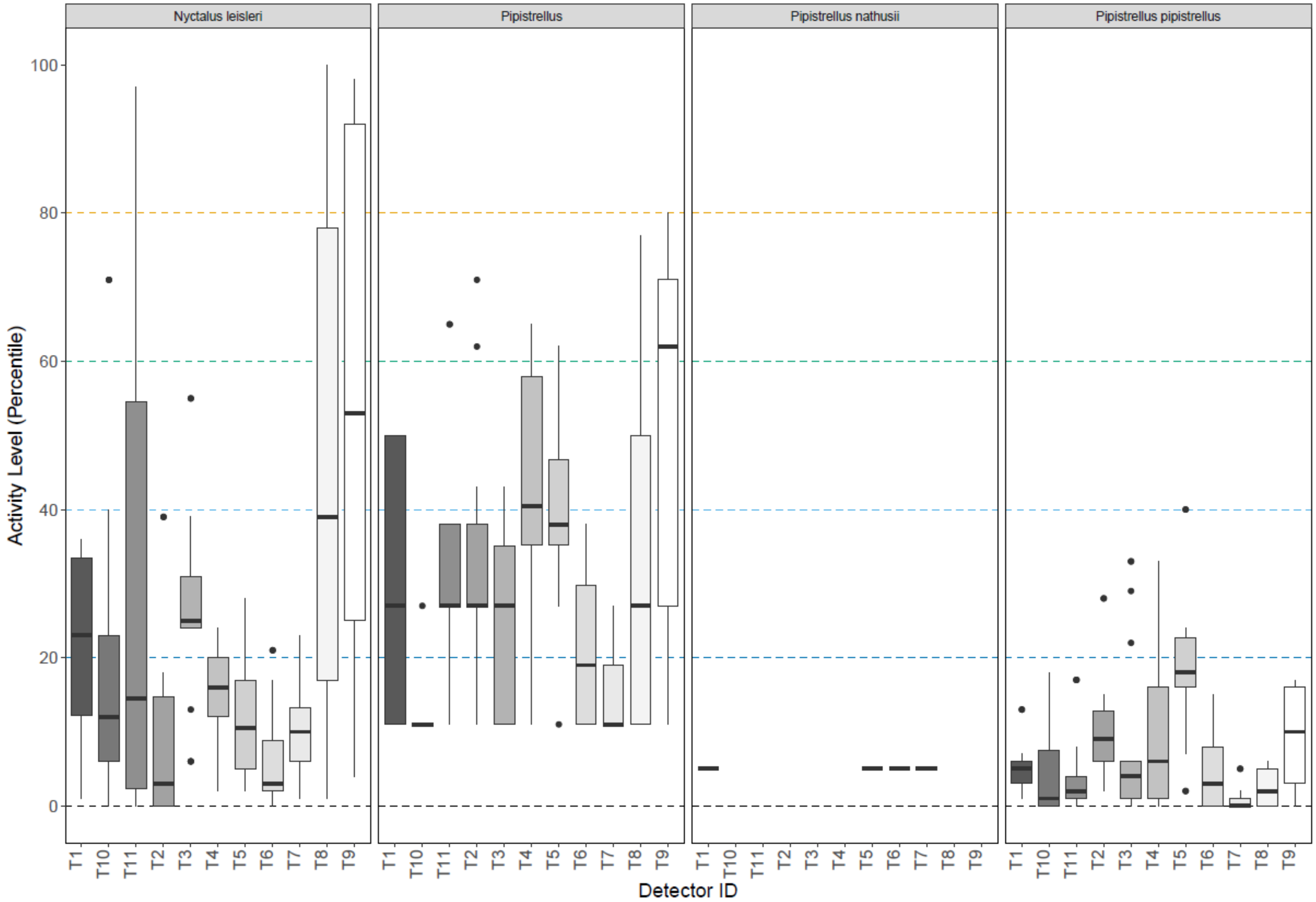


Figure 4-5: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 2 2023 at Drehid (Nyctalus leisleri, Pipistrellus Spp., Pipistrellus nathusii and Pipistrellus pipistrellus)

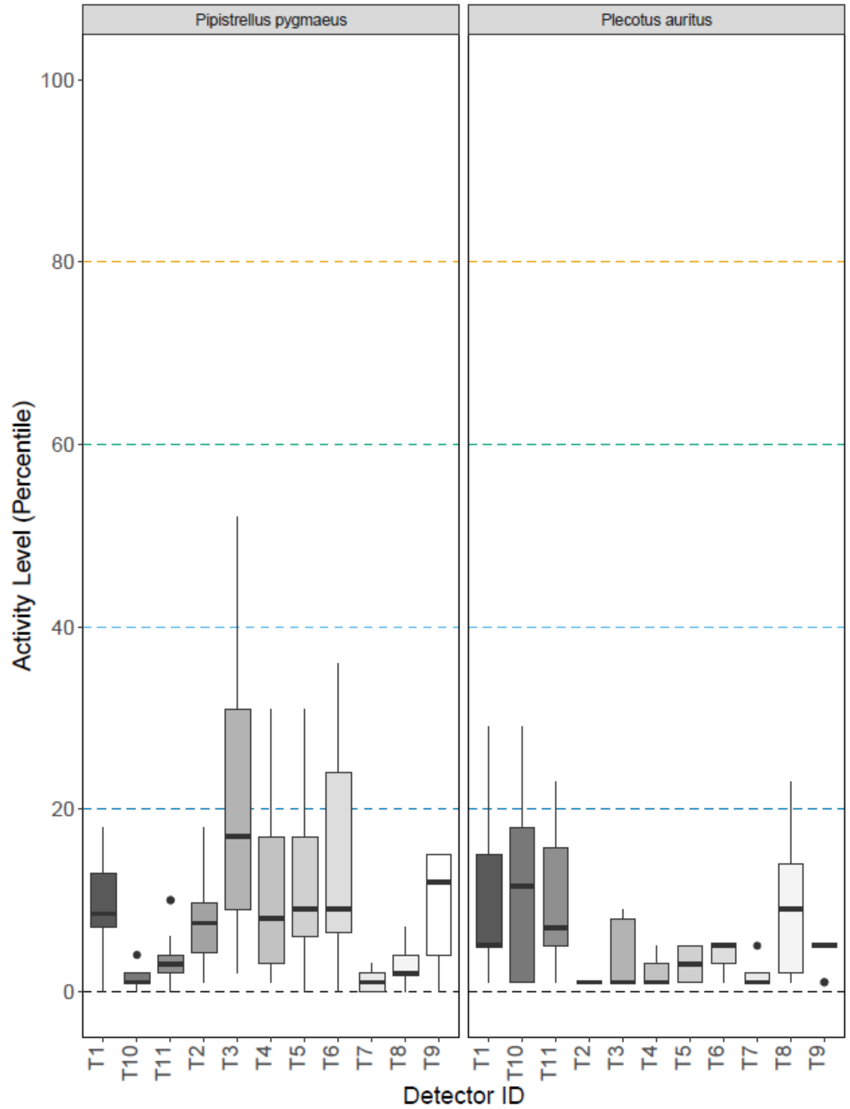


Figure 4-6: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 2 2023 at Drehid (Pipistrellus pygmaeus and Plecotus auritus)

4.1.3 Survey Period 3 (2023)

A summary table extracted from the EcoBat report showing the number of nights recorded bat activity fell into each activity band per species/detector location during Survey Period 3 (2023) is presented below.

During this period at Location T1, exceptional activity for Leisler's bat was recorded for two nights, high activity was recorded for four nights and high/moderate activity was recorded for three nights. A combined total of 115 nights of low activity for Leisler's bat were recorded across locations T6-T11 during this period. No nights of moderate and low/moderate activity for Leisler's bat were recorded.

Locations T2 - T5 each had two nights of moderate/high activity for Leisler's bat, while Location T1 had three nights of moderate/high activity for this species.

One night of exceptional activity for *Pipistrellus* Sp. was recorded at T1 during this period. One night of high activity was recorded at T2 for this genus-level grouping.

One night of moderate/high activity for whiskered bat was recorded at Location T6 during this period.

Across all species and locations, nights of high and exceptional activity each made up less than 1% of the total. This statistic was 1% for nights of high/moderate activity and 2% for nights of moderate activity. Nights of low/moderate activity made up 11% of the total, while nights of low activity represented 85% of the assessed activity across all species and detector locations.

Bat surveys were conducted at T2-T5 for 34 nights between 20/09/2023 and 24/10/2023 and at T6-T8, T10 for 34 nights between 19/09/2023 and 23/10/2023. Surveys at T1 were carried out between 20/09/2023 to 23/09/2023 (33 nights). Surveys at T9 were carried out between 10/10/2023 and 23/10/2023 (13 nights). Surveys at T11 were carried out between 19/09/2023 and 24/10/2023 (35 nights) using Song Meter SM4BAT bat detectors.

Table 4-3: Ecobat summary table detailing number of nights within each activity category per detector/species during Survey Period 3 2023

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T1	*Myotis Sp.*	0	0	0	0	0	20
T1	*Myotis daubentonii*	0	0	0	0	0	9
T1	*Myotis mystacinus*	0	0	0	0	4	3
T1	*Nyctalus leisleri*	2	4	3	1	4	12
T1	*Pipistrellus Sp.*	0	0	0	0	4	1
T1	*Pipistrellus pipistrellus*	0	0	0	0	0	28
T1	*Pipistrellus pygmaeus*	0	0	0	0	6	25
T2	*Myotis Sp.*	0	0	0	0	0	6
T2	*Nyctalus leisleri*	0	0	2	0	5	17
T2	*Pipistrellus Sp.*	0	1	0	0	2	5

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T2	*Pipistrellus pipistrellus*	0	0	0	0	0	23
T2	*Pipistrellus pygmaeus*	0	0	0	2	7	23
T3	*Myotis Sp.*	0	0	0	0	0	12
T3	*Myotis mystacinus*	0	0	0	0	0	1
T3	*Myotis nattereri*	0	0	0	0	0	1
T3	*Nyctalus leisleri*	0	0	2	10	6	11
T3	*Pipistrellus Sp.*	1	0	0	1	9	2
T3	*Pipistrellus pipistrellus*	0	0	0	0	4	26
T3	*Pipistrellus pygmaeus*	0	0	0	5	11	16
T3	*Plecotus auritus*	0	0	0	0	0	1
T4	*Myotis Sp.*	0	0	0	0	0	12
T4	*Myotis daubentonii*	0	0	0	0	0	1
T4	*Myotis nattereri*	0	0	0	0	0	1
T4	*Nyctalus leisleri*	0	0	2	0	2	21
T4	*Pipistrellus Sp.*	0	0	0	0	6	4
T4	*Pipistrellus pipistrellus*	0	0	0	0	0	25
T4	*Pipistrellus pygmaeus*	0	0	0	0	4	25
T4	*Plecotus auritus*	0	0	0	0	0	1
T5	*Myotis Sp.*	0	0	0	0	0	12
T5	*Myotis daubentonii*	0	0	0	0	0	13
T5	*Myotis mystacinus*	0	0	0	0	0	2
T5	*Myotis nattereri*	0	0	0	0	0	1
T5	*Nyctalus leisleri*	0	0	2	0	2	23
T5	*Pipistrellus Sp.*	0	0	0	0	3	3
T5	*Pipistrellus pipistrellus*	0	0	0	0	0	24
T5	*Pipistrellus pygmaeus*	0	0	0	0	3	28
T5	*Plecotus auritus*	0	0	0	0	0	12
T6	*Myotis Sp.*	0	0	0	0	0	16
T6	*Myotis daubentonii*	0	0	0	0	0	6
T6	*Myotis mystacinus*	0	0	1	0	10	4

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T6	*Myotis nattereri*	0	0	0	0	0	7
T6	*Nyctalus leisleri*	0	0	0	0	0	18
T6	*Pipistrellus Sp.*	0	0	0	0	4	4
T6	*Pipistrellus pipistrellus*	0	0	0	0	0	23
T6	*Pipistrellus pygmaeus*	0	0	0	0	6	20
T6	*Plecotus auritus*	0	0	0	0	0	5
T7	*Myotis Sp.*	0	0	0	0	0	2
T7	*Myotis daubentonii*	0	0	0	0	0	5
T7	*Nyctalus leisleri*	0	0	0	0	0	24
T7	*Pipistrellus Sp.*	0	0	0	0	0	1
T7	*Pipistrellus pipistrellus*	0	0	0	0	0	8
T7	*Pipistrellus pygmaeus*	0	0	0	0	0	9
T7	*Plecotus auritus*	0	0	0	0	0	2
T8	*Myotis Sp.*	0	0	0	0	0	5
T8	*Myotis daubentonii*	0	0	0	0	0	5
T8	*Myotis mystacinus*	0	0	0	0	1	5
T8	*Myotis nattereri*	0	0	0	0	0	4
T8	*Nyctalus leisleri*	0	0	0	0	0	28
T8	*Pipistrellus pipistrellus*	0	0	0	0	0	13
T8	*Pipistrellus pygmaeus*	0	0	0	0	0	17
T8	*Plecotus auritus*	0	0	0	0	0	6
T9	*Myotis Sp.*	0	0	0	0	0	3
T9	*Myotis daubentonii*	0	0	0	0	0	5
T9	*Nyctalus leisleri*	0	0	0	0	0	13
T9	*Pipistrellus pipistrellus*	0	0	0	0	0	6
T9	*Pipistrellus pygmaeus*	0	0	0	0	0	11
T9	*Plecotus auritus*	0	0	0	0	0	2
T10	*Myotis Sp.*	0	0	0	0	0	6
T10	*Myotis daubentonii*	0	0	0	0	0	7
T10	*Myotis mystacinus*	0	0	0	0	1	2

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
T10	*Nyctalus leisleri*	0	0	0	0	0	12
T10	*Pipistrellus pipistrellus*	0	0	0	0	0	11
T10	*Pipistrellus pygmaeus*	0	0	0	0	0	15
T10	*Plecotus auritus*	0	0	0	0	0	2
T11	*Myotis Sp.*	0	0	0	0	0	8
T11	*Myotis daubentonii*	0	0	0	0	0	3
T11	*Myotis mystacinus*	0	0	0	0	1	4
T11	*Nyctalus leisleri*	0	0	0	0	0	20
T11	*Pipistrellus Sp.*	0	0	0	0	7	4
T11	*Pipistrellus pipistrellus*	0	0	0	0	0	16
T11	*Pipistrellus pygmaeus*	0	0	0	0	0	20
T11	*Plecotus auritus*	0	0	0	0	0	2

Differences in activity between static detector locations split by species and location are presented in below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity). The dots indicate outlier values.

Note: Myotis daubentonii = Daubenton's bat, Myotis mystacinus = whiskered bat, Myotis nattereri = Natterer's bat, Nyctalus leisleri = Leisler's bat, Pipistrellus nathusii = Nathusius' bat, Pipistrellus pipistrellus = common pipistrelle, Pipistrellus pygmaeus = soprano pipistrelle, Plecotus auritus = brown long-eared bat.

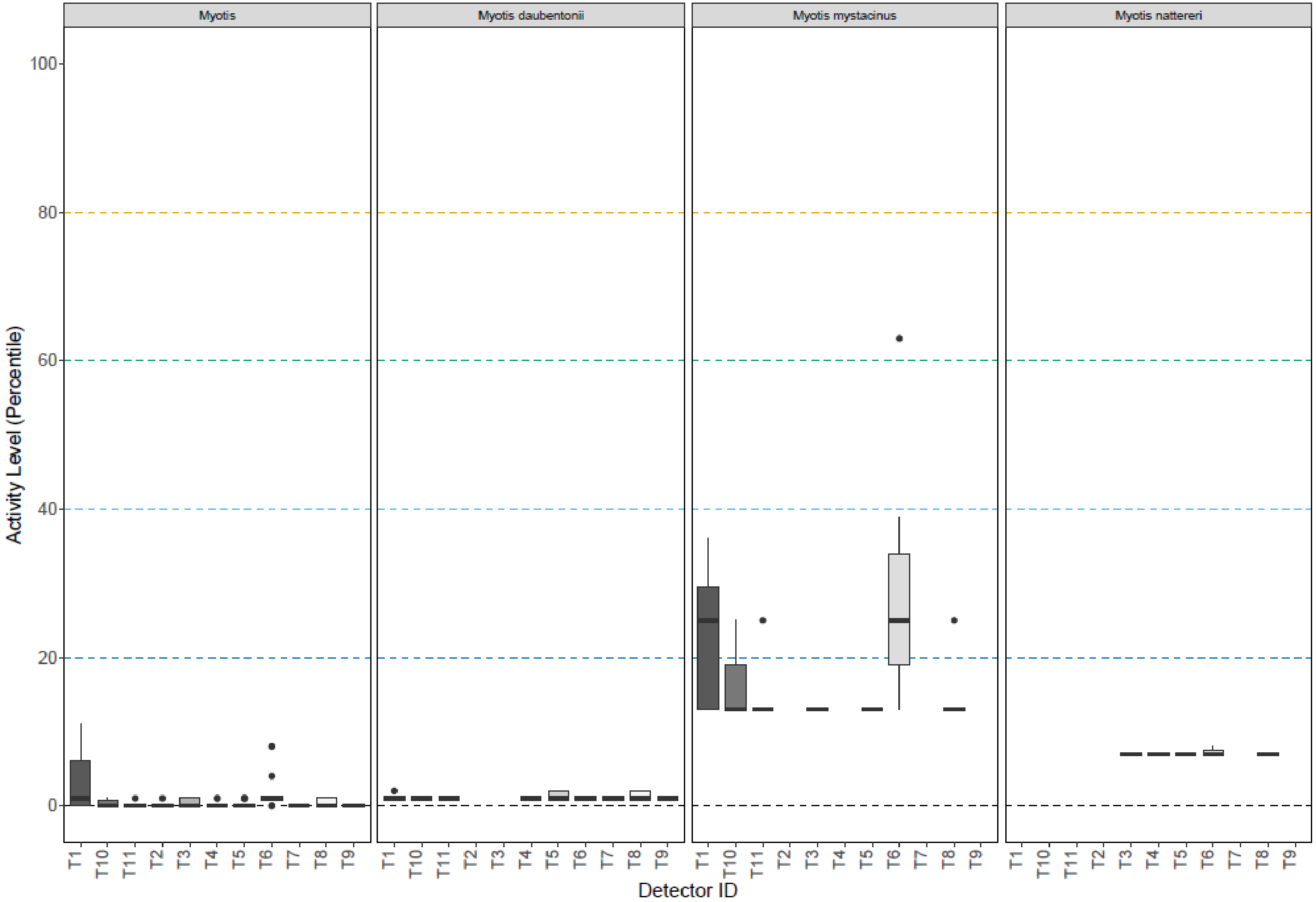


Figure 4-7: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 3 2023 at Drehid (Myotis spp., Myotis daubentonii, Myotis mystacinus and Myotis nattereri)

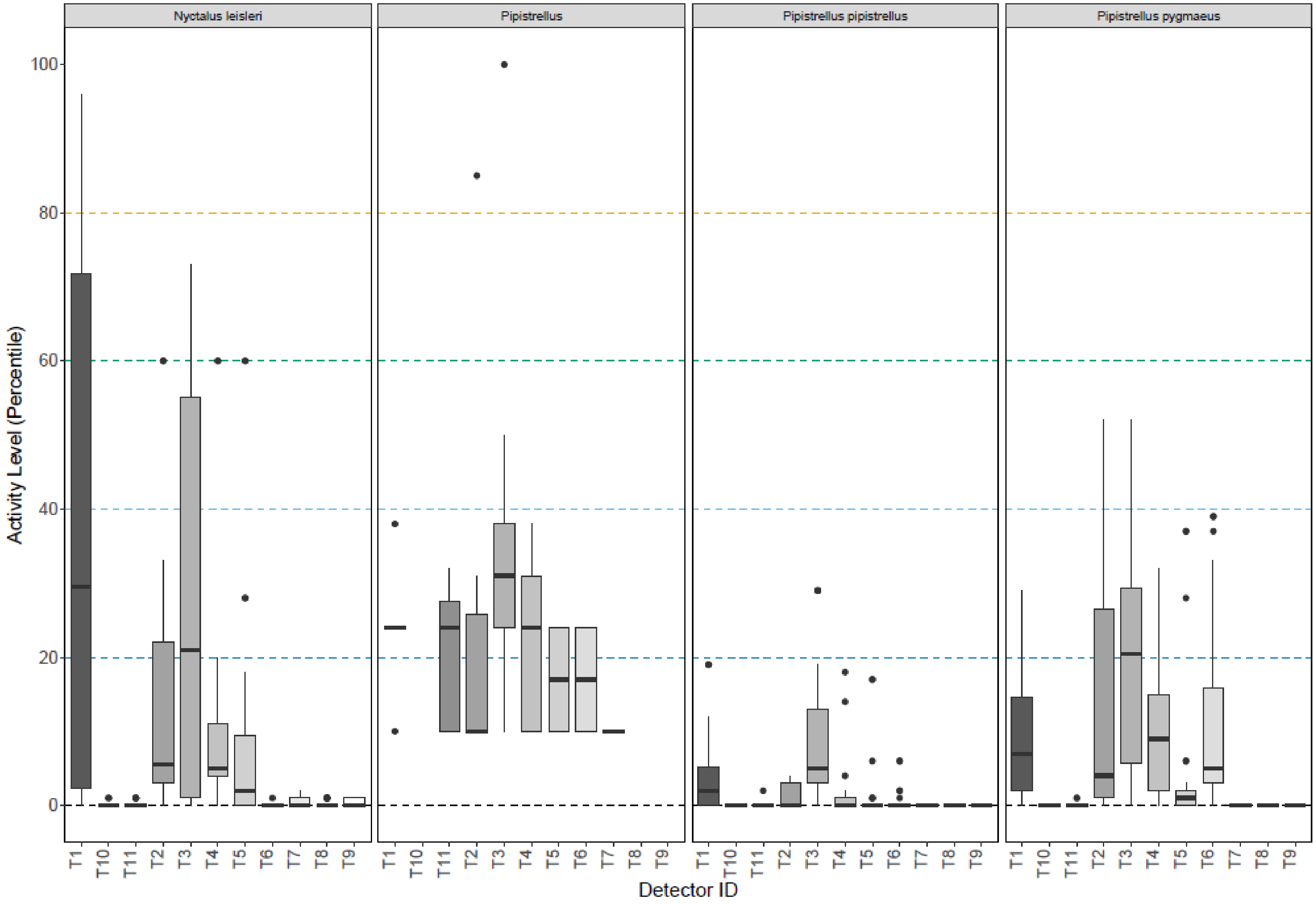


Figure 4-8: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 3 2023 at Drehid (Nyctalus leisleri, Pipistrellus Spp., Pipistrellus nathusii and Pipistrellus pipistrellus)

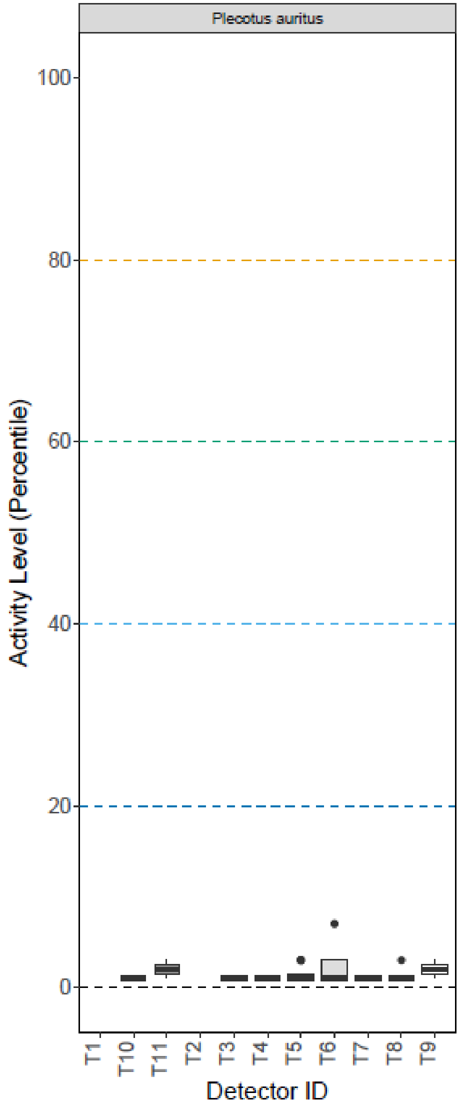


Figure 4-9: Differences in Activity between Static Detector Locations, split by species and detector location during Survey Period 3 2023 at Drehid (Plecotus auritus)

4.2 2022 Ecobat Results

4.2.1 Survey Period 1 (2022)

A summary table extracted from the EcoBat report showing the number of nights recorded bat activity fell into each activity band per species/ detector location during Survey Period 1 (2022) is presented below.

Dr08 had three nights of exceptional activity for Leisler's bat, and Dr12 had two nights of exceptional activity for Leisler's bat.

There were no nights of high activity recorded for any species.

Across all species and locations, nights of exceptional activity each made up 0.87% of the total, while nights of high activity contributed 0%. This statistic was 0.35% for nights of high/moderate activity and 4.50% for nights of moderate activity. Nights of low/ moderate activity made up 9% of the total while nights of low activity represented 85.29% of the assessed activity across all species and detector locations.

Bat surveys were conducted at Dr01, Dr02, Dr04-Dr08 and Dr12 for 13 nights between 09/05/2022 and 23/05/2022, and at Dr09-Dr11 for 12 nights between 10/05/2022 and 23/05/2022 using Song Meter SM4BAT bat detectors.

Table 4-4: Ecobat summary table detailing number of nights within each activity category per detector/species during Survey Period 1 2022

Location	Species/Species group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Dr01	*Myotis daubentonii*	0	0	0	0	0	4
Dr01	*Nyctalus leisleri*	0	0	0	0	0	13
Dr01	*Pipistrellus nathusii*	0	0	0	0	4	1
Dr01	*Pipistrellus pipistrellus*	0	0	0	2	0	12
Dr01	*Pipistrellus pygmaeus*	0	0	0	1	3	9
Dr01	*Plecotus auritus*	0	0	0	0	0	6
Dr02	*Myotis daubentonii*	0	0	0	0	0	3
Dr02	*Myotis nattereri*	0	0	0	0	0	1
Dr02	*Nyctalus leisleri*	0	0	0	0	0	12

Location	Species/Species group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Dr02	*Pipistrellus pipistrellus*	0	0	0	0	0	13
Dr02	*Pipistrellus pygmaeus*	0	0	0	0	0	13
Dr02	*Plecotus auritus*	0	0	0	0	0	2
Dr04	*Myotis daubentonii*	0	0	0	0	0	6
Dr04	*Myotis mystacinus*	0	0	0	0	1	0
Dr04	*Nyctalus leisleri*	0	0	0	2	1	9
Dr04	*Pipistrellus nathusii*	0	0	0	1	1	2
Dr04	*Pipistrellus pipistrellus*	0	0	0	0	0	14
Dr04	*Pipistrellus pygmaeus*	0	0	0	7	4	3
Dr04	*Plecotus auritus*	0	0	0	0	0	7
Dr05	*Myotis daubentonii*	0	0	0	0	0	6
Dr05	*Myotis mystacinus*	0	0	0	0	0	6
Dr05	*Myotis nattereri*	0	0	0	0	0	3
Dr05	*Nyctalus leisleri*	0	0	0	0	0	12
Dr05	*Pipistrellus nathusii*	0	0	0	0	2	4
Dr05	*Pipistrellus pipistrellus*	0	0	0	0	0	14
Dr05	*Pipistrellus pygmaeus*	0	0	0	0	0	12
Dr05	*Plecotus auritus*	0	0	0	0	0	7
Dr06	*Myotis daubentonii*	0	0	0	0	0	6

Location	Species/Species group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Dr06	*Myotis mystacinus*	0	0	0	0	1	2
Dr06	*Myotis nattereri*	0	0	0	2	1	5
Dr06	*Nyctalus leisleri*	0	0	0	0	0	11
Dr06	*Pipistrellus nathusii*	0	0	0	1	2	4
Dr06	*Pipistrellus pipistrellus*	0	0	0	3	0	11
Dr06	*Pipistrellus pygmaeus*	0	0	0	2	3	9
Dr06	*Plecotus auritus*	0	0	0	0	0	11
Dr07	*Myotis daubentonii*	0	0	0	0	0	5
Dr07	*Myotis mystacinus*	0	0	0	0	2	4
Dr07	*Myotis nattereri*	0	0	0	0	0	3
Dr07	*Nyctalus leisleri*	0	0	2	0	1	7
Dr07	*Pipistrellus nathusii*	0	0	0	0	0	2
Dr07	*Pipistrellus pipistrellus*	0	0	0	0	0	12
Dr07	*Pipistrellus pygmaeus*	0	0	0	0	7	6
Dr07	*Plecotus auritus*	0	0	0	0	0	8
Dr08	*Myotis daubentonii*	0	0	0	0	0	5
Dr08	*Myotis mystacinus*	0	0	0	0	7	1
Dr08	*Myotis nattereri*	0	0	0	0	2	3
Dr08	*Nyctalus leisleri*	3	0	0	1	0	7

Location	Species/Species group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Dr08	*Pipistrellus nathusii*	0	0	0	2	0	0
Dr08	*Pipistrellus pipistrellus*	0	0	0	0	0	13
Dr08	*Pipistrellus pygmaeus*	0	0	0	0	0	13
Dr08	*Plecotus auritus*	0	0	0	0	0	5
Dr09	*Myotis daubentonii*	0	0	0	0	0	6
Dr09	*Nyctalus leisleri*	0	0	0	0	2	10
Dr09	*Pipistrellus nathusii*	0	0	0	1	2	4
Dr09	*Pipistrellus pipistrellus*	0	0	0	0	0	12
Dr09	*Pipistrellus pygmaeus*	0	0	0	0	0	10
Dr09	*Plecotus auritus*	0	0	0	0	0	2
Dr10	*Myotis daubentonii*	0	0	0	0	0	3
Dr10	*Myotis nattereri*	0	0	0	0	0	1
Dr10	*Nyctalus leisleri*	0	0	0	0	3	10
Dr10	*Pipistrellus nathusii*	0	0	0	0	0	3
Dr10	*Pipistrellus pipistrellus*	0	0	0	0	0	10
Dr10	*Pipistrellus pygmaeus*	0	0	0	0	0	8
Dr10	*Plecotus auritus*	0	0	0	0	0	5
Dr11	*Myotis daubentonii*	0	0	0	0	0	4
Dr11	*Nyctalus leisleri*	0	0	0	0	2	9

Location	Species/Species group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Dr11	*Pipistrellus pipistrellus*	0	0	0	0	0	12
Dr11	*Pipistrellus pygmaeus*	0	0	0	0	0	7
Dr11	*Plecotus auritus*	0	0	0	0	0	5
Dr12	*Myotis daubentonii*	0	0	0	0	0	2
Dr12	*Myotis nattereri*	0	0	0	0	0	1
Dr12	*Nyctalus leisleri*	2	0	0	1	0	3
Dr12	*Pipistrellus nathusii*	0	0	0	0	1	3
Dr12	*Pipistrellus pipistrellus*	0	0	0	0	0	7
Dr12	*Pipistrellus pygmaeus*	0	0	0	0	0	5
Dr12	*Plecotus auritus*	0	0	0	0	0	4

Differences in activity between static detector locations split by species and location are presented in below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity). The dots indicate outlier values.

Note: Myotis daubentonii = Daubenton's bat, Myotis mystacinus = whiskered bat, Myotis nattereri = Natterer's bat, Nyctalus leisleri = Leisler's bat, Pipistrellus nathusii = Nathusius' bat, Pipistrellus pipistrellus = common pipistrelle, Pipistrellus pygmaeus = soprano pipistrelle, Plecotus auritus = brown long-eared bat.

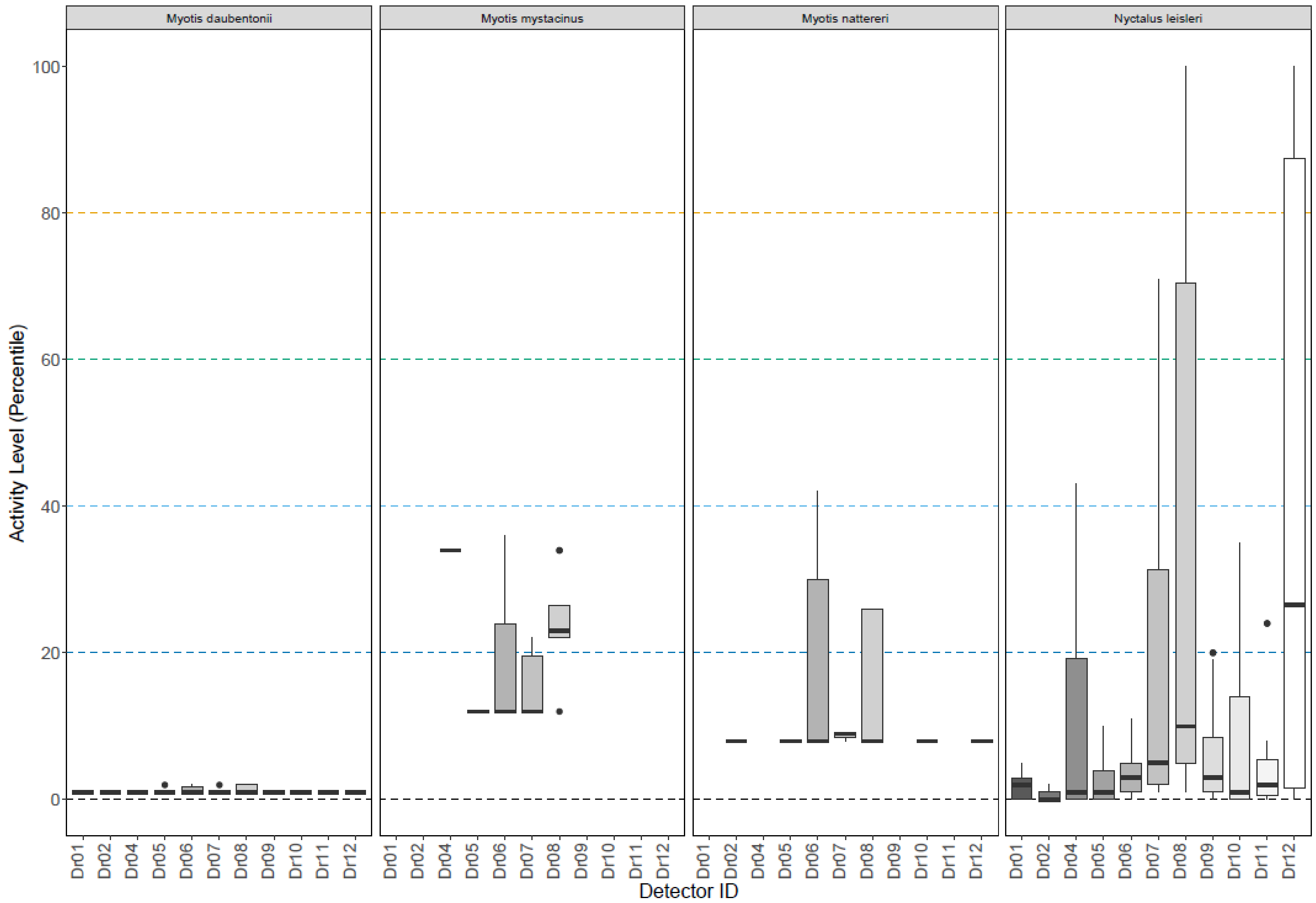


Figure 4-10: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 1 2022 at Drehid (Myotis daubentonii, Myotis mystacinus Myotis nattereri and Nyctalus leisleri)

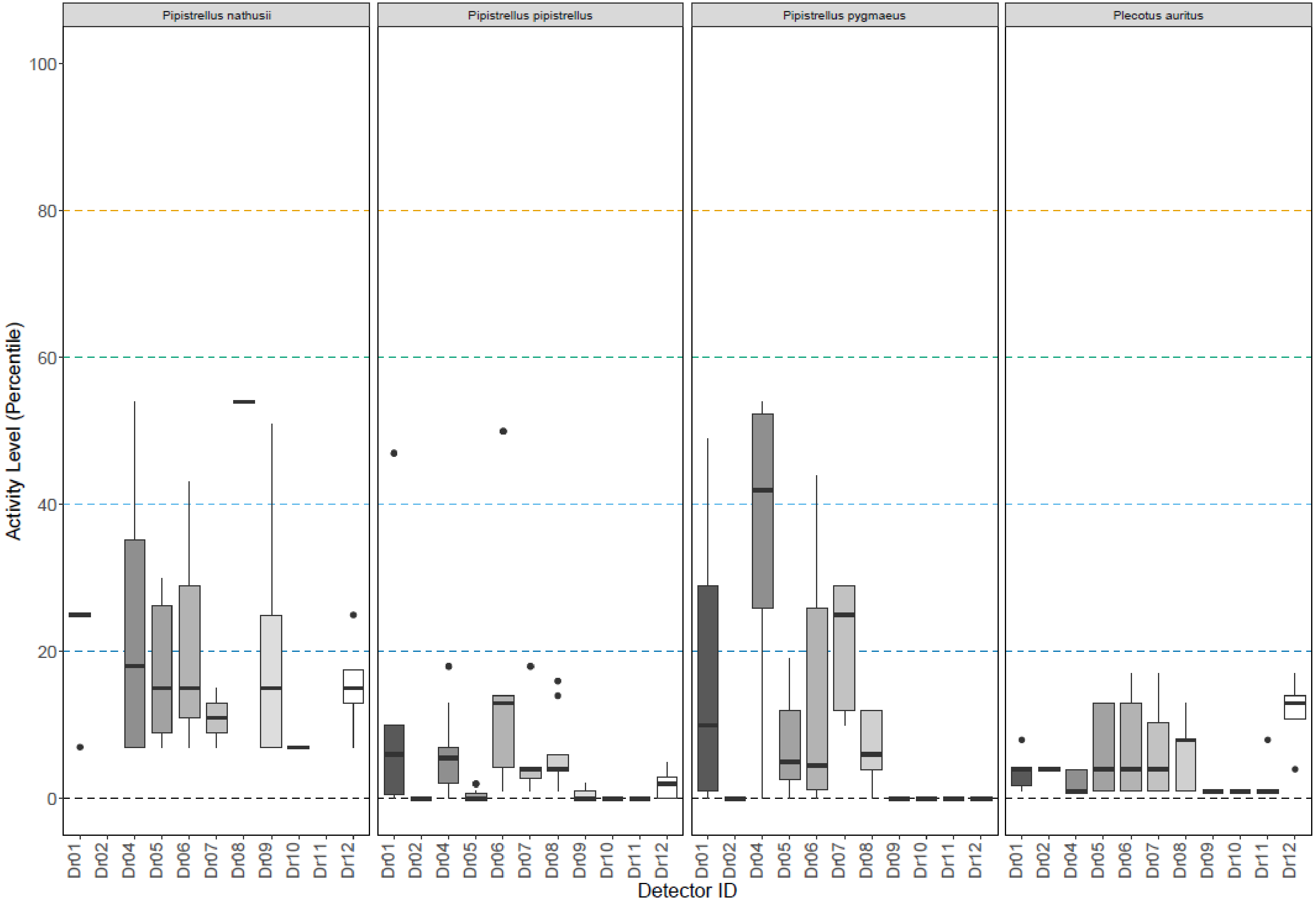


Figure 4-11: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 1 2022 at Drehid (Pipistrellus nathusii, Pipistrellus pipistrellus, Pipistrellus pygmaeus and Plecotus auritus)

4.2.2 Survey Period 2 (2022)

A summary table extracted from the EcoBat report showing the number of nights recorded bat activity fell into each activity band per species/detector location during Survey Period 2 (2022) is presented below.

During this period, there were no nights of high or exceptional activity recorded at any detector location.

Across all species and locations, nights of high/moderate activity accounted for 1% of all recorded activity; nights of moderate activity accounted for 2%, and nights of low-moderate activity accounted for 7%. The majority of nights (90%) were classified as low activity.

Bat surveys were conducted at Dr04, Dr05, Dr07, Dr09, Dr10 and Dr11 for 21 nights between 22/06/2022 and 13/07/2022. Surveys were conducted at Dr02 and Dr06 for 38 nights between 22/06/2022 and 30/072022. Surveys were conducted at Dr01 for 41 nights between 22/06/2022 and 02/08/2022. Surveys were conducted at Dr12 for 15 nights between 13/07/2022 and 28/07/2022. Surveys were conducted at Dr08 for 8 nights between 22/06/2022 and 29/06/2022, with a further 14 nights completed at this location between 13/07/2022 and 27/07/2022.

All surveys were conducted using Song Meter SM4BAT bat detectors.

Table 4-5: Ecobat summary table detailing number of nights within each activity category per detector/species during Survey Period 2 2022

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Dr01	*Myotis daubentonii*	0	0	0	0	0	10
Dr01	*Myotis mystacinus*	0	0	0	0	0	2
Dr01	*Myotis nattereri*	0	0	0	0	0	8
Dr01	*Nyctalus leisleri*	0	0	0	2	1	37
Dr01	*Pipistrellus pipistrellus*	0	0	0	0	0	36
Dr01	*Pipistrellus pygmaeus*	0	0	0	0	0	17
Dr01	*Plecotus auritus*	0	0	0	0	0	18
DR02	*Myotis daubentonii*	0	0	0	0	0	12
DR02	*Myotis mystacinus*	0	0	0	0	0	1
DR02	*Myotis nattereri*	0	0	0	0	0	2
DR02	*Nyctalus leisleri*	0	0	0	0	0	36

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
DR02	*Pipistrellus nathusii*	0	0	0	0	0	3
DR02	*Pipistrellus pipistrellus*	0	0	0	0	5	34
DR02	*Pipistrellus pygmaeus*	0	0	0	0	8	21
DR02	*Plecotus auritus*	0	0	0	0	0	6
DR04	*Myotis daubentonii*	0	0	0	0	0	5
DR04	*Myotis mystacinus*	0	0	0	0	0	2
DR04	*Nyctalus leisleri*	0	0	1	0	0	20
DR04	*Pipistrellus nathusii*	0	0	0	0	0	1
DR04	*Pipistrellus pipistrellus*	0	0	0	0	0	18
DR04	*Pipistrellus pygmaeus*	0	0	0	0	3	16
DR04	*Plecotus auritus*	0	0	0	0	0	5
DR05	*Myotis daubentonii*	0	0	0	0	0	5
DR05	*Myotis mystacinus*	0	0	0	0	0	3
DR05	*Nyctalus leisleri*	0	0	0	2	2	16
DR05	*Pipistrellus nathusii*	0	0	0	0	0	4
DR05	*Pipistrellus pipistrellus*	0	0	0	0	0	19
DR05	*Pipistrellus pygmaeus*	0	0	0	0	0	19
DR05	*Plecotus auritus*	0	0	0	0	1	9
DR06	*Myotis daubentonii*	0	0	0	0	0	6
DR06	*Myotis mystacinus*	0	0	0	0	1	2

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
DR06	*Myotis nattereri*	0	0	0	0	0	5
DR06	*Nyctalus leisleri*	0	0	0	0	0	22
DR06	*Pipistrellus nathusii*	0	0	0	0	0	1
DR06	*Pipistrellus pipistrellus*	0	0	0	0	2	20
DR06	*Pipistrellus pygmaeus*	0	0	0	0	2	18
DR06	*Plecotus auritus*	0	0	0	0	0	13
DR07	*Myotis daubentonii*	0	0	0	0	0	14
DR07	*Myotis mystacinus*	0	0	0	0	1	8
DR07	*Myotis nattereri*	0	0	0	0	2	6
DR07	*Nyctalus leisleri*	0	0	0	0	0	19
DR07	*Pipistrellus nathusii*	0	0	0	0	1	1
DR07	*Pipistrellus pipistrellus*	0	0	0	0	0	20
DR07	*Pipistrellus pygmaeus*	0	0	0	0	0	19
DR07	*Plecotus auritus*	0	0	0	0	0	7
DR08	*Myotis daubentonii*	0	0	0	0	0	11
DR08	*Myotis mystacinus*	0	0	0	4	3	5
DR08	*Myotis nattereri*	0	0	0	0	0	5
DR08	*Nyctalus leisleri*	0	0	4	4	6	5
DR08	*Pipistrellus nathusii*	0	0	0	0	1	11
DR08	*Pipistrellus pipistrellus*	0	0	0	0	0	20

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
DR08	*Pipistrellus pygmaeus*	0	0	2	5	6	8
DR08	*Plecotus auritus*	0	0	0	4	3	9
DR09	*Myotis daubentonii*	0	0	0	0	0	9
DR09	*Myotis mystacinus*	0	0	0	0	2	1
DR09	*Myotis nattereri*	0	0	0	0	0	1
DR09	*Nyctalus leisleri*	0	0	0	0	0	17
DR09	*Pipistrellus nathusii*	0	0	0	0	0	1
DR09	*Pipistrellus pipistrellus*	0	0	0	0	0	19
DR09	*Pipistrellus pygmaeus*	0	0	0	0	0	19
DR09	*Plecotus auritus*	0	0	0	0	0	2
DR10	*Myotis daubentonii*	0	0	0	0	0	5
DR10	*Myotis mystacinus*	0	0	0	0	0	1
DR10	*Myotis nattereri*	0	0	0	0	0	2
DR10	*Nyctalus leisleri*	0	0	0	0	0	17
DR10	*Pipistrellus nathusii*	0	0	0	0	2	2
DR10	*Pipistrellus pipistrellus*	0	0	0	0	0	16
DR10	*Pipistrellus pygmaeus*	0	0	0	0	0	14
DR10	*Plecotus auritus*	0	0	0	0	0	3
DR11	*Myotis daubentonii*	0	0	0	0	0	15
DR11	*Myotis mystacinus*	0	0	0	0	2	3

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
DR11	*Myotis nattereri*	0	0	0	0	0	6
DR11	*Nyctalus leisleri*	0	0	0	3	4	13
DR11	*Pipistrellus nathusii*	0	0	0	0	2	8
DR11	*Pipistrellus pipistrellus*	0	0	0	0	0	19
DR11	*Pipistrellus pygmaeus*	0	0	0	0	0	18
DR11	*Plecotus auritus*	0	0	0	0	0	13
DR12	*Myotis daubentonii*	0	0	0	0	0	3
DR12	*Myotis mystacinus*	0	0	0	0	0	2
DR12	*Nyctalus leisleri*	0	0	0	0	0	16
DR12	*Pipistrellus nathusii*	0	0	0	0	0	6
DR12	*Pipistrellus pipistrellus*	0	0	0	0	8	8
DR12	*Pipistrellus pygmaeus*	0	0	0	0	2	14
DR12	*Plecotus auritus*	0	0	0	0	0	10

Differences in activity between static detector locations split by species and location are presented in below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity). The dots indicate outlier values.

Note: Myotis daubentonii = Daubenton’s bat, Myotis mystacinus = whiskered bat, Myotis nattereri = Natterer’s bat, Nyctalus leisleri = Leisler’s bat, Pipistrellus nathusii = Nathusius’ bat, Pipistrellus pipistrellus = common pipistrelle, Pipistrellus pygmaeus = soprano pipistrelle, Plecotus auritus = brown long-eared bat.

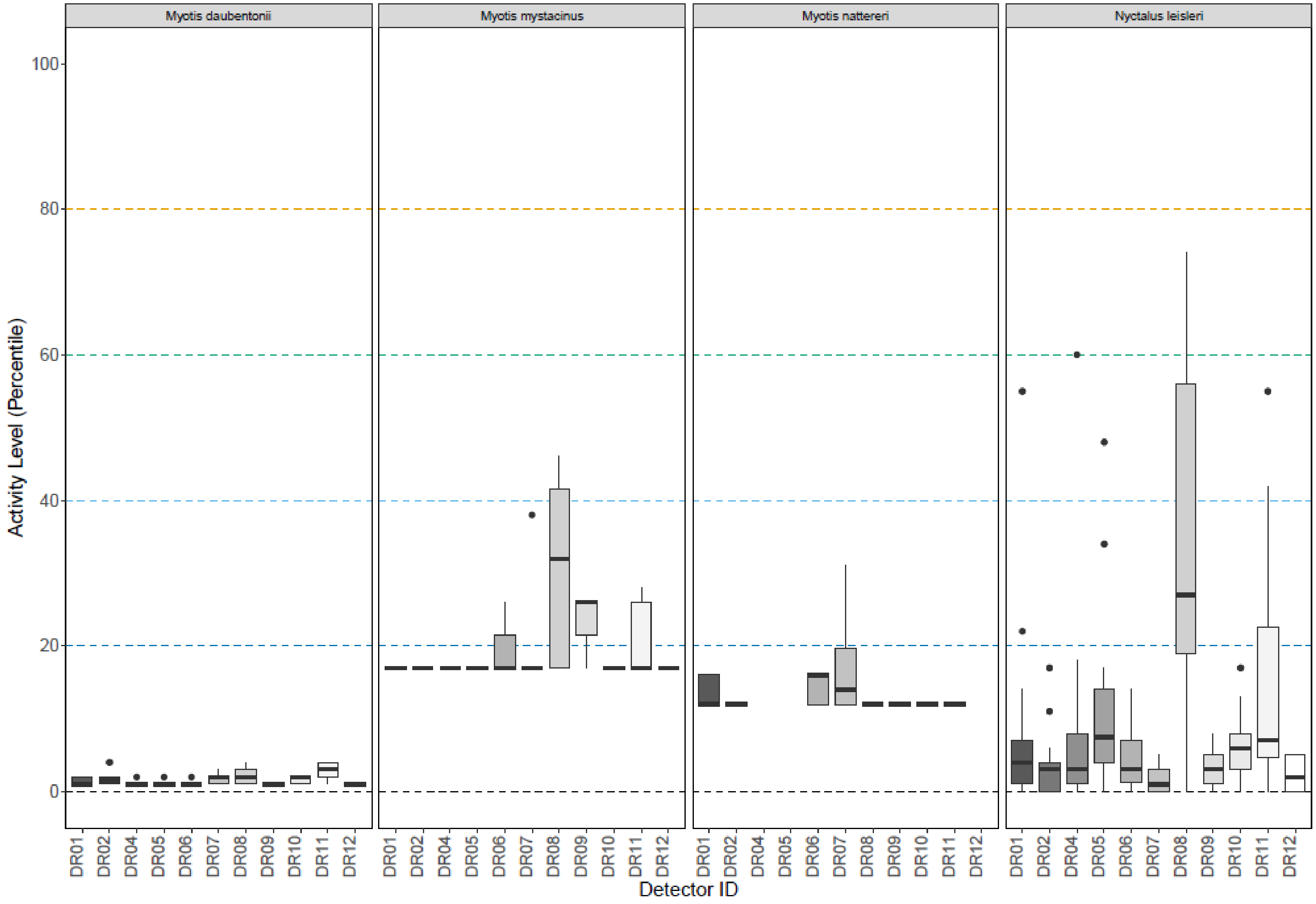


Figure 4-12: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 2 2022 at Drehid (Myotis daubentonii, Myotis mystacinus, Myotis nattereri and Nyctalus leisleri)

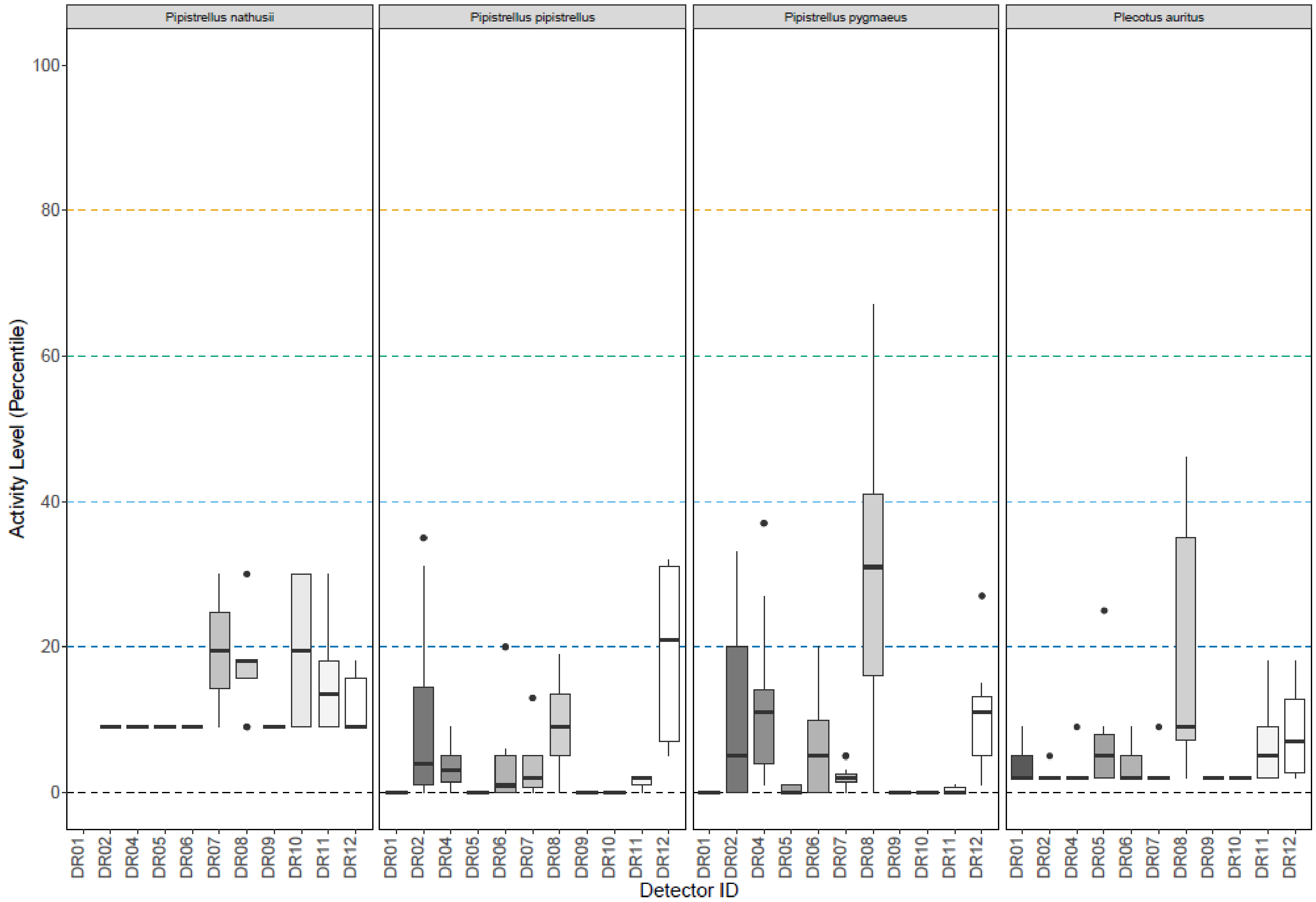


Figure 4-13: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 2 2022 at Drehid (Pipistrellus nathusii, Pipistrellus pipistrellus, Pipistrellus pygmaeus and Plecotus auritus)

4.2.3 Survey Period 3 (2022)

A summary table extracted from the EcoBat report showing the number of nights recorded bat activity fell into each activity band per species/detector location during Survey Period 3 (2022) is presented below.

Locations Dr04 had four nights of exceptional Leisler's activity; location Dr05 had one night of exceptional activity for this species; location Dr06 had three nights of exceptional activity and one night of high activity for Leisler's bat.

Location Dr02 had one night of high activity for Nathusius' pipistrelle.

Across all species and locations, nights of exceptional, high and moderate/high activity each made up <1% of the total, while nights of moderate activity contributed 5%. Nights of low/ moderate activity made up 15% of the total, while nights of low activity represented 79% of the assessed activity across all species and detector locations.

Bat surveys were conducted at Dr02 and Dr07 - Dr12 for 22 nights between 16/08/2022 and 07/09/2022. Surveys were conducted at Dr05 and Dr06 for 37 nights between 16/08/2022 and 22/09/2022. Surveys were conducted at Dr01 for 21 nights between 16/08/2022 and 06/09/2022. Surveys were conducted at Dr04 for 22 nights between 29/08/2022 and 20/09/2022.

All surveys were conducted using Song Meter SM4BAT bat detectors.

Table 4-6: Ecobat summary table detailing number of nights within each activity category per detector/species during Survey Period 3 2022

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Dr01	*Myotis daubentonii*	0	0	0	0	0	6
Dr01	*Myotis mystacinus*	0	0	0	0	0	1
Dr01	*Nyctalus leisleri*	0	0	0	0	0	11
Dr01	*Pipistrellus pipistrellus*	0	0	0	0	0	10
Dr01	*Pipistrellus pygmaeus*	0	0	0	0	0	12
Dr01	*Plecotus auritus*	0	0	0	0	0	2
DR02	*Myotis daubentonii*	0	0	0	0	0	11
DR02	*Myotis mystacinus*	0	0	0	0	0	3
DR02	*Myotis nattereri*	0	0	0	2	2	6

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
DR02	*Nyctalus leisleri*	0	0	1	2	4	15
DR02	*Pipistrellus nathusii*	0	1	0	1	0	1
DR02	*Pipistrellus pipistrellus*	0	0	0	0	0	22
DR02	*Pipistrellus pygmaeus*	0	0	0	0	11	11
DR02	*Plecotus auritus*	0	0	0	0	8	11
DR04	*Myotis daubentonii*	0	0	0	0	0	12
DR04	*Myotis mystacinus*	0	0	0	0	1	3
DR04	*Myotis nattereri*	0	0	0	0	0	6
DR04	*Nyctalus leisleri*	4	0	1	3	8	6
DR04	*Pipistrellus nathusii*	0	0	0	0	0	2
DR04	*Pipistrellus pipistrellus*	0	0	0	0	2	20
DR04	*Pipistrellus pygmaeus*	0	0	4	5	11	2
DR04	*Plecotus auritus*	0	0	0	0	7	8
DR05	*Myotis daubentonii*	0	0	0	0	0	15
DR05	*Myotis mystacinus*	0	0	0	1	3	7
DR05	*Myotis nattereri*	0	0	0	0	0	5
DR05	*Nyctalus leisleri*	1	0	0	3	10	12
DR05	*Pipistrellus nathusii*	0	0	0	0	0	1
DR05	*Pipistrellus pipistrellus*	0	0	0	0	0	29
DR05	*Pipistrellus pygmaeus*	0	0	0	0	0	30

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
DR05	*Plecotus auritus*	0	0	0	0	5	15
DR06	*Myotis daubentonii*	0	0	0	0	0	11
DR06	*Myotis mystacinus*	0	0	0	0	0	2
DR06	*Myotis nattereri*	0	0	0	0	0	3
DR06	*Nyctalus leisleri*	3	1	1	9	4	4
DR06	*Pipistrellus nathusii*	0	0	0	0	0	1
DR06	*Pipistrellus pipistrellus*	0	0	0	0	2	20
DR06	*Pipistrellus pygmaeus*	0	0	0	0	0	22
DR06	*Plecotus auritus*	0	0	0	0	0	17
DR07	*Myotis daubentonii*	0	0	0	0	0	5
DR07	*Myotis mystacinus*	0	0	0	0	7	6
DR07	*Myotis nattereri*	0	0	0	0	1	4
DR07	*Nyctalus leisleri*	0	0	0	0	0	19
DR07	*Pipistrellus pipistrellus*	0	0	0	0	0	22
DR07	*Pipistrellus pygmaeus*	0	0	0	0	0	22
DR07	*Plecotus auritus*	0	0	0	2	4	9
DR08	*Myotis daubentonii*	0	0	0	0	0	8
DR08	*Myotis mystacinus*	0	0	0	8	4	2
DR08	*Myotis nattereri*	0	0	1	0	1	4
DR08	*Nyctalus leisleri*	0	0	0	2	2	16

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
DR08	*Pipistrellus nathusii*	0	0	0	0	0	1
DR08	*Pipistrellus pipistrellus*	0	0	0	3	5	13
DR08	*Pipistrellus pygmaeus*	0	0	0	2	16	3
DR08	*Plecotus auritus*	0	0	0	0	3	14
DR09	*Myotis daubentonii*	0	0	0	0	0	5
DR09	*Myotis mystacinus*	0	0	0	0	0	2
DR09	*Myotis nattereri*	0	0	0	0	0	4
DR09	*Nyctalus leisleri*	0	0	0	0	3	16
DR09	*Pipistrellus pipistrellus*	0	0	0		0	17
DR09	*Pipistrellus pygmaeus*	0	0	0	0	0	17
DR09	*Plecotus auritus*	0	0	2	0	2	12
DR10	*Myotis daubentonii*	0	0	0	0	0	7
DR10	*Myotis nattereri*	0	0	0	0	0	3
DR10	*Nyctalus leisleri*	0	0	0	0	9	13
DR10	*Pipistrellus nathusii*	0	0	0	0	0	3
DR10	*Pipistrellus pipistrellus*	0	0	0	0	0	20
DR10	*Pipistrellus pygmaeus*	0	0	0	0	0	18
DR10	*Plecotus auritus*	0	0	0	0	4	10
DR11	*Myotis daubentonii*	0	0	0	0	0	8
DR11	*Myotis nattereri*	0	0	0	0	0	6

Location	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
DR11	*Nyctalus leisleri*	0	0	0	5	1	14
DR11	*Pipistrellus nathusii*	0	0	0	0	0	2
DR11	*Pipistrellus pipistrellus*	0	0	0	0	4	15
DR11	*Pipistrellus pygmaeus*	0	0	0	0	0	18
DR11	*Plecotus auritus*	0	0	0	2	14	1
DR12	*Myotis daubentonii*	0	0	0	0	0	8
DR12	*Myotis mystacinus*	0	0	0	0	0	1
DR12	*Myotis nattereri*	0	0	0	0	0	3
DR12	*Nyctalus leisleri*	0	0	0	0	2	32
DR12	*Pipistrellus nathusii*	0	0	0	0	0	2
DR12	*Pipistrellus pipistrellus*	0	0	0	0	0	36
DR12	*Pipistrellus pygmaeus*	0	0	0	0	0	34
DR12	*Plecotus auritus*	0	0	0	0	5	24

Differences in activity between static detector locations split by species and location are presented in below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity). The dots indicate outlier values.

Note: Myotis daubentonii = Daubenton's bat, Myotis mystacinus = whiskered bat, Myotis nattereri = Natterer's bat, Nyctalus leisleri = Leisler's bat, Pipistrellus nathusii = Nathusius' bat, Pipistrellus pipistrellus = common pipistrelle, Pipistrellus pygmaeus = soprano pipistrelle, Plecotus auritus = brown long-eared bat.

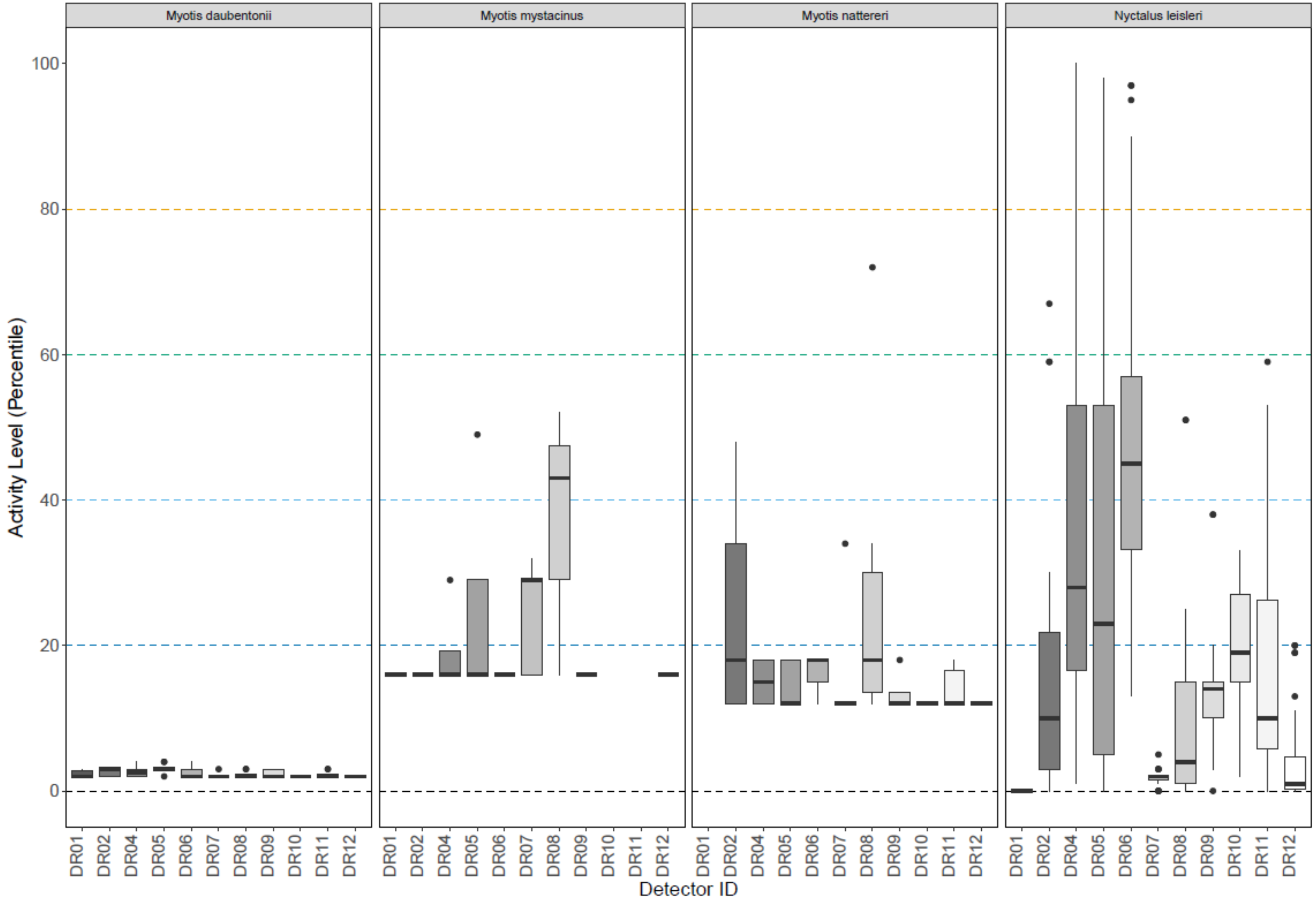


Figure 4-14: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 3 2022 at Drehid (Myotis daubentonii, Myotis mystacinus, Myotis nattereri and Nyctalus leisleri)

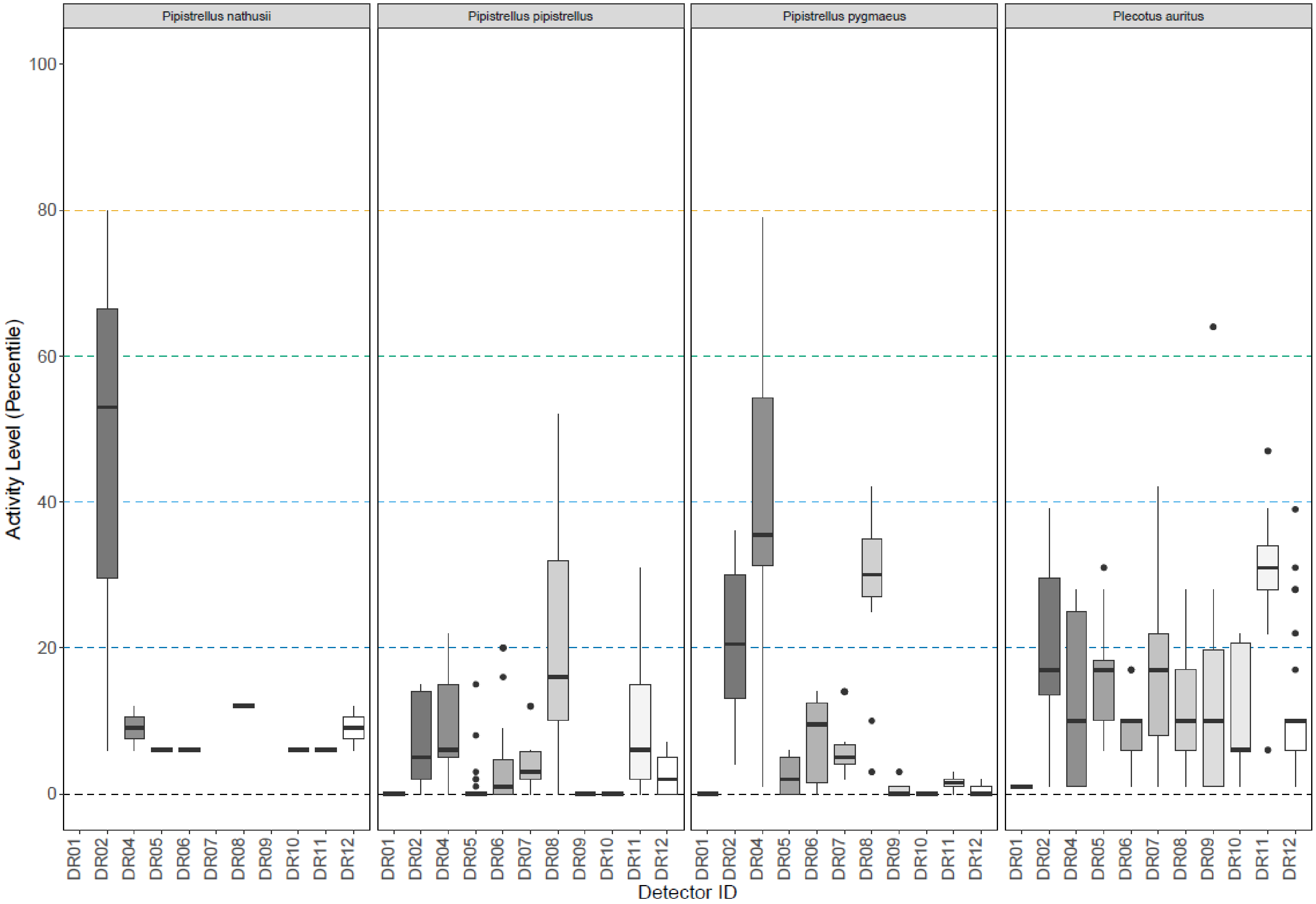


Figure 4-15: Differences in Activity between Static Detector Locations, split by split by species and detector location during Survey Period 3 2022 at Drehid (Pipistrellus nathusii, Pipistrellus pipistrellus, Pipistrellus pygmaeus and Plecotus auritus)

5. ECOLOGICAL EVALUATION

5.1 Bat Species recorded and Sensitivity

Eight species of bat were recorded during the 2022 and 2023 bat surveys at the proposed development. Table 5-1 provides an ecological valuation of each bat species and the collision risk factor in relation to wind farms. Four of the bat species recorded are considered to be High risk.

All bats recorded are classified as 'Least Concern' on the Irish Red List (Marnelll et al, 2019) and protected under the EU Habitats Directive Annex IV and Wildlife Acts.

Table 5-1: Ecological evaluaton of the bat species recorded during the bat survey (CIEEM Guidelines, 2019) and 'Bat Risk' in relation to Wind Turbines (SNH, 2019 and 2021).

Ecological Value	Geographical Scale of Importance	Bat Risk (SNH, 2021)
International	Leisler's bat	High
Regional	Nathusius' pipistrelle Brown long-eared bat Natterer's bat	High Low Low
County	-	-
Local	Soprano pipistrelle Common pipistrelle Whiskered bat Daubenton's bat	High High Low Low

Using the SNH guidelines outlined in Table 2-10, the following risk assessment for the individual turbines in relation to each bat species recorded was completed using the following values:

- Project Size = **Medium** (>10 turbines, other wind energy developments within 10km)
- Habitat Risk = **High** (suitable buildings, trees or other structures with moderate-high roost potential near the site; confirmed roosts close to the site; extensive and diverse habitat mosaic of high quality for foraging bats; site is connected to the wider landscape by a network of strong linear features including rivers, mature hedgerows and woodland edges; proximity to commuting routes)

Therefore, a Site Risk Assessment score value of **4** was applied to the Site as a whole.

5.2 Impact Assessment

The Impact assessment is determined by multiplying the Site Risk Assessment value (4 as outlined above) by the Ecobat median percentile (most frequent activity category) activity values for each turbine, converted to the activity score as shown in Table 5-2. See Table 2-9 for conversion of median percentiles to Ecobat activity levels (there are five Ecobat activity levels across the median percentile range of 0 -100).

The median percentile activity levels for each of the High Risk (leisler, common pipistrelle, soprano pipistrelle and nathusius' pipistrelle) were averaged across each survey season and converted to the corresponding Ecobat activity category for use in the risk assessment matrix (Table 5-2).

The Impact Assessment is then carried out for the individual turbines using the overall site assessment value (4) and compared to the Risk Assessment Matrix (Table 5.2) in order to determine the level of overall risk to the population.

It should be noted that the Impact Assessment is based on the median values to determine overall risk to population.

Table 5-2: Risk Assessment Matrix

	Ecobat activity percentile category					
Site Risk	**Nil (0)**	**Low (1)**	**Low – Moderate (2)**	**Moderate (3)**	**Moderate – High (4)**	**High (5)**
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	15	18
Highest (5)	0	5	10	15	20	25

Overall assessment value (i.e. Turbine Risk value) is then compared to the ranges below:

Low Overall Risk (0-4)	Medium Overall Risk (5-12)	High Overall Risk (13-25)

5.2.1 Ecobat 2023

For the 2023 survey season, a total of ten turbine locations have a low overall risk (T1-2 and T4-T11), and one turbine location (T3) is of medium overall risk in relation to Ecobat median values with regards to Leisler's bat. This is presented in Table 5-3.

Table 5-3: Risk assessment for each turbine location - Leisler's bat

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	T1	4	1	4
2	T2	4	1	4
3	T3	4	2	8
4	T4	4	1	4
5	T5	4	1	4
6	T6	4	1	4
7	T7	4	1	4
8	T8	4	1	4
9	T9	4	1	4
10	T10	4	1	4
11	T11	4	1	4

For the 2023 survey season, all 11 turbine locations have a low overall risk in relation to Ecobat median values with regards to common pipistrelle. This is presented in Table 5-4.

Table 5-4: Risk assessment for each turbine location - common pipistrelle

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	T1	4	1	4
2	T2	4	1	4
3	T3	4	1	4
4	T4	4	1	4

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
5	T5	4	1	4
6	T6	4	1	4
7	T7	4	1	4
8	T8	4	1	4
9	T9	4	1	4
10	T10	4	1	4
11	T11	4	1	4

For the 2023 survey season, all 11 turbine locations also have a low overall risk in relation to Ecobat median values with regards to soprano pipistrelle. This is presented in Table 5-5.

Table 5-5: Risk assessment for each turbine location - soprano pipistrelle

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	T1	4	1	4
2	T2	4	1	4
3	T3	4	1	4
4	T4	4	1	4
5	T5	4	1	4
6	T6	4	1	4
7	T7	4	1	4
8	T8	4	1	4
9	T9	4	1	4
10	T10	4	1	4
11	T11	4	1	4

For the 2023 survey season, Nathusius' pipistrelle was not recorded consistently enough to calculate an average median percentile value. It was not recorded at T5, T6, T8, T9 and T10. All instances where it was recorded where at levels equivalent to activity category 1 i.e. low activity.

As such, it can be assessed that activity category 1 applies to all turbine locations where this species was recorded.

Table 5-6: Risk assessment for each turbine location - Nathusius' pipistrelle

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	T1	4	1	4
2	T2	4	1	4
3	T3	4	1	4
4	T4	4	1	4
5	T5	4	Species Not Recorded	N/A
6	T6	4	Species Not Recorded	N/A
7	T7	4	1	4
8	T8	4	Species Not Recorded	N/A
9	T9	4	Species Not Recorded	N/A
10	T10	4	Species Not Recorded	N/A
11	T11	4	1	4

For the 2023 survey season, activity levels for the genus-level grouping *Pipistrellus* Spp. were assigned across all survey periods at T1-T7 and T11; as such the Ecobat median category is based on average values across all survey periods for these turbines. For T9 and T10, no activity was assigned to this group during survey period 2 and as such the Ecobat median category for these turbines is based on an average values across survey periods 1 and 2. Activity was only assigned to this genus-level grouping at T8 during survey period 2, and as such the median value for that period alone is used to calculate the Ecobat median category.

Turbines T7 and T10 have a low overall risk in relation to Ecobat median values with regards to pipistrelle species. Turbines T1-T6, T8, T9 and T11 have a medium overall risk in relation to Ecobat median values with regards to pipistrelle species. This is presented in Table 5-7.

Table 5-7: Risk assessment for each turbine location - pipistrelle species

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	T1	4	2	8
2	T2	4	2	8
3	T3	4	2	8
4	T4	4	2	8
5	T5	4	2	8
6	T6	4	2	8
7	T7	4	1	4
8	T8	4	2	8
9	T9	4	3	12
10	T10	4	1	4
11	T11	4	2	8

5.2.2 Ecobat 2022

It should be noted that turbine locations were not finalised during the 2022 survey season and as such there were no detectors covering the locations of T2, T7 and T10 for this period.

For the 2022 survey season, a total of eight turbine locations have a low overall risk (T1, T3, T4, T5, T6, T8, T9 and T11) in relation to Ecobat median values with regards to Leisler's bat. There were two detectors deployed approximately equidistant from T6 (Dr07 and Dr08). This is presented in Table 5-8.

Table 5-8: Risk assessment for each turbine location - Leisler's bat

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	Dr01	4	1	4
2	Not Covered	4	N/A	N/A
3	Dr02	4	1	4
4	Dr05	4	1	4
5	Dr06	4	1	4

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
6	Dr07	4	1	4
6	Dr08	4	1	4
7	Not Covered	4	N/A	N/A
8	Dr09	4	1	4
9	Dr10	4	1	4
10	Not Covered	4	N/A	N/A
11	Dr12	4	1	4

For the 2022 survey season, all turbine locations covered by the static detector survey have a low overall risk in relation to Ecobat median values with regards to common pipistrelle. This is presented in Table 5-9.

Table 5-9: Risk assessment for each turbine location - common pipistrelle

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	Dr01	4	1	4
2	Not Covered	4	N/A	N/A
3	Dr02	4	1	4
4	Dr05	4	1	4
5	Dr06	4	1	4
6	Dr07	4	1	4
6	Dr08	4	1	4
7	Not Covered	4	N/A	N/A
8	Dr09	4	1	4
9	Dr10	4	1	4
10	Not Covered	4	N/A	N/A
11	Dr12	4	1	4

For the 2022 survey season, seven of the turbine locations (T1, T3, T4, T5, T8, T9 and T11) covered by the 2022 static detector survey have a low overall risk in relation to Ecobat median values with regards to soprano pipistrelle. T6 has a medium overall risk for this species, based on the higher risk level assessed for Dr08. This is presented in Table 5-10.

Table 5-10: Risk assessment for each turbine location - soprano pipistrelle

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	Dr01	4	1	4
2	Not Covered	4	N/A	N/A
3	Dr02	4	1	4
4	Dr05	4	1	4
5	Dr06	4	1	4
6	Dr07	4	1	4
6	Dr08	4	2	8
7	Not Covered	4	N/A	N/A
8	Dr09	4	1	4
9	Dr10	4	1	4
10	Not Covered	4	N/A	N/A
11	Dr12	4	1	4

For the 2022 survey season, Nathusius' pipistrelle was recorded at Dr02, Dr07 and Dr09 for two survey periods and as such the average Ecobat median category for those detectors is calculated on calculated based on two survey rounds. At Dr01, this species was only recorded during survey period 1 (2022) and as such the Ecobat median percentile for this period alone was used to calculate the Turbine risk for Nathusius' pipistrelle at this location (Dr01/T1). For all other locations covered by detectors during the 2022 survey season, Nathusius' pipistrelle was recorded during all three survey periods and as such the Ecobat median percentiles for these locations were averaged to calculate turbine risk.

Locations T1, T3 and T6 (T6 based on higher median percentile assessed for Dr08) had a medium overall risk for this species, while T4, T5, T8, T9 and T11 were low risk. This is presented in Table 5-11.

Table 5-11: Risk assessment for each turbine location - Nathusius' pipistrelle

Turbine No.	Detector No.	Site risk value	Ecobat median category	Turbine risk (site risk x Ecobat median category)
1	Dr01	4	2	8
2	Not Covered	4	N/A	N/A
3	Dr02	4	2	8
4	Dr05	4	1	4
5	Dr06	4	1	4
6	Dr07	4	1	4
6	Dr08	4	2	8
7	Not Covered	4	N/A	N/A
8	Dr09	4	1	4
9	Dr10	4	1	4
10	Not Covered	4	N/A	N/A
11	Dr12	4	1	4

Table 5-12: Summary of bat survey data and assessments

Survey Season	Turbine No	Risk Assessment Leisler's bat	Risk Assessment Common pipistrelle	Risk Assessment Soprano pipistrelle	Risk Assessment Nathusius' pipistrelle	Risk Assessment *'Pipistrellus* Spp.	Clarifying comment	Bat Habitat within 200m	Bat Habitat along wind farm access tracks	Bat encounters wind farm access tracks	If no mitigation is applied, what is the potential impact level?
	As indicated in this report	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Is location of Static at Turbine location (final layout)? Yes/No			In vicinity of Turbine location	Taking into consideration the clarifying comment.
2023	1	4	4	4	4	8	No (72m)	Yes	Yes	Yes	Low-Moderate
	2	4	4	4	4	8	No (47m)	Yes	Yes	Yes	Low-Moderate
	3	8	4	4	4	8	No (88m)	Yes	Yes	Yes	Low-Moderate
	4	4	4	4	4	8	No (31m)	Yes	Yes	No	Low-Moderate
	5	4	4	4	N/A	8	No (14m)	Yes	Yes	Yes	Low-Moderate
	6	4	4	4	N/A	8	No (14m)	Yes	Yes	No	Low-Moderate

Survey Season	Turbine No	Risk Assessment Leisler's bat	Risk Assessment Common pipistrelle	Risk Assessment Soprano pipistrelle	Risk Assessment Nathusius' pipistrelle	Risk Assessment *'Pipistrellus Spp.*	Clarifying comment	Bat Habitat within 200m	Bat Habitat along wind farm access tracks	Bat encounters wind farm access tracks	If no mitigation is applied, what is the potential impact level?
	As indicated in this report	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	**Turbine risk (site risk x Ecobat median category)**	**Is location of Static at Turbine location (final layout)? Yes/No**			**In vicinity of** Turbine location	**Taking into** consideration the clarifying comment.
	7	4	4	4	4	4	No (16m)	Yes	Yes	No	Low
	8	4	4	4	N/A	8	No (23m)	Yes	Yes	No	Low-Moderate
	9	4	4	4	N/A	12	No (86m)	Yes	Yes	Yes	Low-Moderate
	10	4	4	4	N/A	4	No (182m)	Yes	Yes	No	Low
	11	4	4	4	4	8	Yes (1m)	Yes	Yes	Yes	Low-Moderate

Survey Season	Turbine No	Risk Assessment Leisler's bat	Risk Assessment Common pipistrelle	Risk Assessment Soprano pipistrelle	Risk Assessment Nathusius' pipistrelle	Risk Assessment *'Pipistrellus* Spp.	Clarifying comment	Bat Habitat within 200m	Bat Habitat along wind farm access tracks	Bat encounters wind farm access tracks	If no mitigation is applied, what is the potential impact level?
	As indicated in this report	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	**Turbine risk (site risk x Ecobat median category)**	**Is location of Static at Turbine location (final layout)?** Yes/No			**In vicinity of** Turbine location	**Taking into** consideration the clarifying comment.
2022	1	4	4	4	8	N/A	No (8m)	Yes	Yes	Yes	Low-Moderate
	2	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes	N/A
	3	4	4	4	8	N/A	No (214m)	Yes	Yes	Yes	Low-Moderate
	4	4	4	4	4	N/A	No (235m)	Yes	Yes	Yes	Low
	5	8	4	4	4	N/A	No (156m)	Yes	Yes	No	Low
	6	8	4	8	8	N/A	No (80m)	Yes	Yes	Yes	Low-Moderate
	7	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes	N/A
	8	4	4	4	4	N/A	No (279m)	Yes	Yes	No	Low

Survey Season	Turbine No	Risk Assessment Leisler's bat	Risk Assessment Common pipistrelle	Risk Assessment Soprano pipistrelle	Risk Assessment Nathusius' pipistrelle	Risk Assessment *'Pipistrellus* Spp.	Clarifying comment	Bat Habitat within 200m	Bat Habitat along wind farm access tracks	Bat encounters wind farm access tracks	If no mitigation is applied, what is the potential impact level?
	As indicated in this report	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Turbine risk (site risk x Ecobat median category)	Is location of Static at Turbine location (final layout)? Yes/No			In vicinity of Turbine location	Taking into consideration the clarifying comment.
	9	4	4	4	4	N/A	No (87m)	Yes	Yes	Yes	Low
	10	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	No	N/A
	11	4	4	4	4	N/A	No (30m)	Yes	Yes	Yes	Low

5.3 Habitat Assessment

5.3.1 Improved agricultural grassland (GA1), and Wet grassland (GS4), dense bracken (HD1)

This habitat along the boundaries may offer valuable commuting and foraging habitat for common bat species especially common pipistrelle and Leisler's bat. Low-Medium ecological value for bats.

5.3.2 Scrub (WS1), and recently-felled woodland (WS5), dry meadows and grassy verges (GS2)

May provide foraging areas for bats with some commuting potential. Low-Medium ecological value for bats.

5.3.3 Raised bog (PB1)/ Wet heath (HH3)

These areas provide little foraging habitat for bats and are not suitable for commuting for the majority of bat species, excluding Leisler's bats which do not rely on linear landscape features to commute from roosting site to foraging habitats. Low ecological value for bats.

5.3.4 Hedgerow (WL1), Treeline (WL2), and access tracks (Buildings and artificial surfaces (BL3), and Recolonising bare ground (ED3).

These provide wildlife corridors and foraging areas for many bat species. These linear habitats are essential for commuting bats. High ecological value for bats.

5.3.5 Conifer Plantation(WD4), mixed broadlaved/conifer woodland (WD2), mixed conifer woodland (WD3), immature woodland (WS2), bog woodland (WN7), mixed broadleaved woodland (WD1)

These habitat types, especially along the edge or paths/roads through it, can provide foraging areas for bats with some commuting potential. Its importance is higher when associated with treelines/hedgerows connecting in the landscape. High Ecological value for bats (edge habitats and woodland paths/roads).

5.3.6 Dystrophic lakes (FL1), depositing/lowland rivers (FW2) and Drainage ditches - FW4

There is a large array of drainage ditches in the survey area, rivers, and a small number of areas of open water. Where these are located adjacent to scrub, hedgerows/treelines, their value to bats is higher and creates an area of medium ecological value for commuting and foraging bats. Medium Local value for bats.

6. DISCUSSION

6.1 Detailed Discussion of Results

6.1.1 Static Detector Placement

As detailed in Table 2-3, Table 2-4 and Table 5-12, static detector placement did not match turbine locations exactly in all cases for the 2022 surveys. For 2022 survey locations, this was primarily due to subsequent layout changes resulting in movement or omission of turbines. For the 2023 survey static detectors were located relative to the proposed turbine locations, but focused in the majority of cases on habitats which are analogous to the habitats that would be present when the proposed turbines are in operation. For turbines located in conifer plantation, typically enclosed canopy, locating static detectors within this habitat would record low levels of bat activity as a standard, as they are suboptimal habitat for bat movement. Locating a detector in enclosed conifer would yield false negatives in terms of bat activity levels and would not reflect the habitat type that would be present when the turbine is in place and keyhole felling has been undertaken around it. Forestry edge habitat and other nearby linear habitats including hedgerows and treelines are critical features, where the movement of bats through the local environment are likely to be concentrated. Therefore, nearby forestry edges were utilised for turbine locations currently within enclosed conifer plantation to provide a more conservative representation of bat activity at these locations. The same principle applies for turbines locations in open habitats like the centre of agricultural fields away from linear features, in this case the siting of detectors at adjacent hedgerows and treelines again provides a potential overestimate of bat activity levels but is a more conservative approach to inform this assessment. The average distance between detector and turbine locations in 2023 was 52m, versus 151m in 2022. As such, the 2023 analysis is considered to provide a more accurate overall assessment of bat activity at the Proposed Wind Farm. However, the 2022 survey provides useful additional information of bat activity within the site as a whole.

The exception to the analogous habitat deployment pattern was T3. There were no linear features within the bat felling buffer for this one turbine and therefore it located completely within open habitat. The detector was deployed at the hedgerow running along the Fear English River to the east of T3 during 2023, and as such sampling was more heavily biased towards this linear habitat that the open habitat where the proposed T3 is located. Although the 2022 detector location (Dr02) was further from T3 than the 2023 location, Dr02 sampled open habitat more closely representative of the turbine location. As linear habitats are more heavily used by the majority of bat species, sampling of these is likely to result in overestimates of activity when used to assess turbine locations in adjacent open habitats, following the more conservative approach.

Leisler's bat is a species which often flies high over open habitats more than other bats; however, the Ecobat activity level for Leisler's bat was higher at the 2023 linear habitat location versus the 2022 open location. Considering this, in addition to the comprehensive coverage provided across both years of surveys, a robust assessment of all habitats in the vicinity of T3 was completed.

Detector T10 was the furthest detector from the corresponding turbine location during 2023; however, this detector was placed in analogous linear habitat which is representative of the turbine location during operation.

Overall, the placement of static detectors provided good cover of the areas in which the turbines are located, both in terms of specific turbine locations, and sampling of relevant habitats. As such, a robust assessment of the proposed turbine locations has been undertaken and provides a conservative analysis of activity levels.

6.1.2 Static Detector Analysis

As per SNH (2021) guidance, wind farms present four potential risks to bats: (i) Collision mortality, barotrauma and other injuries, (ii) Loss or damage to commuting and foraging habitat, (iii) Loss of, or damage to, roosts (iv) Displacement of individuals or populations

The species considered at highest risk from death by collision or barotrauma at wind developments are Leisler's bat and Nathusius' pipistrelle (SNH, 2021). These species habitually forage and commute in open airspace and at the heights of the rotor swept area of wind turbines.

Based on Ecobat analysis (median percentile activity score) of 2023 survey data, Leisler's bat had low activity at all turbine locations except T3, where it had low/moderate activity. Ecobat analysis of 2022 survey data indicated low activity at T1, T3, T4, T5, T6, T8, T9 and T11. The locations of T2, T7 and T10 were not covered by 2022 surveys due to layout changes between 2022 and 2023. Based on the assessed low-moderate impact level based on turbine risk for T3 (2023) for this this species, there is potential for Leisler’s bat to be affected by the proposed development in the absence of mitigation.

There were low numbers of Nathusius' pipistrelle records during static detector surveys (11 passes during 2023, 232 passes during 2022) and activity surveys (one pass in 2023). It should be noted that the total no. of passes for 2022 is likely to be an overestimate due to the tendency for Kaleidoscope AutoID to incorrectly attribute common pipistrelle records as Nathusius’ pipistrelle, and use of manual verification for 2023 data. Based on Ecobat analysis (median percentile activity score) of 2023 survey data, Nathusius' pipistrelle had low activity at T1, T4, T3, T4, T7 and T11. This species was not recorded at the remainder of detector locations during 2023. Ecobat analysis of 2022 survey data indicated low activity at T4, T5, T8, T9 and T11, and low moderate activity at T1, T3 and T6. The locations of T2, T7 and T10 were not covered by 2022 surveys due to layout changes between 2022 and 2023. Notwithstanding the bias towards overcounting this species in 2022 data, based on the assessed low-moderate impact level arising from the identified turbine risk for this this species for three turbine locations in 2022 (T1, T3 and T6), there is potential for Nathusius' pipistrelle to be affected by the proposed development in the absence of mitigation.

Soprano Pipistrelle and Common Pipistrelle are identified as being the next most vulnerable group of bats to collision fatality at wind farms in Ireland (SNH, 2021). These species are widespread and common in Ireland, and will generally be recorded at sites throughout the country. Their status as widespread species with a high risk of collision mortality puts them in the category of species with medium population vulnerability to wind farms (SNH, 2021).

During activity surveys and static detector surveys, common pipistrelle was the species with the highest overall occurrence. While common pipistrelle had the highest number of bat passes, Ecobat analysis did not indicate high activity levels for this species. Based on Ecobat analysis (median percentile activity score) of 2023 survey data, common pipistrelle had low activity at all turbine locations. Similarly for 2022, Ecobat indicated low common pipistrelle activity at all turbine locations assessed (all locations except T2, T7 and T10 which were not covered by 2022 surveys due to layout changes between 2022 and 2023). As such, the impact level associated with turbine risk for this species remained low at all locations. Common pipistrelles have been demonstrated to be attracted to wind turbines and occur around wind turbines at higher levels than at control locations nearby (Richardson et al 2021).

Therefore, it is assessed that despite the consistently low activity levels indicated for this species by Ecobat analysis, there is potential for on common pipistrelle to be affected by the proposed development prior to mitigation.

Ecobat analysis of 2023 soprano pipistrelle activity similarly indicated low activity at all locations. Ecobat analysis of 2022 data for this species indicated low activity at all surveyed locations except T6, where low/moderate activity was detected. The locations of T2, T7 and T10 were not covered by 2022 surveys due to layout changes between 2022 and 2023. Based on the assessed low-moderate impact level arising from the identified turbine risk for this this species for T6, there is potential for soprano pipistrelle to be affected by the proposed development in the absence of mitigation.

It is further noted that Ecobat analysis of genus-level pipistrelle records (Pipistrellus Spp.) indicated low/moderate activity levels at all turbines except T7 and T10 which had low activity. This is consistent with the assessments above that indicate all three pipistrelle species recorded may be affected by the Proposed Development prior to mitigation, based on medium overall risk at multiple turbines resulting in a low-moderate impact level.

6.1.3 Comparison of Activity Levels (2019, 2022 & 2023)

Although survey effort varied across the three years that static detector surveys were carried out, when average no. of nightly passes are compared for the high risk species, an overall trend of decreasing activity for common pipistrelle, soprano pipistrelle and Lesiler's bat is evident.

While this comparison relies on averages to compare the different survey years, this approach remains open to bias. It is noted that for surveys in years with higher numbers of nights surveyed, there could be increased likelihood of variability, including detection of more nights with lower activity vs. higher activity as a result of increased survey effort and timing of survey windows, with potential to reduce the average no. of bat passes. However, the alternative is also the case i.e. more nights with higher activity vs. lower activity as a result of increased survey effort and timing of survey windows.

Comparison of these averages is a useful initial high review of results, particularly in conjunction with examination of Ecobat results; however, for the reason outlined above, these initial high-level statistics must be interpreted with a degree of caution. However, the assessment has been based on the more robust statistical analysis provided by the Ecobat results.

Table 6-1: Comparison of avg. no. of nightly bat passes across static survey years

	Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Leisler's Bat	No. of nights surveyed
2019	1,123.33	594.40	Not recorded	354.30	30
2022	558.67	338.89	2.52	182.34	92
2023	675.37	313.48	0.13	263.78	86

6.1.4 Activity Surveys

Activity surveys detected bat activity across the Proposed Wind Farm and Substation sites, in addition to adjacent areas. All commonly occurring Irish bat species except lesser horseshoe bat were recorded, and activity of foraging/commuting bats was observed across all habitat types present in the study area. The activity observed reinforces the results of static detector surveys and provides complimentary information on the spatial distribution and habitat usage patterns of the bat species using the site.

6.1.5 Bat Roosting

While the presence of minor roosts in the local area is indicated by desktop records, previous surveys (2019) and 2022 roost surveys, current roost surveys for the Proposed Wind Farm and Substation focused on a core survey area of 300m around turbine locations which encompassed the requirement set out in NIEA Guidelines (Version 1.1) (2024) and NatureScot (2021) of 200m plus rotor radius (265m for Drehid). The majority of PRFs within this survey area are in trees; a number of bat boxes are also present within the northern part of the site. The survey focused on assessment of trees and bat boxes within this 300m turbine buffer, in addition to any PRFs within close proximity to proposed infrastructure beyond the 300m turbine buffer.

The current roost survey identified significant changes to the condition, habitat suitability and connectivity of the bat boxes in and around the northern part of the Proposed Wind Farm and Substation, namely that five of the boxes are no longer attached to trees (boxes 2, 3, 7 8 and 9), and that three of the boxes still attached to trees have missing or damaged inspection panels (boxes 4, 5 and 6) (reducing shelter and suitability), and box 10 which remains intact and attached has reduced suitability due to conifer clear-felling having removed during tree cover. Box 6 is also exposed after clear-felling removed surrounding tree cover. Bird droppings were also observed in boxes 6 and 10, indicating they are not currently used by bats. As such, the only bat box remaining in good condition in box 1. This bat box is not within or adjacent to any proposed infrastructure.

Boxes 4 and 5 which are in poor condition due to missing inspection panels (leaving them open to the elements), are within the footprint of works due to proximity (<1m) with an existing access track which will be upgraded. Considering the current conditions and relative locations of the bat boxes, potential for impacts to bats in this category are assessed as negligible.

Except for PRF No. 11 (willow tree with crack on main stem) which has fallen, reducing the height of the PRF to an unsuitable level, there are no changes to the status of tree PRFs in and around the Proposed wind Farm and Substation. None of the trees are within turbine felling buffers.

A number of new trees with PRFs additional to the trees identified in 2018 were recorded during surveys (see Table 3-11). A number of these are located within turbine felling buffers. These include four low potential ash trees near T1; five low potential ash trees near T2; one low potential ash tree near T4, and one low potential and one moderate potential ash tree near T5. The moderate potential ash tree within the T5 felling buffer has signs of rot, and a knothole c.3 m up trunk, potentially with room for several bats.

It is noted that mature ivy-covered trees are common across the majority of agricultural field boundaries at the proposed site. As such, while specific trees and features with bat roosting potential have been identified during current surveys, there is potential for new roost features to develop on other trees due to continued ivy growth and/or potential for new features arising from tree damage to remain obscured by ivy. As such, a preconstruction survey will be required, in addition to suitable felling methods to minimise effects to bats for all trees in agricultural areas.

The GLTA TDR survey identified a total of eight trees with PRFs or potential for PRFs which could be subject to effects from vegetation trimming to permit transport of oversized turbine component loads. All of these had low or negligible potential to host individuals or small numbers of bats.

One structure, namely a derelict shed with a partially missing corrugated roof, is within the proposed infrastructure footprint. This has no suitability for roosting bats.

As detailed within the desktop survey and results sections above, the presence of satellite roosts in buildings and suitable roost structures in the local area (outside 300m NIEA study area) has been recorded, in addition to historical use of bat boxes by soprano pipistrelles. The 2019 surveys also identified a soprano pipistrelle tree roost (1.5 km from T1), and 2018 EIAR surveys, and during 2018 EIAR bat surveys, a single soprano pipistrelle was observed emerging from the stand of trees where trees 14-21 are located (see Figure 3-3) (exact tree not observed). No single-species larger roosts were found during surveys.

While current surveys have confirmed the majority of bat boxes are now absent or in poor condition, the use of houses in the local area by roosting bats, and opportunistic use of trees by roosting bats is considered likely to persist. As such there is potential for individual or small groups of bats roosting opportunistically in trees affected by turbine buffer felling or TDR vegetation trimming to be negatively affected. This would occur through either direct effects if bats were present during tree felling or vegetation trimming, or due to reduction in roosting opportunities at the site scale.

Most Irish bat species roost in trees at least occasionally, with the exception of lesser horseshoe bat. Whiskered bat also only roosts in trees very occasionally. Brown long-eared bat is known to roost in trees year round. Pipistrelle bats as well as Daubenton's bat and Natterer's bat are known to use different features in trees as roosts occasionally.

6.1.6 Habitat Effects

The felling of linear wooded habitats around turbines in agricultural land will result in severance of bat commuting and foraging routes, in addition to potential loss of roosting features within mature trees. Felling around turbines in closed wooded habitats will increase the area of open habitats and length of woodland edge habitats.

6.1.7 Timing of Bat Activity

Ecobat analyses provide distribution graphs showing the occurrence of bat passes relative to sunset and the typical emergence times of each species. Where records occur before or during the typical emergence times of a species, this could potentially be attributed to the presence of a roost in the area.

Early Leisler’s bat activity was frequent across most locations and periods; however, since this species is typically early-emerging (mean 18 – 19mins after sunset[5]) and travels fast in direct flight it is less likely that early records could indicate a nearby roost. One location where relatively higher amounts of Leisler’s bat activity was recorded early was at Dr07 (turbine 6) during period 3 (2022).

Notable patterns in this regard include relatively high numbers of common and soprano pipistrelle passes occurring at Dr11 and T10 from 15 minutes before sunset onwards during survey periods 1 and 3 (2022) and period 1 (2023). There were also some records of Leisler’s bat, brown long-eared bat, whiskered bat and Myotis Spp. at these locations which followed similar patterns, although not as consistently as common and soprano pipistrelle.

[5] Collins, (2023)

Other locations and periods where elevated common and soprano pipistrelle activity occurred before or around emergence times included: Dr07/Dr07/T6 during survey period 1 and 2 (2022) and survey period 1 (2023); T5 and T9 during survey period 2 (2023); Dr02/T3 during survey period 3 (2022 & 2023). Elevated common pipistrelle activity occurred early at T4 during survey period 1 (2023), at T8 during survey period 2 (2023), and at Dr12 during survey period 2 (2022). Elevated soprano pipistrelle activity occurred early at T2 during survey period 2 (2023), at T1 during survey period 3 (2023), and at Dr07 during survey period 2 (2022).

These patterns do not conclusively indicate the presence of a nearby roost; however, in some cases, such as certain survey rounds at Dr11/T10, T3 and T8 where common and soprano pipistrelle activity was recorded up to 15 minutes before sunset, the likelihood of a roost occurring nearby is increased. The fact that human settlement in the area is characterised by dense ribbon development along the roads surrounding the site means there are likely to be ample roosting opportunities across the housing in the surrounding area.

6.2 Constraints

As detailed earlier, all Irish bats are protected under the Wildlife Act (Revised). Destruction, alteration, or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence must be obtained from the National Parks and Wildlife Service (NPWS) before works can commence.

In addition, it should be noted that any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by the NPWS.

6.3 Potential Impacts

As outlined by NatureScot (2021), wind farms can affect bats in the following ways:

- Collision mortality, barotrauma, and other injuries
- Loss or damage to commuting and foraging habitat
- Loss of, or damage to roosts
- Displacement of individuals or populations

Furthermore, as indicated in Richardson et al (2021) common pipistrelle bats may be attracted to wind turbines. The study showed common pipistrelle activity was 37% higher at turbines than at control locations. In the same study, soprano pipistrelle showed no increase in activity between the turbine and control locations. The study further discussed the observed higher levels of activity could be because there are more bats around turbines, or because animals spend more time in these locations relative to controls, even if the number of individual common pipistrelles remains the same. We cannot distinguish between these possibilities using acoustic data. However, either way, higher levels of activity around turbines is likely to increase fatality risks and help to explain why fatality rates are often not predicted by acoustic surveys for common pipistrelle activity conducted prior to facility construction.

7. MITIGATION

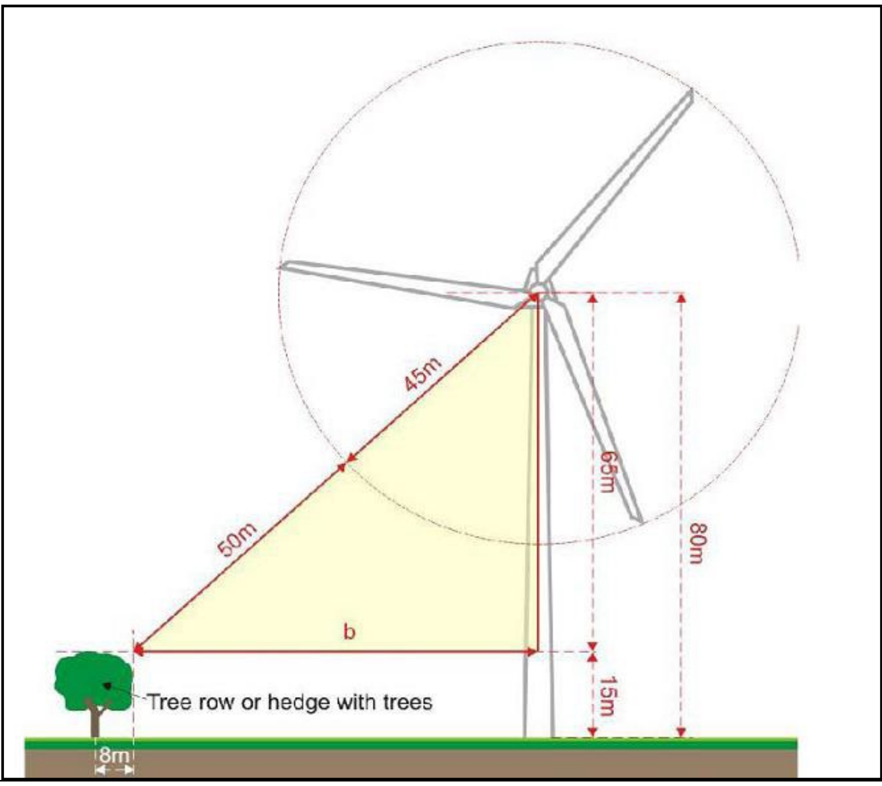
7.1 Mitigation during Construction Phase

7.1.1 Vegetation Buffer

According to SNH (2021) guidance:

> *"The Eurobats guidance recommends a 200m buffer around woodland areas. There is, however, currently no scientific evidence to support this distance in the UK and it is recommended that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features such as wetlands etc.) is adequate mitigation in most, lower risk situations. Exceptionally, larger buffers may be appropriate, e.g. near major swarming and hibernation sites. The longevity of wind farms should also be taken into account and the maximum growth, or management, of woodland and other relevant habitat features considered in their planning. "*

These distances were taken into account during the design phase of the development. The following formula was used to calculate the required felling buffer for each turbine (taking into account the height of surrounding woodland/plantations at each turbine location):



$b = \sqrt{(50 + \mathrm{bl})^2 - (\mathrm{hh} - \mathrm{fh})^2}$

where:

b = the distance on the ground between the edge of the canopy and the turbine (m)

bl = blade length (m)

hh = hub height (m)

fh = tree/hedgerow height

Each of the locations of the eleven turbines was surveyed and the vegetation height informed the application of the dimensions of the blade tip buffer at turbine locations, dependant on the surrounding habitat and turbine specification. The likely growth of hedgerow/treeline/forestry was taken into account for the calculation. Surrounding habitats, height of surrounding trees and felling buffer calculated using the above equation are included in Table 7-1 below.

It should be noted that the proposed hub height for T1 is 81.4m for T1, versus 100.5 for all other turbines, resulting in a larger felling buffer for T1 compared to other turbines with the same height of surrounding vegetation.

To minimize risk to bat populations, a buffer zone is recommended around any treeline, hedgerow, woodland feature, into which no part of the turbine should intrude. The buffers recommended for each turbine are presented in Table 7-1.

Table 7-1: Assessment of potential turbine/bat conflict zones [6]

Turbine number	Habitats Requiring Felling	Surrounding Tree/Hedgerow Height (fh/m)	Felling Buffer Radius (m)
T1	Hedgerow/Treeline Mosaic	12	93.5
T2	Hedgerow/Treeline Mosaic	12	75.8
T3	Hedgerow/Treeline Mosaic	12	75.8
T4	Hedgerow/Treeline Mosaic	12	75.8
T5	Hedgerow/Treeline Mosaic	12	75.8
T6	Conifer Plantation	20	84.2
T7	Conifer Plantation, Mixed Broadleaved/Conifer woodland, Bog Woodland	15	79.1
T8	Mixed Conifer Woodland, Mixed Broadleaved/Conifer woodland, Bog Woodland, Scrub	12	75.8
T9	Conifer Plantation	15	79.1
T10	Conifer Plantation	6	68.1
T11	Conifer Plantation, Mixed Broadleaved/Conifer Woodland, Bog Woodland	20	84.2

[6] Based on turbine hub-height and blade length which for T1 is 81.5 and 66.5 m respectively and 100.5m and 66.5m respectively for all other turbines.

Existing trees / scrub will be cleared around ten proposed turbines, T1, T2, T4, T5, T6, T7, T8, T9, T10 and T11 to provide a vegetation-free buffer zone around each turbine. The minimum distance has been taken into consideration for felling of conifer plantation around wind turbines. All buffers will be maintained throughout the lifetime of the wind farm. Due to sufficient existing separation from treelines, T3 does not require any felling to achieve the required 75.8m buffer.

It is noted that an enlarged buffer using a 90m distance from turbine blade tips to surrounding vegetation was recommended to be implemented in the 2019 bat assessment. This was based on high Ecobat activity levels for Leisler's bat for a number of turbines. Since the current assessment indicates none of the turbine locations are above low/moderate risk for Leisler's bat, this precautionary extension of the felling buffers is not required.

The following mitigation measures for bats are recommended:

7.1.2 Supervision of vegetation clearance

An ecologist/ECoW will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate (e.g., ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand).

It is recommended to complete clearance work during the autumn and spring months. Complete clearance work at least 6 months prior to installation of wind turbines. Studies have shown that bats are attracted to clear felled forestry areas due to increase insect loading. This has been shown to occur for a period of 3-6 months before the insect loading reduces to precleared felled levels.

7.1.3 Diversion from turbines via Hedgerows and Treelines

Linear features such as hedgerows and treelines serve as commuting corridors for bats (and other wildlife). Vegetation buffer clearance around turbines will alter commuting and foraging routes associated with existing hedgerows and woodland edges to avoid bats entering the rotor sweep zone of turbines. Hedgerow and treeline planting will be carried out for the Proposed Development. This will reinstate or replace linear habitat loss to ensure no net loss of these habitats occurs.

Where hedgerows and treelines are affected by turbine clearance buffers, bats will be directed away from tree-free buffers along an alternative commuting route. Where bat buffers are applied, the surrounding hedgerows and treelines should act as commuting corridors, leading bats away from the turbine location, and these hedgerows should not end abruptly at the bat buffer zones. This will be achieved by planting new pollinator-friendly hedgerows, connecting existing hedgerows onsite, around the bat buffers. Willow and Alder will be included in these hedgerows due to their rapid growth. It is proposed to create double lines of hedgerow, with Willow on one side, and pollinator-friendly hedgerow species listed below on the other. Planting of these species will be staggered to prevent excessive shading and aid establishment of the hedgerows.

All hedgerow planting is required to use plants of native provenance. The landscaping contractor is required to be informed well in advance to allow the acquisition of suitable native stock. 2–3-year-old alder and willow trees are required for hedgerows to help accelerate establishment. These will be supplemented with planting of whips.

The following fast-growing damp tolerant species are to be planted along the inner edges of these hedgerows: grey willow *Salix cinerea* and alder *Alnus glutinosa*. The following native fruiting hedgerow species are to be planted along the outer edges of these hedgerows: blackthorn (*Prunus spinosa)*, elder (*Sambucus nigra)*, Holly *(Ilex aquifolium)* and rowan *(Sorbus aucuparia)*.

Tightly cut hedgerows with flat tops provide little benefit to wildlife; taller and bulky hedgerows are required as this provides more shelter for wildlife. When the hedgerows are maintained, stems will be cut a little above the last cut as cutting back to the exact same point depletes the energy of the hedgerow, forms a build-up of scar tissue which discourages new growth.

Light annual cutting of hedgerows is not good for wildlife as it limits the production of flowers and fruit. The sites hedgerows will be cut every three to four years in rotation if cutting is required, as this will leave areas of undisturbed hedgerows. Cutting equipment used will be sharp so as not to shatter or fray the hedge. Shattering and fraying allows for disease to enter plants and can lead to decay and weaken the vigour of the hedgerow. A finger-bar cutter is recommended as the most appropriate tool to minimise fraying and smashing of branches (Heritage Council, 2017). A flail-type hedge cutter is unsuitable for hedge trimming in situations where hedgerow health is a priority.

Hedgerow maintenance will not be carried out between the 1st of March and 31st of August as this is the nesting period for birds and any maintenance at this time will disturb breeding; this is in keeping with the Wildlife Act 1976 (as amended).

7.1.4 Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Brown Long-eared Bat and Whiskered Bat are highly averse to artificial night lighting. Artificial night lighting should be avoided throughout the site. Construction operations within the wind farm site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) will be used to prevent overspill.

This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

It is understood that flashing red aviation lights will be provided on perimeter turbines. These will not negatively impact bats (Bennett and Hale, 2014).

7.1.5 Pre-construction Surveys

If three years lapse from between planning-stage surveys in 2023 and installation of the wind turbines, it will be necessary to repeat one season of surveys during the activity period. Future survey work will be completed according to best practice guidelines available (SNH, 2019/ 2021; Hundt, 2012 & Collins, 2023).

A survey of trees proposed to be felled to search for potential bat roosts prior to construction.

Based on current surveys, a total of 12 trees with potential for use by individual or small numbers of bats are present within turbine felling buffers and will require felling if the wind farm is granted permission. This will result in the loss of potential or actual bat roosting (and foraging) opportunities. Best practice in tree-felling with respect to protection of potential bat roosts should be employed, including pre-felling emergence surveys and hiring a climbing specialist with bat training and licensing to check roost features with an endoscope for bats where necessary.

The eight trees with PRFs or potential for PRFs along the TDR potentially subject to effects from vegetation trimming will require similar measures (pre-felling works emergence surveys and where required inspection at height).

If new bat roosts are present in areas affected by proposed felling, a bat derogation license will be sought from the National Parks and Wildlife Service.

7.1.6 Relocation/Retention of Bat Boxes and PRFs

Bat boxes 4 and 5 adjacent to the proposed/existing access route will be replaced with new boxes (4a and 5a) located directly north along the woodland edge bordering agricultural fields (approx. location ITM 676282 737906). This will mitigate any direct impacts to these bat boxes associated with upgrade works to this section of access track, in addition to providing boxes in optimal condition for use by bats.

Following confirmation that bats are absent prior to felling, the tree PRF (knothole in trunk) of tree C will be retained and relocated to the riparian zone along the Fear English River North of T4. This will be achieved by cutting out the section of trunk containing the PRF following felling, and strapping it to a suitable mature tree along the Fear English riparian zone at similar height (3m or higher). If this is not feasible, a bat box will be provided along the Fear English riparian zone.

7.2 Mitigation during Operational Phase

7.2.1 Feathering of Blades

Turbines will operate in a manner which restricts the rotation of the blades as far as is practicably possible below the manufacturer's specified cut-in speed (SNH 2021). This is usually achieved by feathering the blades during low wind speeds; the angle of the blades is rotated to present the slimmest profile possible towards the wind, ensuring they do not rotate or 'idle' when not generating power.

Turbine blades spinning in low wind can kill bats, however bats cannot be killed by feathered blades which are not spinning (Horn et al., 2008). The feathering of turbine blades combined with increased cut-in speeds have been shown to reduce bat fatalities by up to 50% (SNH 2021). As such, the feathering of blades to prevent 'idling' during low wind speeds is proposed for all turbines.

7.2.2 Cut-in Speeds/Curtailment

While bat activity varied by species, no locations had activity for any species higher than low/moderate levels (based on Ecobat median percentile scores).

Therefore, increased cut-in speeds are not required from commencement of operation, but will rather be reserved for implementation where required based on operational monitoring (see Sections 7.2.3 and 7.2.4).

7.2.3 Post Construction Surveys

Monitoring of bat activity at turbine locations using static detectors will take place for at least three years after construction, providing sufficient data to detect any significant change in bat activity relative to pre-construction levels. It will assess changes in bat activity patterns and the efficacy of mitigation to inform any changes to curtailment requirements.

During years one to three of operation bat activity will be measured continuously during monitoring periods between April and mid-October at each turbine location, in combination with carcass surveys. In addition, wind speed and temperature data will be continuously recorded at the nacelle height of each turbine.

Modern, remotely-operated wind turbines as proposed here allow cut-in speeds to be controlled centrally/automatically, facilitating an operation regime designed to minimise harmful impacts to bats.

The feathering of turbine blades combined with increased cut-in speeds have been shown to reduce bat fatalities from 30% and up to 90% (Adams et al., 2021, Arnett et al., 2011, 2013; Baerwald et al., 2009). The most recent of studies showed a 63% decrease in fatalities (Adams et al., 2021).

7.2.4 Operational Curtailment

Monitoring will be carried out for the first three years of operation, and an annual review at the end of each of these years will determine whether increased cut-in speeds should be implemented.

If, following any of the initial three years of post-construction surveys, bat activity increases above the baseline and/or remains consistently high and carcass searches indicate fatalities are occurring (refer below), increased cut-in speeds will be implemented.

Alternatively, if it is found that the results of bat activity surveys and fatality searches confirm the level of bat activity at turbine locations remains low or low/moderate then curtailment will not be required.

Bat activity will subsequently be monitored in years 5, 10, 15, 20, 25 and 30 with further review after each monitoring period.

Where post construction acoustic surveys are undertaken, they will utilise full spectrum automatic detectors deployed, as a minimum, for one complete bat activity season.

Acoustic monitoring will be supplemented with thermal imaging cameras etc. to provide more detailed information on bat activity in the vicinity of turbines.

An assessment of static data gathered during operational surveillance will be completed using the online analysis tool Ecobat as recommended by SNH (2021) as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.

If the requirement for curtailment is identified following the initial 3-year monitoring period, the following measures will be implemented:

Increasing the cut-in speed above that set by the manufacturer can reduce the potential for bat/turbine collisions. A study by Arnett et al. (2011) showed a 50% decrease in bat fatality can be achieved by increasing the cut-in speed by 1.5 m/s.

Species with elevated risk of collision (Leisler's bat, soprano and common pipistrelle) in particular could benefit from increasing the cut-in speed of turbines, as dictated on a case-by case basis depending on the activity levels recorded at each turbine.

If required based on operational monitoring results, cut-in speeds should be increased to 5.5 m/s during the bat activity season (April-October) or where temperatures are optimal for bat activity, from 30 minutes prior to sunset and to 30 minutes after sunrise at turbines where surveillance shows high bat activity levels for High and Medium-Risk species and/or if bat carcasses are recorded.

The duration required depends on the level of mitigation required for each individual turbine i.e. a full bat activity season or only spring and autumn (duration will be determined by the first year of surveillance).

Cut-in speed restrictions will be operated according to specific weather conditions:

- When the air temperature is greater than 7°C (as bat activity does not usually occur below this temperature).
- Generally, bat activity peaks at low wind speeds (<5.5m/s). As such, it has been shown that curtailing the operations of wind turbines at low wind speeds can reduce bat mortality dramatically, particularly during late summer and the early autumn months.

Due to the considerable unnecessary down time resulting from the "blanket curtailment" and the advances in smart curtailment a focused curtailment regime is further proposed as an optional means of achieving the level of curtailment indicated as required by operational monitoring.

This will focus on times and dates, corresponding with periods when the highest level of bat activity occur within the Site. This includes the use of the SCADA (Supervisory Control and Data Acquisitions) operating system (or equivalent) to only pause/feather the blades below a specified wind speed and above a specified temperature within specified time periods.

Post-construction surveys will be undertaken for the first three years of operation to confirm if curtailment is required in line with post-construction activity levels. The post construction surveys will be used to update the curtailment regime (blanket curtailment) designed around the values for the key weather parameters and other factors that are known to influence collision risk. This will include all of the following:

- Wind speed in m/s (measured at nacelle height)
- Time after sunset
- Month of the year
- Temperature (ºC)
- Precipitation (mm/hr)

7.2.5 Buffer Zones

The vegetation-free buffer zones around the identified turbines will be managed and maintained during the operational life of the development.

Due to mitigation by design, turbines will be sited at a suitable separation distance from treelines/hedgerows and trees or vegetation will be removed to ensure a woodland-free buffer zone.

The immediate surroundings of individual turbines will be managed and maintained so that they do not attract insects (i.e. the concentration of insects in the wind turbine vicinity should be reduced as much as possible, but not such that insect abundancies affected elsewhere on the site). This should be achieved through physical management of habitats without the use of toxic substances.

The radius of each buffer zone as determined by the height of surrounding vegetation is listed in Table 7-1 above.

It is noted that no trees are present within the T3 buffer, and are also absent from other turbine buffers within agricultural land (apart from existing hedgerows). Currently, no management other than removal of trees within these buffers is required, due to ongoing agricultural management limiting vegetation within these buffers to low-growing grassland or cropland. However, vegetation management encompassing the entire extent of the buffers identified in Table 7-1 will apply in the case that regular grazing or tillage of these buffers ceases, and targeted intervention is required to keep vegetation short.

7.2.6 Monitoring of Mitigation Measures

The success of the implemented mitigation measures for bats on the project will be monitored for a period of three years post construction, with further monitoring in years 5, 10, 15, 20, 25 and 30. Appropriate measures will be taken to enhance prescribed mitigation if and where required. A recommended schedule for monitoring is given in Table 7-2 below.

7.2.7 Bat Fatality Monitoring

Whilst no significant residual effects on bats are predicted, the development could provide an opportunity to gain baseline data on bat/turbine interaction and it is recommended that the scheme be monitored for bat fatalities for the first three years of operation (post construction surveys) and subsequently in years 5, 10, 15, 20, 25 and 30 as part of the additional curtailment monitoring schedule. A comprehensive onsite fatality monitoring programme is to be undertaken following published best practice (e.g. SNH 2021 or equivalent at the time of operation).

The primary components of the mortality programme are outlined below:

1. Carcass removal trials to establish levels of predator removal of possible fatalities. This should be done following best recommended practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. No turbines which are used for carcass removal trials should be used for subsequent fatality monitoring.
2. Turbine searches for fatalities should be undertaken following best practice in terms of search area (focusing on hard standing) and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (1.) above. [7]
3. A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).
4. Recorded fatalities should be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

7.2.8 Monitoring schedule

Table 7-2: Monitoring schedule recommended for bat mitigation measures

Mitigation measure	Monitoring required	Description	Duration
Bat boxes / PRFs	Monitor bat use	Bat boxes and PRFs to be placed at/moved to locations removed from wind turbines as determined by project ecologist/ECoW at least 1 season before construction start. These shall be examined by a licensed bat specialist according to NPWS recommendations. Records should be submitted to Bat Conservation Ireland for inclusion in its bat distribution database. Re-	From mounting to 3 years post construction.

[7] Suitably trained dogs with handlers are significantly more efficient and faster than humans in locating carcasses and should preferably be used to achieve more robust results. Dog searches are, however, resource-demanding and may not always be necessary to identify if a problem exists.

Mitigation measure	Monitoring required	Description	Duration
		site if necessary. Annual cleaning required if well used by bats or if used by birds. Replacement if damaged/lost.	
Mortality study	Fatality monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation conducted during years 1, 2, 3, 5, 10, 15, 20, 25 and 30 post construction.
Activity monitoring	Bat activity monitoring	Static detector surveys at detector locations during the bat activity season (between April and mid-October). Assessment of activity levels using Ecobat or other currently accepted analysis methods.	From initial operation conducted during years 1, 2, 3 post construction. Additional years to be surveyed if requirement is indicated by fatality monitoring.

Table 7-3: Summary of Operational-phase mitigation measures for bats

Moderate and Moderate-High Level Bat Mitigation Applies to XX Turbines
Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).
Implement a monitoring programme for the first three years of operation to ensure that bat activity is at a low level in vicinity of these turbines. Review monitoring results to determine if further bat mitigation measures are required.
Continue monitoring for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required. The requirement for the continuation of monitoring across subsequent monitoring years (5, 10, 15, 20, 25 & 30) will be reviewed in consultation with NPWS.
Undertake a carcass search for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required. Repeat searches in years 5, 10, 15, 20, 25 & 30.
Clear and maintain buffer zone free of woodland/trees within 50m of turbine blade tips.
Maintain buffer zones around wind turbines in a manner that does not attract insects.

7.3 Mitigation Measures during Decommissioning

The same mitigation measures will apply for the decommissioning phase as for the construction phase.

8. ENHANCEMENT

It is proposed to provide new bat boxes around the northern section of the Proposed Development. These bat boxes shall be located away from proposed turbine locations, and positioned in areas where trees are likely to be retained long-term.

This measure will contribute to reinstating the roosting availability which existed before the current bat boxes became degraded and damaged.

Table 8-1 below lists the new bat boxes proposed to contribute to ecological enhancement, and also indicates their locations. Please note boxes 4a and 5a described above in Section 7.16 are classified as mitigation rather than enhancement and as such are not listed in the table below; they are however still incorporated within the overall identifying number sequence for all bat boxes.

Table 8-1: New bat boxes proposed as ecological enhancement

ID	Description	Location (approx.) (ITM)
1a	A new bat box will be installed on the same tree as existing bat box no.1 to provide additional roosting capacity and continuity of roosting availability in the event that existing box 1 becomes degraded or damaged.	676037 738190
2a	A new bat box will be installed in the tree tunnel along the existing Coillte site access route. This will provide new roosting opportunities to replace the former bat box no.2 which was located nearby.	676060 738126
3a	A new bat box will be installed in the tree tunnel along the existing Coillte site access route. This will provide new roosting opportunities to replace the former bat box no.3 which was located nearby.	676069 738096
6a & 6b	Two new bat boxes will be installed at the northern end of the Coillte 'old woodland' biodiversity area comprised of mature broadleaved trees. These will provide new roosting opportunities in addition to the currently degraded bat box no.6.	676660 737940
7a	A new bat box will be installed along the mature beech treelines c. 350m south-east of T11. This will provide new roosting opportunities to replace the former bat box no.7 which was located in this area.	676688 737482
8a	A new bat box will be installed along the mature beech treelines c. 350m south-east of T11. This will provide new roosting opportunities to replace the former bat box no.8 which was located near T11.	676655 737457

ID	Description	Location (approx.) (ITM)
9a	A new bat box will be installed along the mature beech treelines c. 350m south-east of T11. This will provide new roosting opportunities to replace the former bat box no.9 which was located near T11.	676601 737426
10a	A new bat box will be installed along the mature beech treelines c. 350m south-east of T11. These will provide new roosting opportunities in addition to the currently degraded bat box no.10 located to the north-west of this area.	676563 737414

9. RESIDUAL EFECTS

The turbines are to be located within or close to existing tree—dominated vegetation but providing vegetation free buffer zones ranging from 68.1m to 93.5m (depending on surrounding vegetation height and turbine hub height) around relevant turbines will reduce the risk of collision and/or barotrauma to foraging and/or commuting species such as pipistrelles. Post construction bat fatality monitoring will also be undertaken at the subject site.

The adjudged worst-case scenario is that, during operation, the turbines may possibly cause injury or death to a few individual specimens of Leisler's bat as it is a high-flying species (10m to 70m+). However, the amount of time spent hunting at the upper height limit cannot be assessed accurately due to the maximum distance (60m to 80m) of detection of this species by ultrasound detectors but most activity and time can be expected to occur in the mid-region of this species' hunting altitude i.e. 40m.

The resulting effect of the development on local bat populations, with implemented mitigation measures, is considered to be a Slight to Imperceptible Residual Negative Reversible Effect and in the Local Context with the favourable conservation status (FCS) of bat species being unaffected and all species confirmed or expected on or near the study areas are predicted to persist.

10. CONCLUSION

Survey results and Ecobat analysis indicated moderate/low activity levels in at least one turbine location for three of the higher risk species (Leisler's bat, soprano pipistrelle and Nathusius pipistrelle), low activity at all locations for common pipistrelle. As such, blanket curtailment is not required from the outset of operation, but will be reserved for implementation in the event that monitoring indicates increased bat activity and/or fatalities at turbine locations.

Eight species of bats have been recorded as present at the development during the bat surveys. All are listed as 'Least Concern' on the Irish Red List, and Annex IV of the EU Habitats Directive.

A comprehensive suite of mitigation measures have been provided to avoid or reduce negative effects on bats during construction and operation of the proposed wind farm. A key measure is the provision of a buffering distance (68.1m to 93.5m) to maintain a distance of 50m from turbine blade tips to key habitat features, which will be implemented during construction and operation of the development.

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DESIGNING AND DELIVERING A SUSTAINABLE FUTURE

APPENDIX 1

Activity Survey Results

Legend

- Road Layout
- Turbine Hardstands
- Temporary Compound
- Turbine Locations
- Nyctalus leisleri
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus
- Myotis sp.
- Plecotus auritus

TITLE: Bat Activty 2022- Round 1 - Turbines 1-3			
PROJECT: P20-326 Drehid Cable Route EIAR			
FIGURE NO.:	-		
CLIENT:	Statkraft		
SCALE:	1:6812	**REVISION:**	0
DATE:	13/12/2024	**PAGE SIZE:**	A3

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Legend

- Road Layout
- Turbine Hardstands
- Turbine Locations
- Nyctalus leisleri
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus

TITLE:	Bat Activty 2022- Round 1 - Turbines 4-8
PROJECT:	P20-326 Drehid Cable Route EIAR
FIGURE NO.:	-
CLIENT:	Statkraft
SCALE:	1:6812
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PAGE SIZE:	A3

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Legend

- Road Layout
- Turbine Hardstands
- Temporary Compound
- Turbine Locations
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus
- Nyctalus leisleri

TITLE: Bat Activty 2022- Round 2 - Turbines 1-5			
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Legend

- Road Layout
- Turbine Hardstands
- Temporary Compound
- Substation
- Turbine Locations
- Nyctalus leisleri
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus

TITLE:	Bat Activty 2022- Round 2 - Turbines 9-11		
PROJECT:	P20-326 Drehid Cable Route EIAR		
FIGURE NO.:	-		
CLIENT:	Statkraft		
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Legend

- Road Layout
- Turbine Hardstands
- Temporary Compound
- Substation
- Turbine Locations
- Nyctalus leisleri
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus

TITLE: Bat Activty 2023- Round 1 - Turbines 1-3			
PROJECT: P20-326 Drehid Cable Route EIAR			
FIGURE NO.:	-		
CLIENT:	Statkraft		
SCALE:	1:4814	**REVISION:**	0
DATE:	13/12/2024	**PAGE SIZE:**	A3

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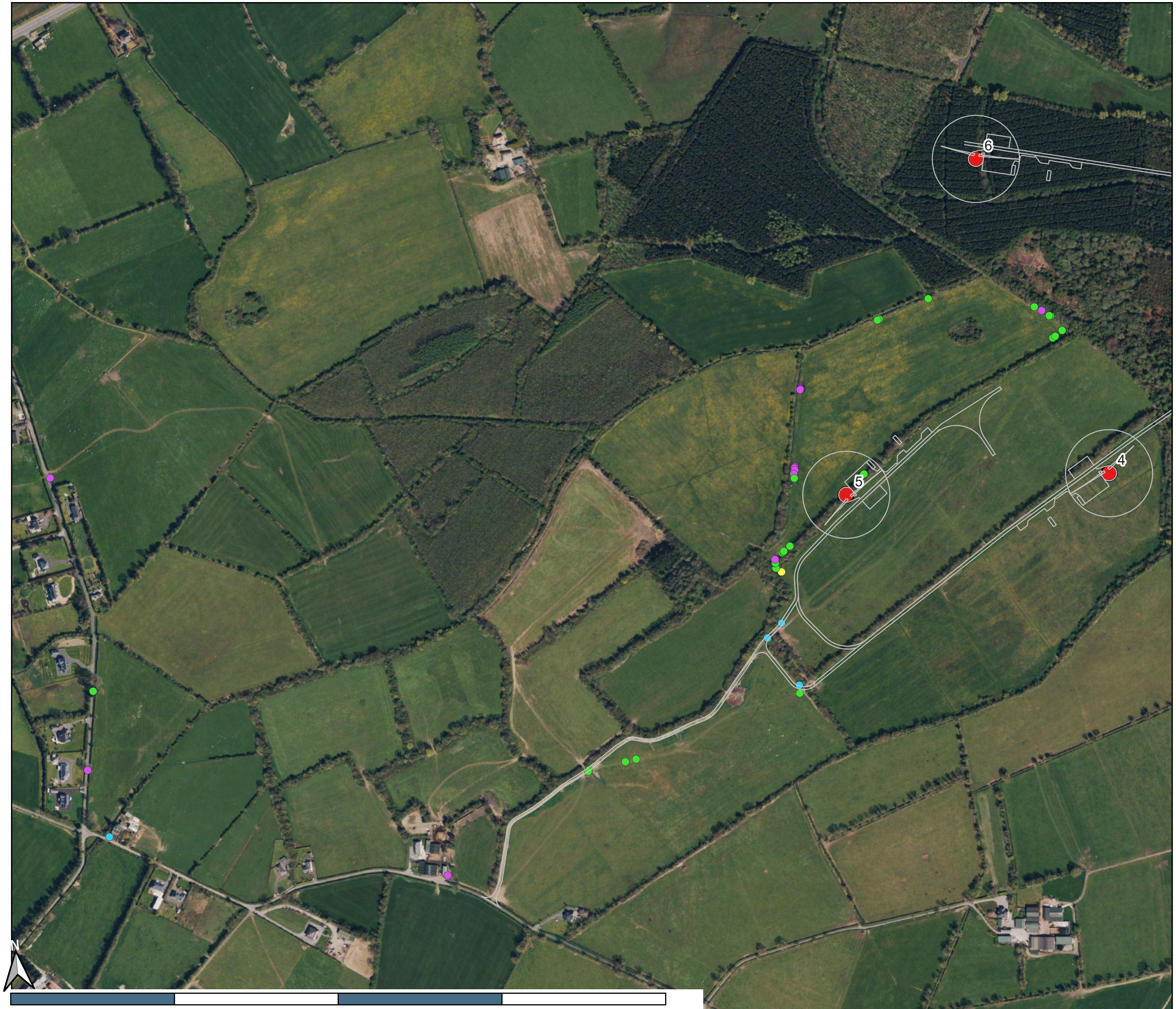

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FIGURE NO.: -	
CLIENT: Statkraft	
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DATE: 13/12/2024	**PAGE SIZE:** A3

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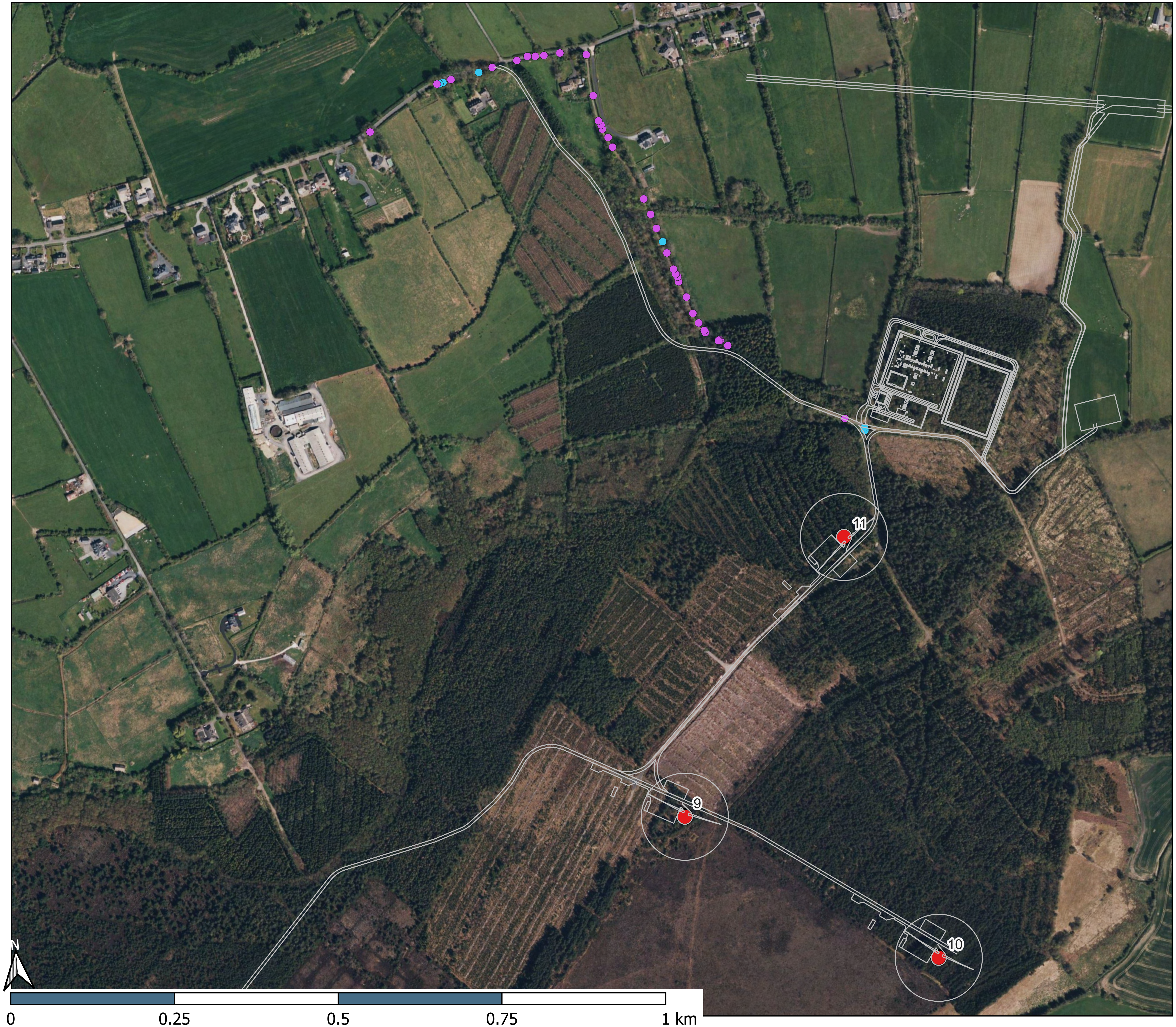

Road Layout
Turbine Hardstands
Turbine Locations
Pipistrellus pipistrellus
Pipistrellus pygmaeus

TITLE:	Bat Activty 2023- Round 1 - Turbines 9-11
PROJECT:	P20-326 Drehid Cable Route EIAR
FIGURE NO.:	-
CLIENT:	Statkraft
SCALE:	1:4814
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PAGE SIZE:	A3

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TITLE:	Bat Activty 2023- Round 2 - Turbines 1-3
PROJECT:	P20-326 Drehid Cable Route EIAR
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REVISION:	0
DATE:	13/12/2024
PAGE SIZE:	A3

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Legend

- Road Layout
- Turbine Hardstands
- Temporary Compound
- Substation
- Turbine Locations
- Nyctalus leisleri
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus

TITLE:	Bat Activty 2023- Round 2 - Turbines 9-11		
PROJECT:	P20-326 Drehid Cable Route EIAR		
FIGURE NO.:	-		
CLIENT:	Statkraft		
SCALE:	1:4814	REVISION:	0
DATE:	13/12/2024	PAGE SIZE:	A3

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Legend

- Road Layout
- Turbine Hardstands
- Temporary Compound
- Substation
- Turbine Locations
- Nyctalus leisleri
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus

TITLE:	Bat Activty 2023- Round 3 - Turbines 1-3		
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DATE:	13/12/2024	PAGE SIZE:	A3

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Legend

- Road Layout
- Turbine Hardstands
- Temporary Compound
- Turbine Locations
- Myotis spec.
- Nyctalus leisleri
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus
- Unidentified Pipistrelle species

TITLE:	Bat Activty 2023- Round 3 - Turbines 4-7		
PROJECT:	P20-326 Drehid Cable Route EIAR		
FIGURE NO.:	-		
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SCALE:	1:4814	REVISION:	0
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Legend

- Road Layout
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- Substation
- Turbine Locations
- Myotis spec.
- Nyctalus leisleri
- Pipistrellus pipistrellus
- Pipistrellus pygmaeus
- Unidentified Pipistrelle species

TITLE: Bat Activty 2023- Round 3 - Turbines 9-11			
PROJECT: P20-326 Drehid Cable Route EIAR			
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APPENDIX 8-1.5

Drehid Marsh Fritillary Survey 2022

Drehid Bog Windfarm Marsh Fritillary Survey September 2022

Job no. P20-326

Ken Bond, B.A.(Hons), F.R.E.S.
19/12/2022

Introduction

This survey was undertaken to assess the status and distribution of *Euphydryas aurinia*, Marsh Fritillary, a protected Annex II species under the Bern Convention, on the Drehid Bog proposed windfarm site, Co. Kildare. A survey carried out in broadly the same parts of the site in 2019 did not reveal the presence of the butterfly, and only relatively small amounts of its foodplant, *Succisa pratensis*, Devil's-bit Scabious.

Methodology

Inspection of the study area by transects across the bog surface commenced late on 19th September, and continued the following two day. On Sept. 18th the access route from the north side (Kilmurry townland) was checked, as was the adjacent area of *Calluna*-dominated raised bog south of here, around ITM N755372. This area was again searched on Sept. 19th for *Succisa pratensis* (Devil's-bit Scabious), and the search was extended further south and south-east to about ITM N757366 and N758368. Apart from small areas of scrub, mainly birch (*Betula pubescens*), and mostly near drains, this area is strongly dominated by *Calluna vulgaris* (ling heather) and *Eriophorum* (Cotton-grass), with smaller areas of *Sphagnum* moss, *Cladonia* lichens, *Erica cinerea* (bell heather) and locally distributed *Narthecium ossifragum* (bog asphodel), *Potentilla sp,* (tormentil) and *Andromeda polifolia* (bog rosemary). No *Succisa pratensis* was observed on this entire bog area, and similar habitat appeared to extend some distance both south-east and southwest of here.

Next inspected was the northern margin of the bog to the south-west, including the more diverse, wetter, elongate rectangular area of *Molinia caerulea* (purple moor-grass) with *Typha* and various other wetland plants extending from ITM N75070 36852 to N75295 36562. Somewhat surprisingly, no *S. pratensis* was found in this area. The bog margin area was then followed further SW to ITM N75051 36530, where *S. pratensis* was found at moderately high density in a sheltered, more floristically diverse area which extends about 50m south from here. In total 14 larval webs of E. *aurinia* were found here (see Fig, 1). Two superficially similar areas immediately south and east of this site were found to contain little or no *S. pratensis*, and the bog beyond these was observed to be *Calluna*-dominated as elsewhere. Inspection of the bog margin extending to the SSW continued on Sept. 20th, and 15 further *E. aurinia* larval webs were found scattered on and close to the narrow track through the vegetation as far as ITM N74718 36025. As both foodplants and larval webs were almost entirely distributed along a relatively narrow band of habitat, the standard method of searching along transects was not required.

The area of mainly improved grassland close to the site proposed for Turbine 6 was later inspected. All the fields observed in this area were found to be improved or semi-improved grassland, without *Succisa pratensis*, while some held grazing cattle. The north-eastern margin of the field centred around N745356 contained an area of longer grass and some other taller plants, but again no *S. pratensis* was observed here.

Results

In total; 29 larval webs were found on the north-western margin of Drehid Bog on two days of the survey (see Table 1). All of these webs occurred within the botanically richer *Molinia* grassland margin between the main part of the raised bog and the adjacent forestry. The larval webs were found in areas not surveyed in 2019, although the earlier survey extended to only a short distance further to the northeast. Only very small amounts of *S. pratensis* were found on rides within the forestry, and the level of shading of those plants means they are unsuitable for *E. aurinia* development. No *S. pratensis* was observed on any inspected areas of the *Calluna*-dominated central part of the bog; the dominant habitat type very precisely defined its distribution.

Fig. 1. Main area of Marsh Fritillary larval webs recorded on 19th September 2022, The largest concentration of webs was observed in this small area of flower-rich habitat.

Recommendations

The narrow band of florally rich *Molinia* grassland along the western margin of Drehid Bog should be as little disturbed as possible during construction and subsequent operational activity. This strip of vegetation contains a much greater botanical diversity than either the adjacent coniferous forestry or the open bog area. It should also be monitored to check that scrub does not invade, with the resultant shading of the Devil's-bit Scabious.

APPENDIX I

Table 1. Locations of Marsh Fritillary larval webs found at Drehid Bog, 19-20 September 2022

ITM reference	date	waypoint
N7506236552	19/09/2022	106
N7507036518	19/09/2022	107
N7507036517	19/09/2022	108
N7506136479	19/09/2022	109
N7506436479	19/09/2022	111
N7506236476	19/09/2022	112
N7505436487	19/09/2022	113
N7505436490	19/09/2022	114
N7505636497	19/09/2022	115
N7503836510	19/09/2022	116
N7503236531	19/09/2022	117
N7502836536	19/09/2022	118
N7503336533	19/09/2022	119
N7503236534	19/09/2022	120
N7494736310	20/09/2022	121
N7490036253	20/09/2022	122
N7490136253	20/09/2022	123
N7490236257	20/09/2022	124
N7489536251	20/09/2022	125
N7490536238	20/09/2022	126
N7490136237	20/09/2022	127
N7490336236	20/09/2022	128
N7492936202	20/09/2022	129
N7491736194	20/09/2022	130
N7479436134	20/09/2022	131
N7474736100	20/09/2022	132
N7472036059	20/09/2022	133
N7470936045	20/09/2022	134
N7471836025	20/09/2022	135

APPENDIX 8-1.6

Drehid Wind Farm Lizard Report 2023

Common lizard (*Zootoca vivipara*) survey of Drehid Wind Farm, Co. Kildare (2021-22)

Prepared by Triturus Environmental Ltd. for Fehily Timoney

October 2023

Please cite as:

Triturus (2023). Common lizard (*Zootoca vivipara*) survey of Drehid wind farm, Co. Kildare (2021-22). Report prepared by Triturus Environmental Ltd. for Fehily Timoney. October 2023.

Triturus

Table of contents

1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by Fehily Timoney & Company (FT) to undertake a common lizard (*Zootoca vivipara,* formerly *Lacerta vivipara*) to inform EIAR preparation for the proposed Drehid wind farm project, located near the Kildare/Meath border south of Enfield, Co. Meath. Surveys of common lizard and their habitats were undertaken within and in the vicinity of the 2021 substation location (superseded) and grid cable route (GCR) in August-September 2021, and within the wider land holding boundary in May-June 2022.

Site surveys completed as part of the Environmental Impact Assessment Report (EIAR) for the proposed development identified common lizard as a key ecological receptor within the study area and noted that "*it is likely that they occur across suitable habitat within the site"* (FT, 2018). Indeed, a single common lizard was observed during a site survey in September 2018 (close to the proposed turbine 8 location; **Figure 2.1**). Subject to a further information request on the 19th February 2019 from Kildare County Council (Planning Ref 18/1534), and to ensure the EIAR and AA Screening/NIS had sufficient scientific data to support its assessment, findings and conclusions, targeted common lizard surveys following best practice guidance, focusing on suitable habitat, were undertaken within the development footprint in the June-September 2019 period. These surveys recorded a low number of lizards within the site boundary (Triturus, 2019).

Considering updated proposals for the layout for the site, the 2021 and 2022 surveys helped to further identify the presence of common lizards within and adjoining proposed Drehid wind farm infrastructure through visual observations and the use of artificial cover objects (ACOs, see Methodology section below). The distribution of observations acted as an indicator regarding habitat used by common lizards, inclusive of potential breeding, foraging and refuge areas. Such a combination of approaches would also help to further inform the wind farm development and minimise potential direct and indirect impacts to the species, particularly in terms of breeding and foraging habitat loss.

1.2 Legislative protection

Common lizards (*Zootoca vivipara*) are Ireland's only native reptile and are protected under the Wildlife Act (1976-2021). The species is considered to be of 'least concern' in Ireland (King, et al., 2011). The species is also classified as 'least concern' under the IUCN Red List (Aghasyan et al., 2019) and is listed on Appendix III of the Bern Convention (Council of Europe, 1979) and Annex IV of the EC Habitats Directive (92/43/EEC).

1.3 Survey area description

The c. 393ha landholding in which the Proposed Wind Farm and Substation are located is composed primarily of agricultural pasture (GA1; Fossitt, 2000) to the north and south, with more central areas dominated by coniferous afforestation and associated clear-fell (WS5) over peat soils. Adjoining the east of the site boundary lies Timahoe North Bog, a large area of cutaway bog (PB4). Small areas of degraded raised bog (PB1), scrub (WS1), bog woodland (WN7) and mixed broad-leaved woodland

(WD1) are also scattered throughout the wider site. A small, c.1ha dystrophic lake (FL1 habitat) is situated in degraded raised bog (PB1) habitat within the centre of the wind farm site (adjoining the location of turbine T9). The site boundary is bisected by the historically modified Fear English River (aka Ballynamullagh/Coolree River) and several small tributaries.

2. Methodology

2.1 Desktop review

A desktop review of the available common lizard-related data for the Drehid wind farm site and surrounding areas was undertaken. Data records held by the National Biodiversity data Centre (NBDC) and National Parks & Wildlife Service (NPWS) were also reviewed. Data collated during previous lizard surveys of the site (Triturus, 2019; FT, 2018) was also reviewed.

2.2 Lizard presence/absence surveys

2.2.1 Refugia searching (including ACOs)

Presence / absence surveys for common lizard were undertaken in two areas the vicinity of the proposed grid cable route (GCR) and (superseded) 2021 substation location in May-June 2021 (survey area A, 8 no. site visits) and August-September 2021 (survey area B, 5 no. site visits) (**Figure 2.1; Table 2.1**). Further surveys were undertaken in April-June 2022 (6 no. site visits) in the vicinity of proposed turbine locations T5, T7, T8 and T10 where lizards had previously been observed (Triturus, 2019) (**Figure 2.1; Table 2.1**).

Given the discrepancies and spatial variation between natural (pre-existing) refugia sites within the survey areas, artificial cover objects (ACOs) were utilised to survey for lizards (as per Triturus, 2019). These were placed strategically within the vicinity of the proposed substation/grid cable route (GCR) (2021) and turbines T6, T8, T9 and T11 (2022), located in the northern extent of the wind farm site (**Figures 2.1, 2.2**). Black bitumen roofing felt mats (hereafter felt mats) were used given their known acceptance by lizards as both basking and refugia sites (Triturus, 2019; Fish, 2016; Beebee, 2013). All felt ACOs measured ≥0.5m^2 in area following best practice guidelines (e.g. Sewell et al., 2013; NRA, 2009). ACOs were placed at the equivalent density of ≥10 per hectare (i.e. 100 x 100m area) in suitable areas of habitat in the vicinity of the survey areas (as recommended by NRA, 2009). This equated to a total of n=92 ACOs deployed throughout the study area in 2021 (n=39) and 2022 (n=53), respectively.

ACOs were positioned in various habitat types including clear-fell brash (WS5; Fossitt, 2000), coniferous forestry (WD4), immature woodland (WS2), bog woodland (WN7) and degraded raised bog (PB1). To maximise the likelihood of adoption by common lizard, ACO sites were chosen to be south-facing (i.e. greater thigmothermal properties) and adjoining suitable vegetation or other structural cover likely to be favoured by common lizards.

Data on site-specific factors thought to be potentially relevant for site occupancy and lizard detection rates, such as soil type, vegetation type and cover, adjoining habitats, habitat connectivity, weather conditions, air temperature, cloud cover, orientation and relative human disturbance levels, were collected to elucidate the most appropriate survey conditions over time (as per Sewell et al., 2012). Where possible, site visits were undertaken on bright, sunny mornings (8-11am period) or when later sunshine followed a period of rainfall or cold / dull conditions. This approach helped to maximise the likelihood of observing basking lizards on ACOs. Each ACO cluster and individual ACO site were visited at least a total of six times throughout the study period, (**Table 2.1**). This far exceeded the minimum number of visits (three) required to determine common lizard presence with 95% confidence (Sewell et al., 2012).

Plate 2.1 Example of roof felt ACO positioned in recolonising clear-fell habitat near the proposed substation/GCR in May 2021

Plate 2.2 Example of roof felt ACO positioned in peatland/heath habitat near turbine T9

2.2.2 Directed visual transects

Following best practice guidance, in addition to ACO refugia surveys, directed visual transects were also conducted during the May-September 2021 and April-June 2022 survey periods to maximise the likelihood of basking or foraging lizard detection outside of the ACO areas. Transects were completed by surveyors moving between ACO clusters, typically along forestry access tracks but also across raised bog, coniferous plantation and improved agricultural grassland habitats (**Figures 2.1 & 2.2**). In total, approx. 4km of linear habitat was surveyed via directed visual transects.

2.3 Biosecurity

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was disinfected with Virkon® between survey sites to prevent the transfer of pathogens and/or invasive species between survey areas. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any invasive species recorded within or adjoining the survey area were geo-referenced.

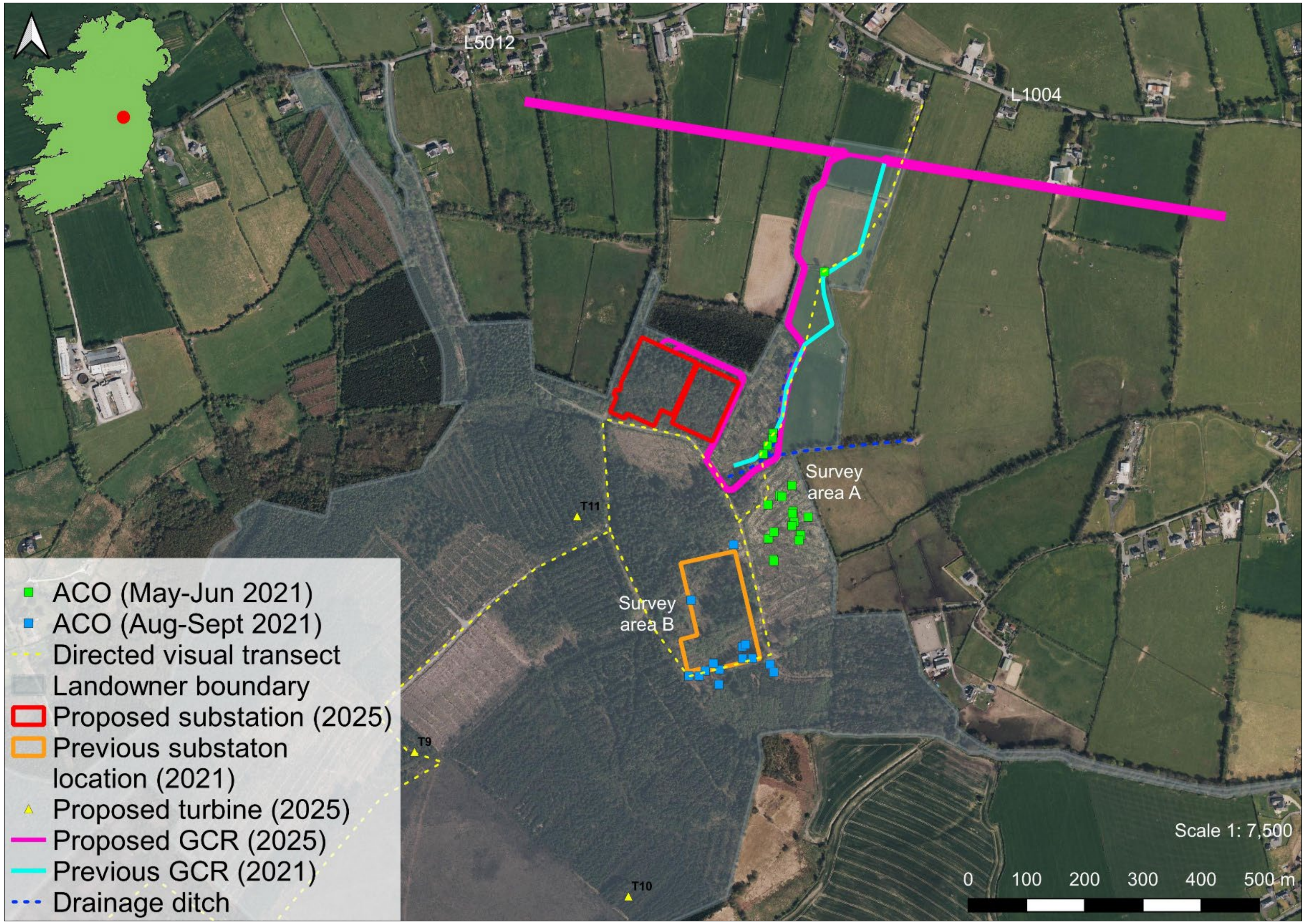

Figure 2.1 Overview of the common lizard 2021 survey areas in the vicinity of the proposed substation & GCR (May-September 2021)

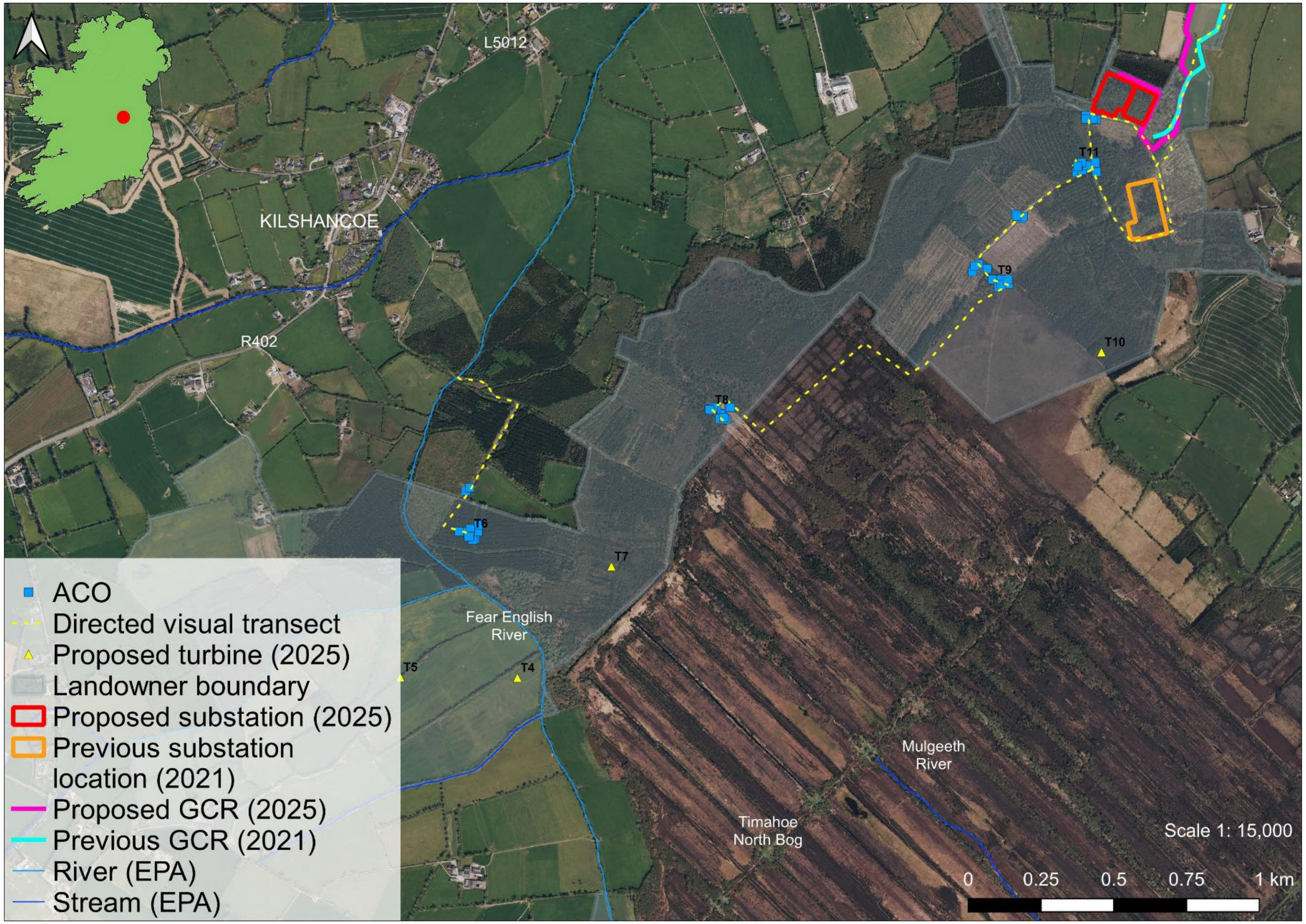

Figure 2.2 Overview of the common lizard 2022 survey areas in the vicinity of turbine locations T6, T8, T9 & T11 (April-June 2022)

3. Results

Presence/absence surveys for common lizards was undertaken in the vicinity of the proposed Drehid wind farm development in May-June 2021, August-September 2021 and April-June 2022. Both refugia (artificial cover object, ACO) and directed visual transect methodologies were utilised to best detect lizards and identify the most important areas of lizard habitat. A total of *n*=92 ACOs were surveyed repeatedly (≥6 occasions each) with 4km of linear habitat (transects) also walked (≥6 occasions each) throughout the survey periods.

3.1 Refugia searching

A total of *n*=8 common lizards (comprising males and females) were recorded utilising ACOs throughout the 2021-2022 survey period. The majority (*n*=7) of these were recorded over the course of 8 no. site visits in May-June 2021 from survey area A located near the former substation location (**Table 3.1; Figure 3.1**). Lizards were recorded in both woodland and clear-fell habitats. A lizard was recorded near an ACO in survey area B (beech woodland clearing) on the 8th September 2022 (**Plate 3.2**). This was the only lizard recorded in survey area B over a total of 5 no. site visits in the respective 2021 survey period (August-September).

Only a single lizard was recorded during ACO surveys over a total of 6 no. site visits undertaken in 2022 in the vicinity of turbine locations T6, T8, T9 and T11 (**Table 3.2**). This individual was observed basking on an ACO on the 19th May 2022 in a fire-break clearing in proximity of turbine T11 (**Figure 3.1**).

Plate 3.1 Adult female lizard sheltering underneath an ACO in survey area A in May 2021

Plate 3.2 Adult lizard recorded at an ACO in beech woodland at survey area B in late September 2021

Table 3.1 Abundance of common lizards (*Zootoca vivipara*) recorded at each artificial cover object (ACO) cluster in 2021 (*n*=39 ACOs in total)

	Artificial Cover Object (ACO) cluster		
Site visit	Survey area A	Survey area B	Total no. lizards
8th May 2021	None recorded	n/a	
13th May 2021	None recorded	n/a	
17th May 2021	None recorded	n/a	
19th May 2021	**Lizard recorded at 3 no. ACOs**	n/a	**3**
26th May 2021	None recorded	n/a	
2nd June 2021	**Lizard recorded at 2 no. ACOs**	n/a	**2**
7th June 2021	**1 no. lizard recorded**	n/a	**1**
13th June 2021	None recorded	n/a	
27th August 2021	n/a	None recorded	
8th September 2021	n/a	**1 no. lizard recorded**	**1**
10th September 2021	n/a	None recorded	
16th September 2021	n/a	None recorded	
30th September 2021	n/a	None recorded	
Total observations			**7**

Table 3.2 Abundance of common lizards (*Zootoca vivipara*) recorded at each artificial cover object (ACO) cluster in 2022 (*n*=53 ACOs in total)

	Artificial Cover Object (ACO) cluster				
Site visit	**T7**	**T9**	**T10**	**T12**	**Total no. lizards**
25th April 2022	None recorded	None recorded	None recorded	None recorded	
8th May 2022	None recorded	None recorded	None recorded	None recorded	
17th May 2022	None recorded	None recorded	None recorded	None recorded	
19th May 2022	None recorded	None recorded	None recorded	**1 no. lizard recorded**	**1**
4th June 2022	None recorded	None recorded	None recorded	None recorded	
23rd June 2022	None recorded	None recorded	None recorded	None recorded	
Total observations					**1**

3.2 Directed visual surveys

Approximately 4km of linear habitat was surveyed for common lizards via directed visual transects during the 2021 and 2022 survey periods. A total of *n*=2 lizard observations were made during these transects (**Table 3.3**). One was made alongside a forestry track near turbine T11 (June 2021; **Plate 3.3**) with another recorded along a woodland track near turbine T6 (May 2022) (**Figure 3.1**).

Table 3.3 Common lizards (*Zootoca vivipara*) recorded via directed visual transects in 2021 and 2022

Site visit	Nearest turbine/infrastructure	Notes
13th June 2021	T11 (180m south)	Single adult recorded basking on brash/tree stump alongside forestry track. Within site boundary
17th May 2022	T6 (260m south)	Single adult recorded on track edge. Outside site boundary

Plate 3.3 Adult lizard recorded in clear-fell/brash habitat near turbine T12 during a visual transect survey in June 2022

Plate 3.4 Example of natural lizard refuge and basking area in the vicinity of the previous substation location

Plate 3.5 Sub-optimal lizard habitat within a coniferous block near turbine T6, April 2022

Plate 3.6 Poor quality lizard habitat (improved pasture) adjoining mixed woodland near the proposed grid connection route, May 2021

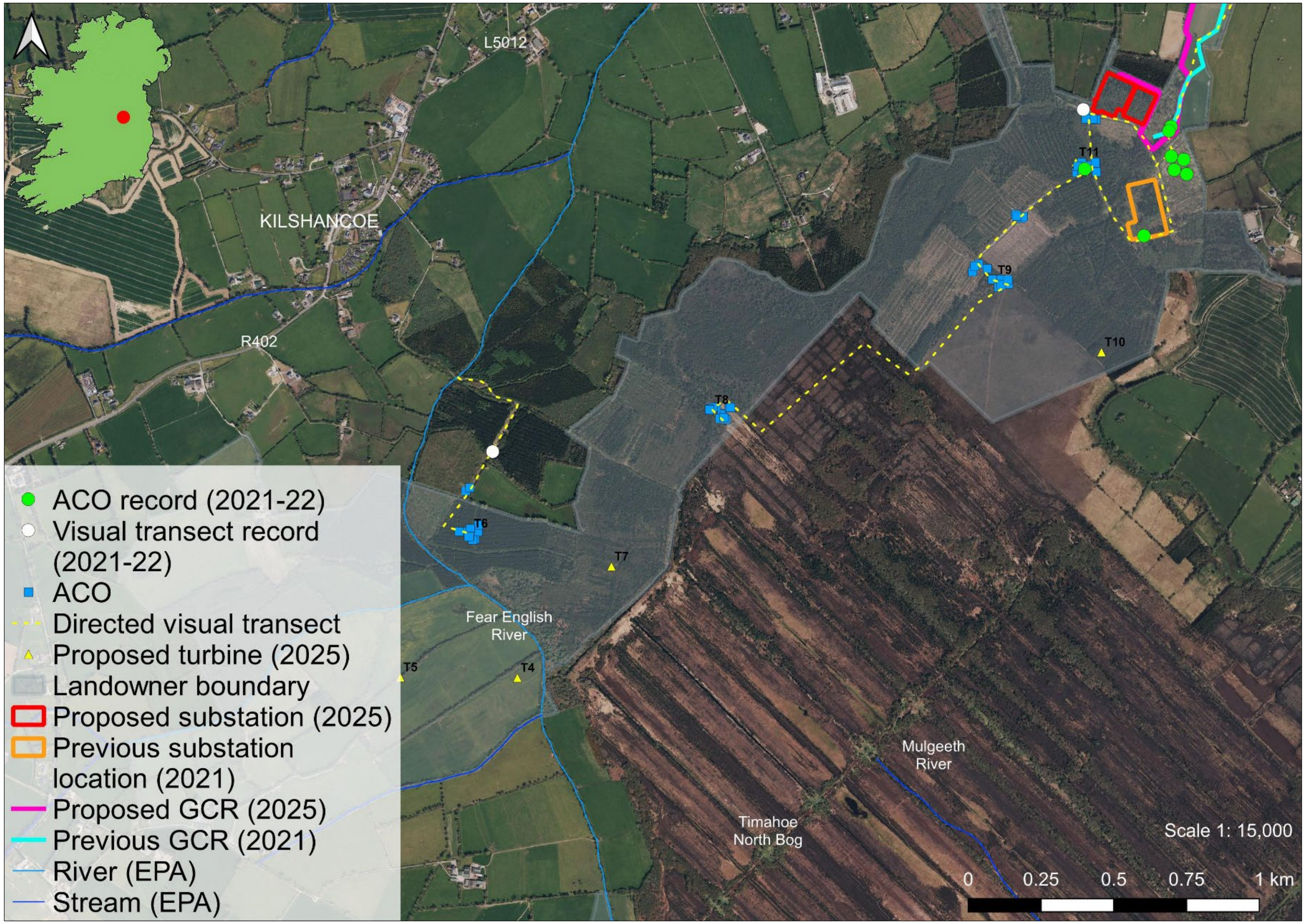

Figure 3.1 Overview of common lizard records in the vicinity of the proposed Drehid wind farm in 2021 and 2022

4. Discussion

4.1 Most valuable areas for common lizard

In support of previous surveys (Triturus, 2019; FT, 2018), a low number of common lizards were recorded in 2021 (*n*=8 total) and 2022 (*n*=2 total) via refuge searching (ACOs) and directed visual transects undertaken in the vicinity of the proposed wind farm site. As a species, common lizards occupy small home ranges and demonstrate relatively high site fidelity (philopatry) with limited dispersal distances from natal sites (typically <100m; Cotto et al., 2015; Beebee, 2013; Verken et al., 2012; Clobert et al., 2012). As noted during previous surveys, there would appear to be a preference for the northern/north-western extent of the site boundary with most lizard observations made in this area (**Figure 3.1**). Whilst much of this area of the site provides sub-optimal lizard habitat (dense scrub with limited open areas or basking sites), some localised areas of more suitable, open habitats associated with historical clear-fell and the margins of woodland were present and supported low densities of lizards.

Common lizards occupy a diverse range of habitats but typically favour those with high, complex cover of grasses or scrub such as gorse and heather in moors, bogs, heaths and woodlands (Beebee, 2013). No lizards were observed in low-lying improved agricultural grassland habitat adjoining the proposed GCR, which supports previous findings at this site (Triturus, 2019) and elsewhere (e.g. Jofré & Reading, 2012; Strijbosch, 2002). The majority of lizard records in the 2021-2022 period were associated with the edge of coniferous woodland, where clear-fell brash (as well as ACOs) offered ample basking sites for the species, such as logs and elevated felled-tree stumps. Often favouring mesic (moist) habitats (Horreo & Fitze, 2022; Rozen-Rechels et al., 2021; Farren et al., 2010; Lorenzon et al., 1999), common lizards are known to utilise coniferous plantations and adjoining rides/fire breaks for foraging and shelter. There is a preference for younger, less mature plantations with tree canopy cover <5% or recently felled and or planted areas (Jofré et al., 2016) which may explain the absence of lizard observations fro*m within* coniferous woodland blocks on site during the survey period.

No lizards were recorded via ACO or directed visual transect surveys in bog and heath habitats in the 2021 or 2022 survey period (e.g., near turbine T8 and T9). However, common lizards show a preference for such habitats (Farren et al., 2010; Marnell, 2002; Reading et al., 1997) and are known to utilise these habitats within and adjoining the Drehid wind farm site (pers. obs.; Triturus, 2019; FT, 2018). Our results are likely an artefact of low populations densities and sampling a small proportion of these extensive habitats within the proposed site rather than a lack of utilisation or absence of lizards from these wider areas.

As noted previously (Triturus, 2019), the majority of ACOs (roofing felt mats) were quickly colonised by a range of invertebrate species after placement (e.g. ants, spiders, slugs, woodlice etc.). Despite ant, spider, slug and other invertebrate species forming the basis of common lizard diet (Diaz, 1995; Avery, 1966), our low return of observations implies that such colonisations did not encourage lizard utilisation of the ACO sites (i.e. foraging).

Given the predominant land use practices of the Drehid wind farm site (i.e. improved agricultural grassland and mature coniferous afforestation), the most suitable habitat for common lizards would appear to be the edge of coniferous plantations, as well as degraded raised bog which forms matrices with heath. Much of this habitat is outside of the site boundary and away from proposed infrastructure.

Visual observations of lizards, such as those made through ACO or directed transect surveys, are not a proxy for population estimates, with these methodologies only confirming presence or absence at a given site. Nevertheless, the repeated use of multiple ACOs across a wide spatial and temporal range, such as in this study, typically provides a good estimation of site utilisation by common lizards (Sewell et al., 2012). Therefore, whilst accurate population estimates are not available, the Drehid wind farm site can be considered locally important to common lizards although our results suggest the species may be present at low densities and show a stronger fidelity for certain areas (e.g. north-western extent of the site boundary).

4.2 Common lizard management recommendations

In concordance with previous recommendations for the development site (Triturus, 2019; FT, 2018), vegetation should be felled and removed near the proposed turbine locations outside of the peak breeding season (July-August) to displace any lizards present and reduce the risk of impact and injury to individuals. This measure should be implemented in areas of suitable habitat as per the findings of this report (i.e. proposed substation/GCR areas and turbine T12 but also T7, T9 & T10 based on previous findings). Furthermore, targeted pre-construction relocation surveys could be conducted at the proposed works locations known to support common lizard with trapping methodologies employed to maximise lizard capture and minimise risk to overall lizard populations.

Common lizard dispersal distances from natal sites are typically much less than 100m (Cotto et al., 2015; Beebee, 2013; Verken et al., 2012; Clobert et al., 2012) and unsuitable/sub-optimal habitat can provide an effective barrier, making the species particularly vulnerable to population fragmentation (Boudjemadi et al., 1999). Considering this, habitat recreation/remediation should be undertaken in the vicinity of the proposed works/infrastructural areas following the construction phase of development (e.g. provision of artificial & natural refugia in addition to basking sites). The felling of enclosed mature conifer plantation (a sub-optimal habitat for common lizard; Jofré et al., 2016) associated within the proposed development will provide more open semi-natural habitat for the species as these areas will naturally revegetate following construction.

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APPENDIX 8-1.7

Drehid Aquatic Report

DREHID WIND FARM

AQUATIC ECOLOGY ASSESSMENT




Version : 14th May 2025

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TABLE OF CONTENTS

1. INTRODUCTION

1.1 Foreword

This report provides a baseline description of the aquatic ecology receiving environment for the proposed Drehid wind farm. The results of a new updated survey completed in December 2023 are included. The watercourses have previously been surveyed in detail in 2018, 2019, 2021. This report provides an updated description of the affected areas - however none of the conclusions of the previous surveys and evaluation of the watercourses have changed.

The proposed Drehid Wind farm is located south-west of Enfield town, Co. Meath. This document provides an aquatic ecology assessment and includes aquatic habitats, aquatic ecological communities, and individual aquatic species. The aims of the aquatic ecology assessment are:

- To carry out a desktop study in order to determine the surface water features affected by the proposed development and surrounding area;
- To carry out a baseline fisheries and aquatic ecological survey of the affected aquatic areas;

Field survey work to inform the current assessment included kick/sweep sampling and visual assessments completed during September 2018, 2019, and 2021. An additional walkover survey was completed during December 2023. Electrical fishing surveys were conducted in September 2010 and September 2021.

Figure 1 shows the location of the proposed Drehid wind farm. This report has been prepared by Ecofact Environmental Consultants Ltd.

1.2 Legislative Context

A diversity of flora and fauna, rare at a national level, are protected under the provisions of the Wildlife Act, 1976 and Wildlife (Amendment) Act, 2000; which includes the Flora Protection Order (1999). The Habitats Directive 1992 has been transposed into Irish legislation as the European Union (Natural Habitats) Regulations SI 94/1997 and amended in 1998 and 2005. The Habitat Regulations have been updated in 2011 as the European Communities (Birds and Natural Habitats) Regulations (2011) to bring the Irish transposition of these regulations into line with the requirements of the EU Habitats Directive (1992).

Under the Fisheries (Consolidation) Act, 1959, it is an offence to disturb the bed of a river; therefore, it will be necessary to get written permission from Inland Fisheries Ireland to proceed with the works in any areas where disturbance to the spawning and nursery areas of both salmonids and lampreys will occur as a result of the proposed development. Salmon, all lamprey species and their habitats are further protected under the EU Habitats Directive, 1992. Under Section 3 of the Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act) it is an offence to cause or permit any polluting matter to enter waters. Suspended solids would be a key parameter here. Likewise any visual evidence of oil/fuel in the river would constitute an offence.

Section 171 of the Fisheries (Consolidation) Act 1959 creates the offence of throwing, emptying, permitting or causing to fall onto any waters deleterious matter. Deleterious matter is defined as not only as any substance that is liable to injure fish but is also liable to damage their spawning grounds or the food of any fish or to injure fish in their value as human food or to impair the usefulness of the bed and soil of any waters as spawning grounds or other capacity to produce the food of fish.

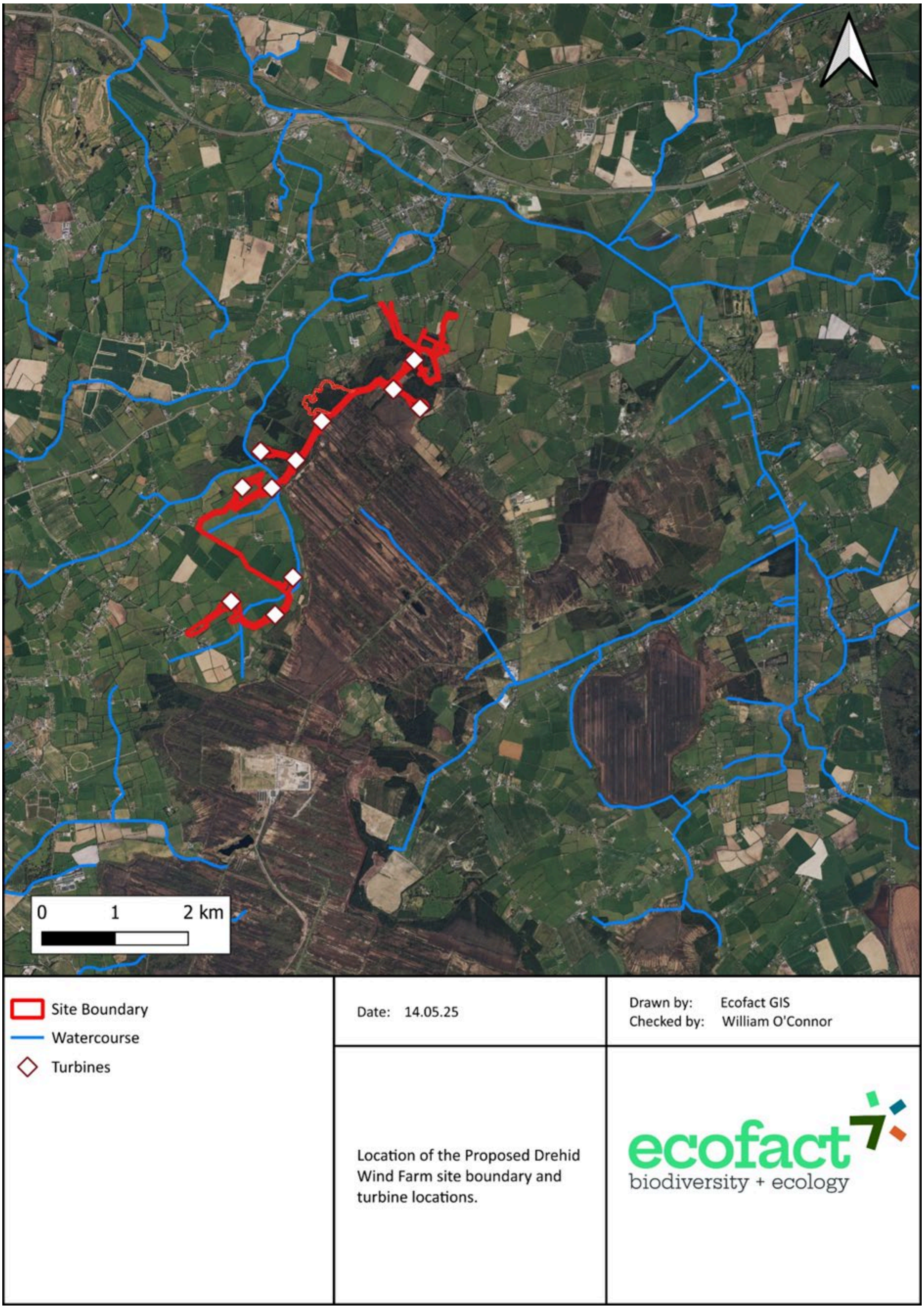

Figure 1 Location of the proposed Drehid Wind Farm site boundary and turbine locations.

2. METHODOLOGY

2.1 Introduction

This report provides a baseline description of the aquatic ecology receiving environment for the proposed Drehid wind farm. The results of a new updated survey completed in December 2023 are included. The watercourses have previously been surveyed in detail in 2018, 2019, 2021. This assessment was based on a desk study and a baseline aquatic ecological survey of 10 sites, completed in 2018, 2019, and 2021 along with a updated walkover survey completed in December 2023. The location of the aquatic ecology survey sites are indicated in Figures 2 and 3. The conducted surveys encompassed aquatic habitat evaluations, fish population studies via electrofishing, and biological water quality assessments using kick sampling techniques. The selection of survey sites was made in agreement with the client and also with the approval of Inland Fisheries Ireland and the Department of the Environment, Climate, and Communications. This approval was granted under Section 14 of the Fisheries (Consolidation) Act of 1959.

2.2 Desk Study

A desktop study was undertaken to describe the aquatic ecology of the study area of the proposed Drehid wind farm. The purpose of this desk study was to identify previous records of aquatic species. This involved accessing the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie). The National Parks and Wildlife Service (www.npws.ie) website was also accessed in relation to designated areas, qualifying interests, and site synopses on relevant Special Areas of Conservation. The Environmental Protection Agency (www.gis.epa.ie/EPAMaps/) websites including (including www.catchments.ie) were accessed to identify watercourse in study area. Similarly, any relevant information on the website of Inland Fisheries Ireland (www.fisheriesireland.ie) was reviewed. All documents reviewed are included in the bibliography section of the current report.

2.3 Field Surveys

2.3.1 Selection of Watercourses for Assessment

All watercourses / water bodies which could be affected directly (i.e. within the site) or indirectly (i.e. drain areas close to the site) were considered as part of the current appraisal. Aquatic habitat surveys were completed on all watercourses draining the proposed wind farm site and a total of 10 sites were selected for detailed assessment. The purpose of these sites is to provide baseline information and can also be used for monitoring during the construction of the proposed wind farm. The location of the 10 survey sites is given in Table 1 and shown in Figure 2. This is considered to be a very high-resolution survey for the study area in question. The surveys completed at each site were at a level required to make an evaluation of biological water quality, fisheries value, aquatic habitat value, and presence of rare/protected/notable aquatic species at each site. All watercourses on the site were viewed during the 2018, 2019, 2021, and 2023 walkover surveys.

During the December 2023 survey five new sites were also visited – Sites A,B, C, D, and E. The location of these sites is shown in Figure 3, and they are also listed in Table 3. These areas were already considered and evaluated in the previous surveys but were considered in further detail during the December 2023 surveys. In the previous surveys in 2018, 2019, and 2021 sites located both downstream and upstream of these areas were surveyed and evaluated. Site A is located on the Ballynamullagh Stream downstream of Sites 9 and 10. Sites B and C are also located on the Ballynamullagh Stream further downstream again. Site D is also located on the Ballynamullagh Stream, downstream of sites A, B, and C but upstream of the confluence with the Coolree 07 River. Site 8 is located on the Coolree 07 River upstream of the Ballynamullagh Stream confluence. Site 6 is located on the Coolree 07 River upstream of the Ballynamullagh Stream confluence. The December 2023 survey therefore was a survey of areas already extensively survey and evaluation. However, it provides an updated description and more detailed description of these channels.

Site E was located on an unregistered watercourse in Coillte lands. This artificial /highly modified stream flows into the Gorteen 07 stream, which is a minor tributary of the Coolree 07 River. This minor sub catchment was also already captured in the previous surveys; Site 5 is located downstream, and Site 6 is located upstream of this site.

2.3.2 Licensing and personnel

The 2021 electrofishing survey was completed under authorisation from the Department of the Environment, Climate and Communications under Section 14 of the Fisheries (Consolidation) Act (1959). Licenses were not required for the 2023 survey which involved visual observation, and kick/sweep net sampling only. The surveys and assessments were completed by Dr William O' Connor with the assistance of a number of ecologists including Grace Walsh, Eoin McMahon, and Dr Lucy Harding.

2.3.3 Biosecurity

Strict biosecurity measures were employed during the survey. This included disinfecting gear between sites and working at the upstream sites first. The IFI (2010) '*Biosecurity Protocol for Field Survey Work'* was followed during all survey work.

2.3.4 Aquatic Habitat Surveys

The habitat surveys were completed with regard to the Environment Agency's manual "*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*" (EA, 2003) and "*A Guide to Habitats in Ireland*" by Fossitt (2000). Fish habitat was evaluated with reference the Department of Agriculture for Northern Irelands Fisheries Division document, the '*Evaluation of habitat for Salmon and Trout'* (DANI, 1995), the English Nature manuals 'Ecology of the Atlantic Salmon' by Hendry K & Cragg-Hine D (2003), and '*Ecology of the River Brook and Sea Lamprey'* by Maitland (2013). River habitat types characterised at each survey site. The status of the watercourses surveyed was categorised on a scale of High-Good-Moderate-Poor-Bad.

2.3.5 Biological Water Quality

Qualitative sampling of benthic (or bottom dwelling) macroinvertebrates was undertaken at all survey sites using kick-sampling (Toner *et al*., 2005). This sampling was completed in 2018, 2019, 2021 and an additional walkover/visual survey was completed during December 2023.

A biological water quality rating was assigned at each site following the methodology given in Toner *et al*., (2005). For the smaller streams the a "risk level" was given as described in the 'Small Stream Risk Score Method Manual' Anon (2005). This was a rapid assessment and estimated water quality ratings were assigned for each of the aquatic survey sites. The SSRS categories are "Probably not at risk", "Probably at risk", and "At risk" of not meeting the Good Status requirements of the Water Framework Directive.

2.3.6 Electrofishing Surveys

Electrical fishing surveys were undertaken at the 10 selected aquatic survey sites during September 2019 and 2021. The sites were surveyed following the methodology outlined in the CFB (2008) guidance "*Methods for the Water Framework Directive-Electric fishing in wadable reaches*" and had regard to Matson *et al*, (2018). A portable electrical fishing unit (Smith Root-LR 24backpack) was used to carry out the survey. The sites were fished continuously for 5 minutes each. Juvenile Lamprey surveys were completed following the methodology for ammocoete surveys given in the manual *'Monitoring the River, Brook and Sea Lamprey, Lampetra fluviatilis, L. planeri* and *Petromyzon marinus'* by Harvey & Cowx (2003). Captured fish were collected into a container of river water using dip nets. The fish were released alive and spread evenly over the sampling area.

2.3.7 Rare species surveys

During the course of the survey the possible presence of rare/notable species, including White-clawed crayfish (*Austropotamobius pallipes*), was fully considered. Crayfish, if present, will be detected during electrofishing surveys, and kick/sweep sampling was also conducted at each site. The potential of any other important species, including Otters and Kingfishers, was also considered at each site.

Table 1 Location of the aquatic ecology sites assessed for the proposed Drehid Wind Farm site (2018, 2019, 2021, and 2023).

Site No.	Catchment	Sub-catchment	Watercourse Name	Watercourse Order	EPA Segment Code
1	Boyne	Blackwater (Longwood)	Blackwater (Longwood)	3	07_1059
2	Boyne	Blackwater (Longwood)	Blackwater (Longwood)	3	07_2240
3	Boyne	Blackwater (Longwood)	Mulgeeth	2	07_1720
4	Boyne	Blackwater (Longwood)	Mulgeeth	2	07_1320
5	Boyne	Blackwater (Longwood)	Blackwater (Longwood)	4	07_350
6	Boyne	Blackwater (Longwood)	Coolree 07	3	07_1848
7	Boyne	Blackwater (Longwood)	Clonkeeran	1	07_1287
8	Boyne	Blackwater (Longwood)	Coolree 07	1	07_1230
9	Boyne	Blackwater (Longwood)	Ballynamullagh	1	07_801
10	Boyne	Blackwater (Longwood)	Drehid	1	07_800

Table 2 Location of the additional aquatic ecology sites considered during the 2023 survey.

Site No.	Catchment	Sub-catchment	Watercourse Name	Watercourse Order	EPA Segment Code
A	Boyne	Blackwater (Longwood)	Ballynamullagh	1	07_864
B	Boyne	Blackwater (Longwood)	Ballynamullagh	1	07_864
C	Boyne	Blackwater (Longwood)	Ballynamullagh	1	07_864
D	Boyne	Blackwater (Longwood)	Ballynamullagh	1	07_864
E	Boyne	Blackwater (Longwood)	Unnamed	n/a	n/a

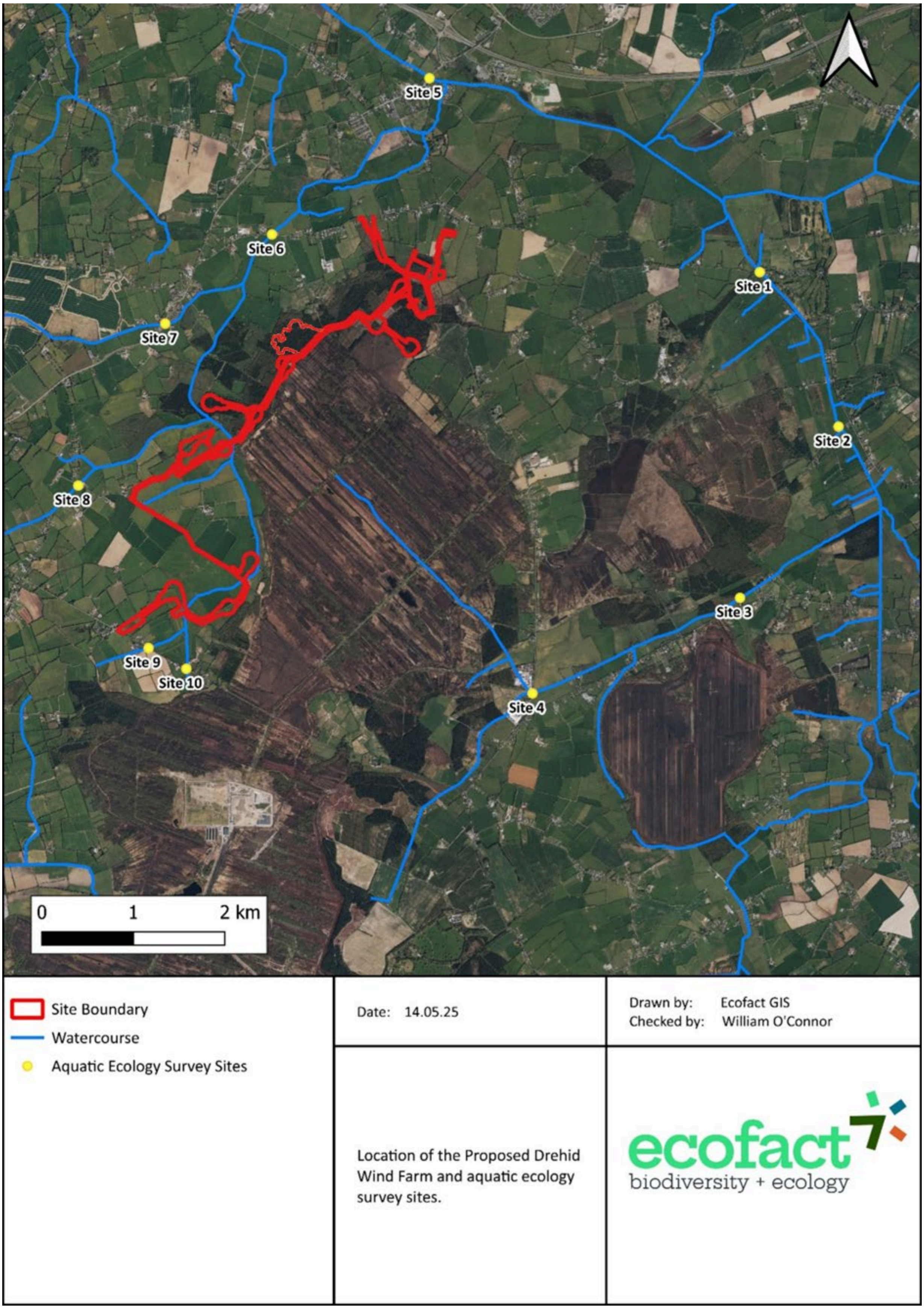

Figure 2 Location of the proposed Drehid Wind Farm and aquatic ecology survey sites.

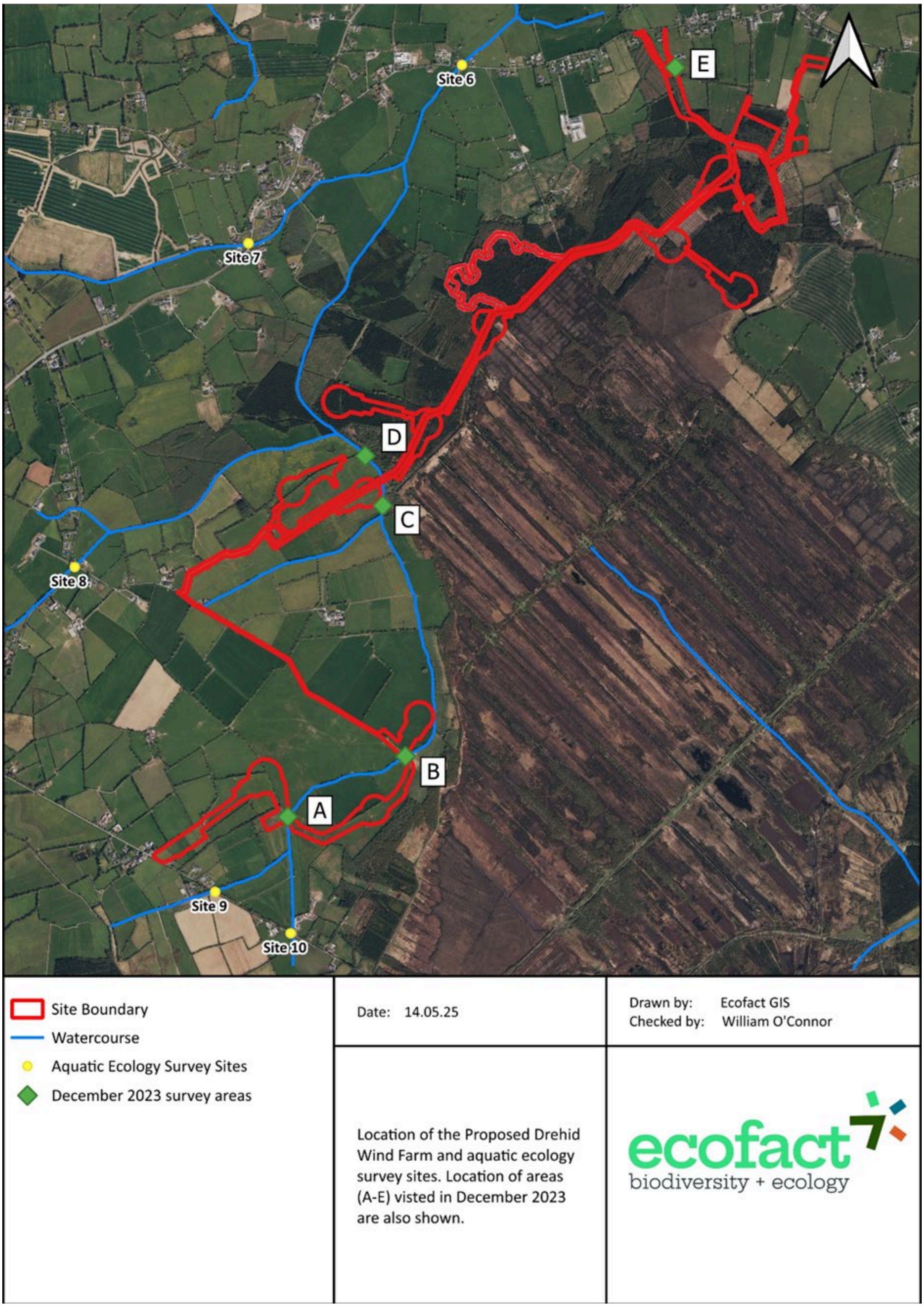

Figure 3 Location of the proposed Drehid Wind Farm and additional areas visited during December 2023.

3. RECEIVING ENVIRONMENT

3.1 Desk Study

3.1.2 SACs designated for aquatic interests

The only Natura 2000 river system in the study area with a downstream hydrological connection to the proposed Drehid wind farm site is the River Boyne and River Blackwater SAC (Site Code: 002299). The River Boyne and the River Blackwater SAC comprises the freshwater element of the River Boyne as far as the Boyne Aqueduct, the Kells Blackwater as far as Lough Ramor and the Boyne tributaries including the Deel, Stoneyford and Tremblestown Rivers. This site is a SAC selected for Alkaline fens [7230] and Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0], both listed on Annex I of the E.U. Habitats Directive. The site is also listed for the following Annex II species; River lamprey (*Lampetra fluviatilis*) [1099], Atlantic salmon (*Salmo salar*) [1106] and Otter (*Lutra lutra*) [1355]. The shortest hydrological pathway between the proposed development and the River Boyne and the River Blackwater SAC is approximately 19.5rkm via the Blackwater (Longwood) River.

3.1.3 Boyne Catchment

The proposed Drehid wind farm is located within the Boyne catchment. The River Boyne main channel rises near Edenderry on the borders of Counties Offaly and Kildare and flows in a north-easterly direction for 112 km before entering the Irish Sea at Drogheda. Together with its tributaries, it drains a catchment of approximately 2,500 km^2. The River Boyne corridor, together with its tributary the Kells Blackwater River, is designated as a Special Area of Conservation (SAC) (Site Code: 002299). In addition, the River Boyne main channel is also a designated salmonid river under the EU Freshwater Fish Directive (78/659/EEC).

An arterial drainage programme was undertaken throughout the Boyne catchment between 1969 and 1985 (O'Grady 1998). The only major section of this catchment which was not drained was the lower reaches of the main Boyne channel - from Navan downstream, and a section of the Kells Blackwater. The river channels affected by the proposed development were all dredged and channelised at this time and are subjected on ongoing drainage maintenance.

3.1.4 Water Quality

3.1.4.1 Blackwater (Longwood) River

The Blackwater [Longwood] River (07B02) rises south west of Enfield, Co. Meath. The total channel length is approximately 24km. From the source, the river flows north as far as survey Site 1. From here it flows north-east past Enfield and north to its confluence with the River Boyne (Segment Code: 07B04). There are six EPA biological water quality monitoring stations on the River Blackwater [Longwood] that were recently monitored. The furthest upstream (Station Code: 07B02 0060) was rated Q3 in 2020; This station was located at Site 2. Another EPA station is located where the R402 crosses the Blackwater (Longwood) river. This station (Station Code: 07B02 0100) was rated Q3-4 in 2020. There is another monitoring site (Station Code: 07B02 0200) approximately 4km downstream that was rated Q3 in 2009.

The next EPA monitoring station (Station Code: 07B02 0300) is approximately 8km downstream from here. This site was rated Q3-4 in 2020. In 2003 another site 2km from here (Station Code: 07B02 0400) was rated Q3-4. The last EPA monitoring station (Station Code: 07B02 0600) is located where the R161 crosses the river approximately 200m upstream of the confluence with the Boyne. This site was rated Q3-4 in 2020.

The EPAs most recent assessment of the Blackwater [Longwood] River is as follows: *" The dominance of pollution tolerant and paucity of pollution sensitive macroinvertebrate taxa indicated unsatisfactory ecological conditions at all sites surveyed on the Blackwater (Longwood) River in 2020. Enriched conditions were evident with enhanced algal growth noted at all sites".*

All waterbodies in the Blackwater [Longwood] SC_010 sub catchment, except one are considered to be at risk. The majority of the survey sites are on waterbodies with a Water Framework Directive status of 'Poor'.

3.1.4.2 Mulgeeth River

The Mulgeeth River (EPA Code: 07M54) is a tributary of the Blackwater [Longwood] River]. The river rises in the Dunfierth Bog which is located just east of the proposed Drehid wind farm site. From here it flows south-east before turning sharply north-east to its confluence with the Blackwater [Longwood] River. The entire channel length is approximately 8rkm (river kilometres). There are no EPA biological monitoring stations on this watercourse.

3.1.4.3 Coolree 07 River

The Coolree River (EPA Code: 07C23) is a tributary of the Blackwater [Longwood] River. The entire channel length is approximately 10rkm. It rises to the south-west of Enfield and flows predominantly north-west until it's confluence with the Blackwater [Longwood] River. There are no EPA biological monitoring stations on this river. A section of this river and one of its tributaries, the Ballynamullagh River (EPA code: 07B19) flows along the proposed wind farm site.

The Coolree 07 River is also known as the Fear English River. The "Fear" part is locally pronounced "Fair" and it understood that the name relates to the word "meadow".

3.1.4.4 Ballynamullagh Stream

The Ballynamullagh Stream (EPA Code: 07B19) is also a tributary of the Blackwater [Longwood] River. The entire channel length is approximately 4rkm. This stream is also known as the Fear English River locally. The Ballynamullagh Stream rises ca. 1.2rkm south of the wind farm site. Immediately upstream of the boundary of the wind farm site the 1st order Drehid stream (EPA Code: 07D13) joins this watercourse. From here the Ballynamullagh stream flows north-east through the proposed wind farm site, before flowing north through the wind farm site. Seven of the proposed turbines are located near this watercourse, and it is proposed that access roads will cross this stream at three different points. Just before the proposed Turbine 6 the Ballynamullagh Stream flows into the Coolree 07 River.

The EPA do not carry out biological monitoring on the Ballynamullagh Stream, presumably due to its small size.

3.2.4 Previous aquatic ecology surveys

The Coolree 07 and Blackwater (Longwood) Rivers were surveyed by Ecofact during 2005 as part of a baseline survey of lamprey populations in the in the River Boyne catchment. This survey is presented in the report '*A survey of juvenile lamprey populations in the Boyne Catchment'* by O'Connor (2006). These watercourses were again surveyed by Ecofact during 2013 as part of an assessment of a different proposed wind farm (Ecofact. 2013). These historical surveys were again reviewed as part of the current assessment.

A total of five sites were investigated on the Longwood Blackwater including its tributary - the Fear English (Coolree 07 River) during the Boyne baseline juvenile lamprey survey completed by O'Connor 2005. A total area of 30 m^2 was fished and the mean density of Brook/River lampreys (*Lampetra* spp.) recorded was 4.62 per m^2 (0.20-15.00 per m^2). Minnow (*Phoxinus Phoxinus*), Three-spined sticklebacks (*Gasterosteous aculeatus),* and Brown trout (Salmon trutta) were also recorded.

No lampreys were recorded on the Fear English stream (Coolree 07 River), which was visibly polluted at the time of the survey in 2005.

It was considered by O'Connor (2005) that only one species of lamprey occurs in the Longwood Blackwater catchment – the resident Brook Lamprey (*Lampetra planeri*). Although the anadromous river lamprey (*Lampetra fluviatilis*) is indistinguishable from brook lamprey at the larval stage, a number of lamprey migration barriers are present on the main channel of the River Boyne. Sea lamprey (*Petromyzon marinus*), also an anadromous species, is distinguishable from *Lampetra* spp. at the larval stage but this species was not encountered in the O'Connor (2005) survey. Overall it was considered that lampreys were present at an unsatisfactory conservation status level. It was stated that "*as in other tributaries of the Boyne, lamprey populations here are currently threatened by pollution and drainage maintenance*".

There are limited other records from the study area. There is a previous record of White-clawed crayfish from the Longwood Blackwater at Johnstown Bridge in 2018. It is noted that crayfish were also recorded here during the Ecofact surveys for Drehid wind farm, most recently in September 2021. There are no other relevant records from the study area, apart from a record of Duck Mussel (*Anodonta anatina*) from Johnstown Bridge (in 2003).

The current 10 sites were surveyed in 2018 and 2019 as part of the baseline survey for the current proposed Drehid wind farm development (Ecofact, 2019). In September 2018 aquatic habitat surveys, and kick sampling surveys, were conducted at the 10 baseline sites. In September 2019 updated aquatic surveys were again conducted at the 10 baseline sites. In September 2021 an electrofishing survey of these 10 sites was also completed. The results of these surveys are presented in the field results section. The latest and most up-to-date results is presented for each site. The most recent survey was completed in December 2023.

3.2 Baseline Aquatic Ecology Surveys

3.2.1 Introduction

The survey sites are located on watercourses that both drain – or run close to - the proposed Drehid wind farm site. The watercourses surveyed are the Blackwater (Longwood) River, the Mulgeeth River, the Ballynamullagh Stream, the Drehid Stream and the Coolree 07 River. All of the sites are located within the Boyne catchment, and the Blackwater (Longwood) sub catchment. The survey sites are discussed in detail below with additional results provided in Appendix 1.

3.2.2 Site 1

Site 1 is located on the 3rd order Blackwater [Longwood] River (EPA segment code: 07_925). The site is located approximately 4km south-east of Enfield, Co. Meath just off the L1004 road. The EPA do not monitor water quality this part of the river. There are three EPA stations upstream from here but they have not been monitored in recent years,

The section of river this site is located on is classified by the Water Framework Directive (WFD) as an "at risk" waterbody. The watercourse also has a WFD (2016-2021) Ecological Status or Potential status of `Poor'. This survey site is located to the north-east of the proposed wind farm,

This site is located on a low gradient section of the 3rd order Blackwater (Longwood) River. This stretch of the river has been deepened and channelised in the past. The site was previously well shaded by riparian trees which overhung the watercourse along high banks. During the December 2023 survey it was apparent that extensive maintenance works had been undertaken along the channel at this site and the overhanging trees has been removed. There is no instream vegetation in the river at this location. The water is silted and slow flowing at this site. It was considered that the maintenance works had been completed recently.

This stretch of the river does not have any suitable spawning or nursery habitats for salmonids. There is potential lamprey nursery habitats and trout rearing and foraging habitats present. This channel has been further degraded by the recent maintenance works.

Brown Trout, Brook Lamprey, Three-spined Stickleback, Minnow (*Phoxinus Phoxinus*), and Stone Loach (*Barbatula barbatula*) were recorded during the 2019-2021 electro fishing surveys. These species are all still likely to be present. However, the removal of the overhanging trees will have negatively affected fish habitats and has caused further siltation in the river. Although White-clawed Crayfish have been recorded in this river previously, none found to be present at the site during the 2021 survey. Habitats for crayfish are very limited at this site due to the general absence of suitable refuges.

The estimated current Q-rating for this site is 'Q3 – Moderately Polluted'. The overall status of this channel is rated as 'Moderate'. This stretch of the river has been further degraded by recent arterial drainage maintenance works.

3.2.3 Site 2

Site 2 is located 2km upstream of Site 1 on the Blackwater (Longwood) River (EPA segment code: 07_2240). The Blackwater [Longwood] River rises approximately 4km upstream of Site 2. The EPA carry out biological monitoring at this site (Station Code: 07B020060). It was rated as Q3 in 2020, which corresponds to WFD 'Poor' status. The site is classified by the WFD as an "at risk" waterbody and has a Water Framework Directive (2016-21) waterbody status of "Poor". The proposed Drehid wind farm site is located to the west this site.

The water channel at this site is very narrow and channelised, flowing through agricultural land. It is evident that this section of the river has been well maintained in the past, and further channel maintenance works had recently been completed at the site. There was evidence of recent bank works and tree clearance, and a tracked machine was still present at the site when it was visited in December 2023. The gradient at this site was very low and siltation levels were high. This is a relatively featureless channel with no pool, riffle, glide sequences. This is an artifact of the arterial drainage scheme. The river is lined by high spoil heaps of material that was previously dredged from the river.

Brown Trout, Brook Lamprey, Minnow, Three-spined Stickleback, and Stone Loach were recorded during the 2021 electro fishing survey. The results were very similar to the previous 2019 survey and the numbers of all species recorded was low. These species are all still likely to be present – but this is a very degraded stretch of river and is subject to regular disturbance by maintenance activities. White-clawed Crayfish were recorded here in low numbers during the 2021 survey. Habitats for crayfish are very limited at this site due to the low instream physical diversity, and regular disturbance. They could still be present in very low numbers.

The estimated current Q-rating for this site is 'Q3 – Moderately Polluted'. The overall status of this channel is rated as 'Poor'. This stretch of the river has been further degraded by recent / ongoing arterial drainage maintenance works.

3.2.4 Site 3

Site 3 is located on the 2nd order Mulgeeth River (EPA segment code: 07_1720). This watercourse rises in the Dunfierth Bog. This site is located approximately 3km upstream of Site 2. There is no EPA water quality monitoring station on this river. The section of river this site is located on is assessed by the WFD as an "at risk" waterbody. The watercourse has a Water Framework Directive (2016-2021) waterbody status of "Poor". The site is located to the south-east of the proposed Drehid wind farm.

The Mulgeeth River channel at Site 3 is also subject to regular arterial drainage maintenance, and impacts and disturbance was apparent again in the December 2023 survey. The banks are hight and the gradient is low. The site is heavily silted, as was similarly noted in previous surveys.

The only species that was recorded at this site in the 2021 electrofishing survey were Three-spined Stickleback and Minnow which were recorded in small numbers. Lampreys and crayfish were never recorded at this site. It is unlikely that this has changed and the landowner at this site informed as that there were no fish at this site.

The estimated current Q-rating for this site is 'Q3 – Moderately Polluted'. The overall status of this channel is rated as 'Poor'. There have not been any significant changes at this site since the 2021 survey.

3.2.5 Site 4

Site 4 was located on the 2nd order Mulgeeth River (EPA segment code: 07_1320). This site is approximately 2.5km upstream of Site 3. There are no EPA monitoring stations on this stretch of river. The site is assessed by the WFD as being an "at risk" waterbody. The watercourse has a Water Framework Directive (2016-2021) waterbody status of "Poor". This site is located to the south-east of the proposed Drehid wind farm site.

This channel has been dredged and channelised in the past, and is well maintained. The condition of this site is much the same as it was during the 2021 survey. The only species recorded at this site during the 2021 electrofishing survey was Three-spined Stickleback. This species was common at this location. This site is considered to be unsuitable for lampreys, salmonids, and crayfish.

The estimated current Q-rating for this site is 'Q3 – Moderately Polluted'. The overall status of this channel is rated as 'Poor'. There have not been any significant changes at this site since the 2021 survey.

3.2.6 Site 5

Site 5 is located in Johnstown bridge on the 4th order Blackwater [Longwood] River (EPA segment code: 07_350). It is located downstream of an existing bridge where the R402 road crosses this watercourse. The EPA carries out biological monitoring at this site (Station Code: 07B020100). It was rated Q3 in 2020, corresponding to WFD status 'Poor'. The section of river this site is located on is classified by the WFD as an "at risk" waterbody. The watercourse also has a Water Framework Directive (2016-2021) waterbody status of "Poor Ecological Status (or Potential)". The site is located to the north of the proposed Drehid wind farm.

The river at the site has been drained and channelised in the past, and water quality has declined since 2018. There were construction works underway with the building of a new sewage treatment works downstream of the site. There was evidence that machinery had crossed the river at the 2021 electrofishing site with tracks on both sides of the river leading to the waterline. This location was heavily impacted by cattle accessing the river for drinking in September 2021. The site is heavily silted.

During the 2021 electrofishing survey Salmon and Brook Lampreys were recorded in small numbers. This was the only site Salmon were recorded during the baseline surveys for the proposed wind farm site. Brown Trout, Three-spined stickleback, and Minnow were also recorded in small numbers. White-clawed Crayfish were recorded at this site in 2021, but not in 2019 and 2018. The numbers present are very low.

The estimated current Q-rating for this site is 'Q3 – Moderately Polluted'. The overall status of this channel is rated as 'Poor'. There have not been any significant changes at this site since the 2021 survey, apart from the localised impacts of machines tracking across the river.

3.2.7 Site 6

Site 6 is located on the 3rd order Coolree 07 River (EPA segment code: 07_1848). It is located approximately 3 km upstream of Site 5. This site is assessed as an "at risk" waterbody by the WFD. The watercourse has a Water Framework Directive (2016-2021) waterbody status of "Poor". This site is located to the north-east of the proposed Drehid wind farm.

This site is heavily silted and was recently subjected to arterial drainage maintenance. Dredging and removal of vegetation has occurred since the last survey. There is cattle access to the river which was also evident during previous surveys. Indeed, cattle were recorded in the river during both the 2019 and 2021 surveys. The heavy siltation at this site is due to livestock entering the river, and the upstream maintenance works.

Brown Trout, Minnow, Three-spined Stickleback and Stone Loach were recorded in low numbers during the September 2021 electrofishing survey. Nominal numbers of Brook lampreys were recorded at this site in 2018, but not in the subsequent surveys. This site was first surveyed by Ecofact in 2005 when it was considered to be "*visibly polluted at the time of the survey*".

The estimated current Q-rating for this site is 'Q3 – Moderately Polluted'. The overall status of this channel is rated as 'Poor'. This stretch of the river has been further degraded by recent maintenance works.

3.2.8 Site 7

Site 7 was located on the 1st order Clonkeeran River (EPA segment code: 07_1287). There are no EPA monitoring stations on this river. The section of river this site is located on is classified as an "at risk" waterbody. The watercourse has a waterbody status of 'Poor'. This site is located to the west of the proposed wind farm. The site is highly modified.

This site on the 1st order Clonkeeran River does not provide optimal aquatic habitat. The Clonkeeran River is also known locally as the "Sweep River". The origins of this name are unknown and it is a very small and low gradient stream, and does not have a significant flow. Indeed during the 2018 survey the site was dry. In 2019 there was a very small flow in the river, but not enough to provide substantial aquatic habitat. In 2021 the site was again dry and overgrown with briars and overhanging vegetation. In December 2023 there was a moderate flow in the river. It was obvious that recent maintenance works had been completed - vegetation cleared from the banks and some dredging had been undertaken. The channel was heavily silted.

The estimated current rating for this site is "at risk". It is not suitable for applying a Q rating. The overall status of this channel is rated as 'Poor'. This stretch of the river has been further degraded by recent maintenance works.

3.2.9 Site 8

Site 8 is located a further c. 4km upstream from Site 6 on the first order Coolree 07 River (EPA segment code: 07_1230). There are no EPA biological water quality monitoring stations here. This section of the river is classified as an "at-risk" waterbody by the EPA and has a 'Poor' status. This site is located to the west of the proposed Drehid wind farm.

The banks of the river at this site are high and overgrown with heavy vegetation. There is significant siltation at this site, and it is accessible to cattle, which are trampling through the watercourse and exacerbating the sediment issue. The only fish species recorded at this site during the 2019 and 2021 electrofishing surveys were Three-spined Sticklebacks.

During December 2023, water levels at this site were higher than in the previous year. There are a few areas of the channel in the upper Coolree 07 River catchment where there is at least some gradient and some run-type habitat present. It cannot be fully excluded that some trout might move upstream into a channel like this in wet years (like 2023). However, this would provide temporary habitat only in a wet year, and the trout present would be expected to leave or perish when more normal conditions return. Brown trout were not recorded in the two previous electrofishing surveys. The summer and autumn of 2023 were record wet periods, and it is to be expected that all watercourses were higher as a result. Obviously, a stream with more water provides better potential habitat. However, at best this watercourse could provide a marginal habitat for trout, and considering more typical water levels and water quality it would be a temporary one only.

The estimated current Q-rating for this site is 'Q3 – Moderately Polluted'. The overall status of this channel is rated as 'Poor'. Water levels in this stretch were higher than what was observed in previous surveys. However, the overall evaluation of the channel/site remains the same.

3.2.10 Site 9

Site 9 was located on the 1st order Ballynamullagh Stream (EPA Segment Code: 07_801) approximately 590rm upstream of the proposed Drehid wind farm site. There are no EPA monitoring stations on this watercourse. The EPA classifies this watercourse as being 'At Risk'. The Ballynamullagh Stream flows through the proposed wind farm site and approximately 7 of the proposed 11 turbines are located in the lands surrounding this watercourse. Proposed access roads also cross the Ballynamullagh Stream at three different points.

The stream is very small at this site with overgrown banks. It does not provide suitable habitat for aquatic species. No fish were recorded during the electrofishing surveys completed in 2019 and 2021. The stream was slightly higher in December 2023 than in the previous surveys – but it was still very obvious that it could not provide a suitable habitat for fish.

The estimated current rating for this site is "at risk". It is not suitable for applying a Q rating. The overall status of this channel is rated as 'Poor'. There have not been any significant changes at this site since the 2021 survey.

3.2.11 Site 10

Site 10 was located on the 2nd order Drehid River (EPA segment code: 07_800) approximately 570rm upstream of the proposed Drehid wind farm site boundary. There are no EPA monitoring stations on this watercourse. The section of river this site is located on is classified as an 'at risk' waterbody and has a Water Framework Directive (2016-2021) waterbody status of 'Poor'.

The Drehid River watercourse is largely concealed under heavy vegetation overhanging from high banks at both sides of the river. The site was dry during the 2021 current survey. In 2019 there was very little water and it was heavily silted. No fish were recorded and it was concluded that this stream does not provide any suitable habitat for any fish species. During the December 2023 survey the stream was higher than we had seen before, and there was a flow.

The estimated current rating for this site is "at risk". It is not suitable for applying a Q rating. The overall status of this channel is rated as 'Poor'. This channel was dry during the 2021 survey, and there was a flow during December 2023. However, the site remains in a poor condition and does not provide a sufficient aquatic habitat to support any fish or other important aquatic organisms.

3.2.12 Sites A-D

Sites A-D were additional sites considered during the December 2023 survey at the request of the client. In the previous surveys in 2018, 2019, and 2021 sites located both downstream and upstream of these points were surveyed.

Site 6 is located downstream of Sites A-D on the 3rd order Coolree 07 River. Sites 8, 9, and 10 are located upstream of Sites A-D on the Coolree 07 stream, Ballynamullagh stream, and Drehid stream respectively. Sites A-D are all located on the Ballynamullagh stream between Sites 6 and 8-10. It is considered that this stretch of river has already been fully assessed and evaluated. However, the current December 2023 updated survey provides an updated and a higher level of resolution survey. Sites A-D are all located on the same EPA river segment (07_864).

Site 6 is located downstream on the 3rd order Coolree 07 River (EPA segment code: 07_1848), and is downstream of Sites A-D. The Coolree 07 River has been surveyed on a number of occasions and is a small and physically degraded aquatic habitat. It is considered that Site 6 is the upper limit of where salmonids would be regularly found. During the previous surveys nominal numbers of Brown Trout were found on this site, but it is considered to be a marginal and suboptimal habitat for salmonids. Upstream of Kilshanroe bridge the river is very modified, has low gradient, is dominated by silt and mud substrates. There are ongoing agricultural, forestry, and river maintenance impacts. During the original 2018 survey, Site 6 was selected as a receptor site due to the reason that this was the closest potentially suitable salmonid habitat to the proposed wind farm site on this watercourse. Sites 8, 9, and 10 are located upstream from here and no salmonids were found. The only fish species thought to regularly occur in the Coolree 07 River catchment upstream of Site 6 is Three-spined stickleback. This is a highly modified catchment and subject to regular instream maintenance works. During the current survey it was clear that dredging and vegetation removal had occurred in the stretch upstream of Site 6. This was also concluded in previous surveys and is clearly an ongoing impact.

During December 2023 the channels between Sites 6, 8,9, and 10 were investigated, including Sites A-D. Water levels in this channel were higher than during the previous surveys. This was due to the current survey being completed in the winter when rainfall levels are generally higher. Moreover, the preceding 6 months had also been very wet and this resulted in most watercourses in the study area being much higher than during the previous visits. This was the case even though the current survey was preceded by a relatively dry two-week period. Therefore these channels were viewed at their best, with higher base flows and die back of algae/instream vegetation. However, they were still rated as being marginal habitats for salmonids, and unsuitable for species such as lampreys and crayfish.

There are a few areas of channel in the upper Coolree 07 River catchment where there is at least some gradient; for example, downstream of Site 8 on the Clonkeeran stream. It can’t be fully excluded that some trout could move upstream into these areas in wet years. However, this would provide temporary habitat only and the trout present would be expected to leave or perish when more normal conditions occur. The Clonkeeran stream runs very slow in the summer and had obvious agricultural impacts when previously visited. Streams often look their best in the winter months when there is more water, but this stream is still, at best, a marginal salmonid habitat. Moreover, Sites A,B,C,D are located upstream of where the Clonkeeran stream joins the Ballynamullagh Stream. There is no salmonid habitat present at Sites A, B, C, D, or E. The Ballynamullagh Stream itself is very unlikely to be ever used by salmonids and the areas at Sites A,B,C, and D are not of any potential value to fish or other sensitive aquatic organisms. This is because of the small size of the stream, its degraded physical status, and unsatisfactory water quality. Even when viewed in the winter months this the same conclusion has been reached.

The Coolree 07 River at Site 6 is a salmonid nursery channel (albeit a very marginal one) so the overall evaluation and assessment of this aquatic area does not change. Water quality in the Ballynamullagh Stream will of course influence water quality in the Coolree 07 River. Similarly, the water quality in the downstream River Boyne is ultimately strongly influenced by the water quality in the smaller catchment feeder streams. Therefore, despite its degraded status it was already accepted that the upper reaches of the Coolree 07 River would need to be fully protected during the construction of the proposed wind farm.
Overall, the conclusion of the current updated survey of the upper Coolree 07 River is that the evaluation is the same. There are really no suitable salmonid habitats upstream of Kilshanroe bridge. Similarly, lampreys and crayfish have been confirmed absent from this area. The character of the river changes above Site 6 to a channelised drain-like watercourse with a mud substrate, and it becomes smaller and of less value to aquatic ecology as you move further upstream. In a wet year and in the winter months

it can't be fully ruled out that some Brown Trout may move upstream. But this would be into degraded, marginal, and temporary habitats only.

The estimated quality rating for EPA river segment (07_864) where sites A-D are all located is "at risk". None of the sites are suitable for applying a Q rating. The overall status of this channel is rated as 'Poor'. There have not been any significant changes on this section of river since the 2021 survey, when sites both upstream and downstream of this river segment were surveyed using electrofishing.

3.2.13 Site E

This site was located on an unregistered watercourse. This means that it is not included in the EPA watercourse maps. Very small, ephemeral, watercourses are sometimes not included in the EPA maps. This is often the case for very small artificially created watercourses (e.g. drains) also. This site was visited during December 2023 and a watercourse is present at the site. This is a very small watercourse that is heavily modified and more like a drain than a stream. Even during December 2023 there was a minimal flow and this 'watercourse' can be expected to dry up.

This 'drain' is within the catchment of the Kilmurray 07 stream (EPA segment 07_1820) which is a minor tributary of the Coolree 07 river. Site E is located approximately 300m upstream from the Kilmurray 07 stream. The confluence with the Coolree 07 river is then a further c. 400m downstream. The confluence of the Coolree 07 river and the Longwood Blackwater is a further c. 2km downstream. The Kilmurray 07 stream itself is not of any aquatic ecological importance, and the 'watercourse' at Site E is of less importance. There is also very little risk of conveying any pollutants downstream due to the low flow, low gradient, and a high level of in channel vegetation growth.

This site can't really be rated under any biological monitoring scheme as it does not qualify as a watercourse. But by any measures this would not meet anything higher than 'Poor Status'. This site does not provide any habitat that could support fish or other important aquatic organisms.

4. CONCLUSIONS

This report presents the findings from a comprehensive survey conducted on various watercourses within the vicinity of the proposed Drehid wind farm site. The surveys were completed in 2018, 2019, 2021, and 2023. A total of 10 sites were surveyed in detail during the 2018-2021 surveys (Sites 1-10). These sites were visited again in December 2023 to document any changes at the sites. In additional a further 5 sites were considered in the December 2023 visit (Sites A-E). The surveys completed were located at sites on the Blackwater (Longwood) River, the Mulgeeth River, the Ballynamullagh Stream, the Drehid Stream, and the Coolree 07 River, all located within the Boyne catchment and the Blackwater (Longwood) sub-catchment. The baseline survey sites in this survey were chosen to reflect reference and receptor areas for the proposed Drehid Wind Farm. In addition to the field surveys completed, detailed desk studies were also completed, and these were updated as part of the current assessment.

None of the river channels in the study area are meeting “Good Ecological Status”. The common issues identified across these sites include high levels of siltation, degraded hydromorphology, limited instream vegetation, and the absence of optimal habitats for key species such as salmonids, lampreys, and crayfish. Recent arterial drainage maintenance works have further degraded the river channels, exacerbating siltation and disturbing aquatic habitats. These works have resulted in the removal of overhanging trees and vegetation, which previously provided shade and habitat for fish species. There are three sites on the Blackwater (Longwood) River included in the current assessment two of them had been subjected to recent arterial drainage works (Sites 1 and 2) when visited in December 2023. There was evidence that track machines has recently crossed the third site (Site 5). Additional maintenance works were also recorded at Sites 6 and 7 during the current survey. Evidence of agricultural impacts was recorded at every one of the baseline survey sites investigated. This included cattle accessing the watercourses and banks.

The surveys identified the presence of various fish species including Brown Trout, Brook Lamprey, Three-spined Stickleback, Minnow, and Stone Loach in the overall study area. However, the abundance of these species is low, and their habitats have been negatively impacted by the overall poor condition of the watercourses. The current water quality ratings for the sites generally indicate "Moderately Polluted" conditions. The overall status of these channels is "Poor" reflecting the degraded state of the watercourses and their unsuitability to support a healthy aquatic ecosystem.

The most important watercourses in the study area is the main channel of the Blackwater (Longwood) River. Salmon, Brown trout, and White-clawed crayfish occur in this river. It is a tributary of the River Boyne, and associated Natura 2000 sites. This watercourse is a significant distance downstream from the proposed wind farm boundary and can be easily protected during the development of the proposed wind farm site. The Blackwater (Longwood) River is also a highly modified watercourse that was severely dredged and channelized during the Boyne arterial drainage scheme. It is also has a ‘Poor-Moderate’ water quality rating. The Ballynamullagh Stream which flows through the proposed wind farm site is very unlikely to be ever used by salmonids and the areas at Sites A,B,C, and D investigated in December 2023 are not of significant value to fish or other sensitive aquatic organisms. This is because of the small size of the stream, its degraded physical status, and unsatisfactory water quality. It was also concluded that the new Site E in the Kilmurray 07 stream catchment is not of any aquatic ecological importance. It is an unregistered watercourse and is just a highly modified drain.

Overall, the conclusion of the current updated survey is that the previous evaluation of the watercourses has not changed. Indeed, conditions have deteriorated at some sites due to arterial drainage maintenance works and a background decline in water quality. All the sites visited in the current survey had evidence of agricultural impacts and have been drained or channelised in the past. Most of the areas have been subjected to recent maintenance or other physical impacts.

The impact of developing a wind farm in the Coolree 07 / Ballynamullagh Stream sub-catchment is not considered to be a significant cumulative pressure. The Ballynamullagh Stream which flows through the proposed wind farm site is very unlikely to be ever used by salmonids, and is of limited/no aquatic ecological significance. The receiving watercourses can be easily protected with industry standard 'best practice' mitigation. The proposed wind farm site is also not in an upland area so controlling and treating runoff from the proposed works area can be easily achieved. None of the aquatic areas affected are particularly sensitive. As concluded in O'Connor (2017), most potential issues arising between wind farms and the aquatic environment can be avoided or mitigated through careful project design and management. This is the case for the current site and changes in land use as a result of the development of the proposed wind farm could actually bring positive benefits to water quality and the receiving watercourses.

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PLATES

Plate 1 Site 1 on the Blackwater (Longwood) River in 2021. This site had high banks, overhanging riparian trees and a sluggish flow.

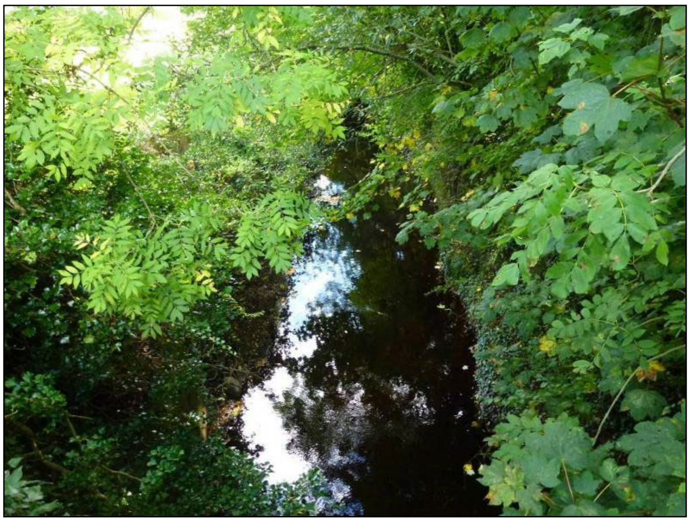

Plate 2 Site 1 on the Blackwater (Longwood) River in 2013. These watercourses are very well known to the project aquatic ecologists.

Plate 3 Recently completed riparian tree removal and maintenance at Site 1 on the Blackwater (Longwood) River in December 2023. Arterial drainage maintenance is a major pressure on this river.

Plate 4 Brown trout from Site 1 on the Blackwater (Longwood) River, September 2021.

Plate 5 Three-spined Stickleback from Site 1 on the Blackwater (Longwood) River in September 2019. This was the most common fish species recorded in the 2019 and 2021 electrofishing surveys.

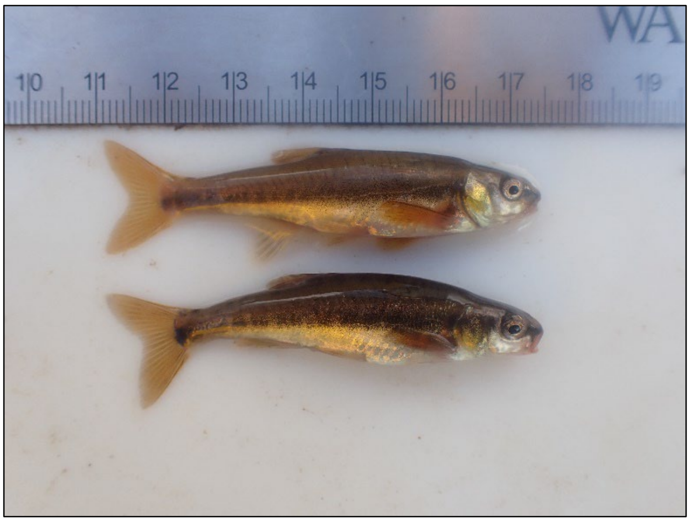

Plate 6 Minnows from Site 1 on the Blackwater (Longwood) River, September 2021.

Plate 7 Site 2 on the Blackwater (Longwood) River, September 2021.

Plate 8 Site 2 on the Blackwater (Longwood) River, December 2023.

Plate 9 Bank clearance and maintenance works at Site 2 on the Blackwater (Longwood) River, December 2023.

Plate 10 Electrofishing at Site 2 on the Blackwater (Longwood) River, September 2021.

Plate 11 Brown trout with unusual coloration from the peat-stained Blackwater River at Site 2. September 2021.

Plate 12 Brook lampreys from Site 2 on the Blackwater (Longwood) River, September 2021.

Plate 13 Stone Loach were present at Site 2 on the Blackwater (Longwood) River.

Plate 14 Site 3 on the Mulgeeth River in 2018 – this channel had been recently maintained at this time.

Plate 15 Electrical fishing survey at Site 3 on the Mulgeeth River during September 2019.

Plate 16 Site 3 on the Mulgeeth River in September 2021.

Plate 17 Site 3 on the Mulgeeth River in December 2023.

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Plate 19 Site 4 on the Mulgeeth River during December 2023.

Plate 20 Site 5 on the Blackwater (Longwood) River, September 2021.

Plate 21 Lamprey survey at Site 5 on the Blackwater (Longwood) River, September 2021.

Plate 22 Site 5 on the Blackwater (Longwood) River, September 2021, showing agricultural imapcts.

Plate 23 Site 5 on the Blackwater (Longwood) River, December 2023. There was evidence that construction machinery had recently tracked across the river at this point.

Plate 24 Salmon (top) and Brown Trout from Site 5 on the Blackwater (Longwood) River, September 2021.

Plate 25 Juvemile Atlantic salmon from Site 5 on the Blackwater (Longwood) River, September 2021.

Plate 26 White-clawed crayfish from Site 5 on the Blackwater (Longwood) River, September 2021. Only nominal numbers were indicated to be present.

Plate 27 White clawed crayfish were also recorded at Site 5 on the Blackwater (Longwood) River during September 2019.

Plate 28 Adult Brown Trout from Site 5 on the Blackwater (Longwood) River during September 2019.

Plate 29 Minnows were common at Site 5 on the Blackwater (Longwood) River during September 2019.

Plate 30 Site 6 on the Coolree 07 River during September 2021.

Plate 31 Site 6 on the Coolree 07 River during December 2023.

Plate 32 Site 6 on the Coolree 07 River during September 2019. Cattle were also in the river here during the 2016 and 2021 surveys.

Plate 33 Site 6 on the Coolree 07 River during December 2023. Cattle were again accessing this site.

Plate 34 Site 7 – the Clonkeeran stream during September 2019. This stream was dry during the September 2021 survey.

Plate 35 Site 7 – the Clonkeeran stream during December 2023.

Plate 36 Site 8 on the Coolree 07 River during December 2024. Water levels river were higher than previously recorded, due to the very wet conditions in 2023.

Plate 37 Site 8 on the Coolree 07 River during September 2018 showing more typical conditions. This is not salmonid habitat.

Plate 38 Water levels on the upper Coolree 07 river were higher than previously recorded, due to the very wet conditions in 2023.

Plate 39 Site 9 on the Ballynamullagh Stream during September 2021.

Plate 40 Site 9 on the Ballynamullagh Stream during December 2024.

Plate 41 Three spined sticklebacks are the most common fish species in the upper Coolree 07 river.

Plate 42 Site 10 on the Drehid Stream during September 2021.

Plate 43 Site 10 on the Drehid Stream during December 2024.

Plate 44 Additional Site A on the Ballynamullagh Stream in December 2023 (this is at a livestock drink).

Plate 45 Site B on the Ballynamullagh Stream in December 2023. Note the agricultural impacts (sheep).

Plate 46 Site C on the Ballynamullagh Stream in December 2023. Note the agricultural impacts (sheep).

Plate 47 Whooper Swans near the Ballynamullagh Stream, December 2023.

Plate 48 Site E is on an unregistered watercourse/drain of no aquatic ecological importance and was visited during December 2023.

APPENDIX 1 RESULTS

Table A1.1 Summary and evaluation of the aquatic ecology survey of 15 sites (updated 2023 survey).

Site No.	Watercourse name	Biological Water quality	Aquatic habitat	Fish population	Rare / notable species	Overall evaluation
1	Blackwater (Longwood)	Q3	Drained and channelized river with fine substrate and high banks. Recent arterial drainage maintenance work completed.	Brown Trout, Brook lamprey, Minnow, Three-spined stickleback, and Stone Loach recorded during 2019 and 2021 electrofishing surveys.	Brown Trout Brook Lamprey (nominal numbers)	Moderate status
2	Blackwater (Longwood)	Q3	Drained and channelized river with excessive macrophyte growth, mixed substrate and high banks. Recent arterial drainage maintenance work completed.	Brown Trout, Brook lamprey, Three-spined stickleback and Stone Loach recorded during 2019 and 2021 electrofishing surveys.	Brown Trout Brook Lamprey White-clawed crayfish (nominal numbers)	Poor status
3	Mulgeeth	Q3	Drained and channelized river with fine substrate and high banks	Minnows and sticklebacks only.	None	Poor status
4	Mulgeeth	Q3	Drained and channelized river with fine substrate and high banks	Three-spined sticklebacks	None	Poor status
5	Blackwater (Longwood)	Q3-4	Drained and channelized river with excessive macrophyte growth, mixed substrate and high banks. Recent tracking of machines across river.	Salmon, Brown Trout, Brook lamprey, Minnow, Three-spined stickleback, and Stone Loach recorded during 2019 and 2021 electrofishing surveys.	Salmon Brown Trout Brook Lamprey White-clawed crayfish	Poor status
6	Coolree 07	Q3	Drained, highly modified. Cattle accessing the river. Fine/gravel substrate. Recent arterial drainage maintenance work completed.	Minnows, stone loach, and three-spined sticklebacks recorded in very low numbers during 2019 and 2021 electrofishing surveys.	None	Poor status
7	Clonkeeran	At risk	Dry in previous years, low flow in 2023 survey. Recent maintenance work completed.	No fish present	None	Poor status
8	Coolree 07	Q3	Highly modified tiny stream, higher water levels in 2023 survey.	Three spined sticklebacks, possibly provides temporary habitat for trout.	None	Poor status

Site No.	Watercourse name	Biological Water quality	Aquatic habitat	Fish population	Rare / notable species	Overall evaluation
9	Ballynamullagh	At risk	Drain like stream	No fish present	None	Poor status
10	Drehid	At risk	Drain like stream	No fish present	None	Poor status
A	Ballynamullagh	At risk	Tiny, modified stream	No fish present	None	Poor status
B	Ballynamullagh	At risk	Tiny, modified stream	No fish present	None	Poor status
C	Ballynamullagh	At risk	Tiny, modified stream	Three spined sticklebacks may be present.	None	Poor status
D	Ballynamullagh	At risk	Tiny, modified stream	Three spined sticklebacks may be present	None	Poor status
E	Unnamed	n/a	Drain	No fish present	None	Poor status

Table A1.2 Results of the River Corridor Survey (RHS) Assessments of survey sites at the proposed Drehid wind farm site, September 2021.

Site	**Watercourse Name**	**EPA Segment**	**Drained (Y/N)**	**Wetted Width (m)**	**Gradient (Low/Med/High)**	**Siltation (Heavy/Moderate/Normal/Free)**	**Filamentous algae (Y/N)**	**Eroding Banks (Y/N)**	**Braided Channel (Y/N)**	**Artificial Features (Y/N)**
1	Blackwater (Longwood)	07_1059	Y	2.8	L	H	N	N	N	Y
2	Blackwater (Longwood)	07_2240	Y	2.5	L	H	N	N	N	Y
3	Mulgeeth	07_1720	Y	2.5	L	H	N	N	N	Y
4	Mulgeeth	07_1320	Y	1.2	L	H	N	N	N	Y
5	Blackwater (Longwood)	07_350	Y	2.8	L	M	N	N	N	Y
6	Coolree 07	07_1848	Y	2	L	H	N	N	N	Y
7	Clonkeeran	07_1287	Y	<1	L	H	N	N	N	Y
8	Coolree 07	07_1230	Y	1.5	L	H	Y	N	N	Y
9	Ballynamullagh	07_801	Y	0.9	L	H	N	N	N	Y
10	Drehid	07_800	Y	<1	L	H	N	N	N	Y
A	Ballynamullagh	07_864	Y	<1	L	H	N	N	N	Y
B	Ballynamullagh	07_864	Y	<1	L	H	N	N	N	Y
C	Ballynamullagh	07_864	Y	<1	L	H	N	N	N	N
D	Ballynamullagh	07_864	Y	<1	L	H	N	N	N	N
E	Unnamed	n/a	Y	<1	L	H	N	N	N	Y

Table A1.3 Results of the fisheries habitat assessments of survey sites at the proposed Drehid wind farm site, updated December 2023.

Site	Watercourse Name	Salmonid Nursery (Y/N)	Salmonid Fishery (Y/N)	Coarse Nursery (Y/N)	Coarse Fishery (Y/N)	Salmon (P/A)	Trout (P/A)	Coarse Fish (P/A)	Eel (P/A)	Lamprey Habitat (P/A)	Lamprey (Y/N)	Crayfish (P/A)	FWPM (P/A)
1	Blackwater (Longwood)	N	N	N	N	A	P	P	L	P	Y	L	A
2	Blackwater (Longwood)	N	N	N	N	A	L	L	L	P	Y	L	A
3	Mulgeeth	N	N	N	N	A	L	L	A	P	L	A	A
4	Mulgeeth	N	N	N	N	A	A	A	A	P	L	A	A
5	Blackwater (Longwood)	Y	N	N	N	P	P	A	L	P	Y	P	A
6	Coolree 07	N	N	N	N	A	P	A	A	P	L	A	A
7	Clonkeeran	N	N	N	N	A	A	A	A	A	N	A	A
8	Coolree 07	N	N	N	N	A	A	A	A	A	N	A	A
9	Ballynamullagh	N	N	N	N	A	A	A	A	A	N	A	A
10	Drehid	N	N	N	N	A	A	A	A	A	N	A	A
A	Ballynamullagh	N	N	N	N	A	A	A	A	A	N	A	A
B	Ballynamullagh	N	N	N	N	A	A	A	A	A	N	A	A
C	Ballynamullagh	N	N	N	N	A	A	A	A	A	N	A	A
D	Ballynamullagh	N	N	N	N	A	A	A	A	A	N	A	A
E	Unnamed	N	N	N	N	A	A	A	A	A	N	A	A

Y = Yes, N= No, P = Present, A = Absent, L = not recorded but likely to occur in the waterbody

Table A1.4 Biological water quality and WFD status at the aquatic survey sites at the proposed Drehid wind farm.

Site	Watercourse Name	EPA Code	EPA Q Value	Ecofact Q Value	WFD Status
1	Blackwater (Longwood)	07_1059	N/A	Q3	Moderate
2	Blackwater (Longwood)	07_2240	Q3	Q3	Poor
3	Mulgeeth	07_1720	N/A	Q3	Poor
4	Mulgeeth	07_1320	N/A	Q3	Poor
5	Blackwater (Longwood)	07_350	Q3-4	Q3-4	Poor
6	Coolree 07	07_1848	N/A	Q3	Poor
7	Clonkeeran	07_1287	N/A	n/a	Poor
8	Coolree 07	07_1230	N/A	Q3	Poor
9	Ballynamullagh	07_801	N/A	n/a	Poor
10	Drehid	07_800	N/A	n/a	Poor
A	Ballynamullagh	07_864	N/A	n/a	Poor
B	Ballynamullagh	07_864	N/A	n/a	Poor
C	Ballynamullagh	07_864	N/A	n/a	Poor
D	Ballynamullagh	07_864	N/A	n/a	Poor
E	Unnamed	n/a	N/A	n/a	Poor

Table A1.5 Summary results of the electrical fishing surveys undertaken at the 10 survey sites during September 2021. Each site was fished for 5 minutes and an additional 3 minutes was spent surveying for juvenile lampreys.

Site	Watercourse Name	Brown Trout	Salmon	Brook Lamprey	Minnow	Three-spined stickleback	Stone Loach	White-clawed crayfish
1	Blackwater (Longwood)	*		*	*	***	*	
2	Blackwater (Longwood)	**		**		**	*	*
3	Mulgeeth				**	**		
4	Mulgeeth					***		
5	Blackwater (Longwood)	***	**	*	***	**		*
6	Coolree 07	*			*	*	*	
7	Clonkeeran							
8	Coolree 07					*		
9	Ballynamullagh							
10	Drehid							

*Present, **Small Numbers, ***Common, ****Numerous

Table A1.6 Results of the 5-minute electrical fishing surveys at the 10 survey sites (CPUE fish/min) during September 2021.

Site	Watercourse Name	Brown Trout	Minnow	Three-spined stickleback	Stone Loach
1	Blackwater (Longwood)	0.4	0.4	0.8	1.2
2	Blackwater (Longwood)	0.6	0.6	0	0.8
3	Mulgeeth	0	0	1	1.4
4	Mulgeeth	0	0	0	2
5	Blackwater (Longwood)	1.2	0.4	2	1.8
6	Coolree 07	0.2	0	0.4	0.6
7	Clonkeeran	0	0	0	0
8	Coolree 07	0	0	0	0.8
9	Ballynamullagh	0	0	0	0
10	Drehid	0	0	0	0

Table A1.7 Results of the 3-minute lamprey surveys at the 10 survey sites (CPUE fish/min) during September 2021.

Site	Watercourse Name	Potential lamprey habitat present (Y/N)	Brook Lamprey	CPUE
1	Blackwater (Longwood)	Y	2	0.67
2	Blackwater (Longwood)	Y	1	0.33
3	Mulgeeth	Y	n/a	
4	Mulgeeth	N	n/a	
5	Blackwater (Longwood)	Y	4	1.33
6	Coolree 07	Y	n/a	
7	Clonkeeran	N	n/a	
8	Coolree 07	N	n/a	
9	Ballynamullagh	N	n/a	
10	Drehid	N	n/a	

APPENDIX 8-1.8

Drehid Invasive Species Management Plan

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

DREHID WIND FARM AND SUBSTATION

Invasive Species Management Plan

Prepared for:
North Kildare Wind Farm Ltd.

Date: **May 2025**

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Invasive Species Management Plan

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT

User is responsible for Checking the Revision Status of This Document

Rev. No.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
0	Final	DF/BOD/KB	BOD	JK	30/05/2025

Client: North Kildare Wind Farm Ltd.

Keywords: Invasive Species, North Kildare Wind Farm Ltd., Drehid Wind Farm and Substation, Sycamore, Cherry Laurel, Rhododendron, Snowberry, Butterfly-bush

Abstract: This document provides an Invasive Species Management Plan to provide guidance and strategies for the management of invasive plant species at the proposed Drehid Wind Farm and Substation, Co. Kildare.

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1. INTRODUCTION

North Kildare Wind Farm Ltd. has commissioned Fehily Timoney & Company (FT) to prepare an Invasive Species Management Plan as part of the proposed Drehid Wind Farm and Substation assessment. Fehily Timoney & Company (FT) has prepared this Invasive Species Management Plan (ISMP) to comply with Regulations 49 and 50, Schedule III of the European Communities (Birds and Natural Habitats) Regulations 2011 to 2021 (not to cause the spread of non-native invasive plant species listed in the Third Schedule), and to ensure non-native invasive plant species not listed in the Third Schedule are not spread to adjacent lands or Natura 2000 (European) sites. The report details a programme for the monitoring and control of invasive species at and adjacent to the proposed project.

In total, five invasive/non-native species were recorded. Of these, one species (*Rhododendron ponticum*) is listed in the Third Schedule.

1.1 Legislative Context

In Ireland, the spread and propagation of species listed in the Third Schedule of S.I. No. 477/2011 European Communities (Birds and Natural Habitats) Regulations 2011 to 2021 is an offence. Under Regulation 49 (2) - save in accordance with a licence granted under paragraph (7), any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place specified in relation to such plant in the third column of Part 1 of the Third Schedule, any plant which is included in Part 1 of the Third Schedule, shall be guilty of an offence. Under Regulation 50 it is an offence to transport a vector material listed in Part 3 of the Third Schedule except under licence.

1.2 Site Location and Description

The Proposed Wind Farm is wholly located in County Kildare and includes lands in the townlands of Ballynamullagh, Kilmurry, Killyon, Coolree, Mulgeeth and Drehid. The site is accessed from the M4 motorway until Enfield, then along the R402 for c. 7.7 km and finally along the local road (L5025) to the entrance of the site. The site lies c. 2.8 km south of the motorway M4 at Enfield and 1.2 km southeast of the regional road R402 linking the M4 to the R420 east of Tullamore in County Offaly.

The Proposed Substation, including the loop-in connection to the existing Kinnegad-Rinawade overhead line, is wholly located in County Kildare, within the townland of Coolree.

The site of the Proposed Wind Farm is located in relatively low-lying, relatively flat land with the majority of proposed turbines located beneath the 80 m contour line. The landcover is classified by Tailte Eireann's National Land Cover map as improved grassland, treelines, hedgerows, transitional forest, coniferous forest, broadleaved forest and woodland, mixed forest, scrub, bare peat, bare soil and disturbed ground, and artificial surfaces (forest roads). The east of the site is adjacent to a cutover bog (Timahoe Bog). The Fear English River bisects the site, flowing south to north before it enters the Blackwater River at Johnstown Bridge. The landscape is classified as being of low sensitivity from a landscape perspective.

The site of the Proposed Substation is located in commercial forestry at the northern extent of the wind farm site. The proposed loop-in connection to the existing overhead line is situated in agricultural lands, approximately 500m northeast of the Proposed Substation compound.

The Fear English River bisects the proposed development. This is the traditional local name for the river, however it is noted that the Fear English is comprised of two EPA-named watercourses, namely the Ballynamullagh and Coolree 07. The Fear English is a tributary of the River Blackwater (Longwood). The Blackwater is a main tributary of the River Boyne.

1.3 Relevant Guidance

The methodology and guidance for this management plan has been devised in consideration of the following relevant guidance:

- NRA, (2010) Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. Revision 1, December 2010. National Roads Authority.
- Property Care Association, (2018). Practical Management of Invasive Non-Native Weeds in Britain and Ireland. Packard Publishing Ltd.
- Kelly et al., (2008). Best Practice Management Guidelines Japanese Knotweed *Fallopia japonica*. Prepared for NIEA and NPWS as part of Invasive Species Ireland.
- Tu, (2009) Assessing and Managing Species within Protected Areas. Protected Area Quick Guide Series. Editor J., Ervin, Arlington, VA. The Nature Conservancy, 40 pp.
- Stokes et al., (2004). Invasive Species in Ireland. Unpublished report to Environment and Heritage Service and National Parks and Wildlife Service. Quercus, Queens University Belfast, Belfast.
- AM-SOP-009 Information and Guidance Document on Japanese Knotweed
- RAPID, 2018. Good Practice Management- Japanese Knotweed (*Fallopia japonica*).
- INNSA, 2017. Code of Practice – Managing Japanese Knotweed

A desktop study was carried out to identify existing records of invasive flora species both within and adjacent to the proposed Drehid Wind Farm and Substation assessment, as well as habitat suitability of the footprint of the development for the invasive species. This study allows the surveyor to narrow down the source of the species introduction and its likelihood of spreading. The following open sources of information were consulted:

- Invasive Alien Species in Ireland website (Invasives.ie, 2025)
- OSI Aerial photography and 1:50000 mapping
- National Parks and Wildlife Service (NPWS) web mapping (NPWS, 2025)
- National Biodiversity Data Centre (NBDC) web mapping (National Biodiversity Data Centre, 2025)
- Environmental Protection Agency (EPA) web mapping (EPA, 2025)

1.4 Surveys and Baseline

Detailed botanical surveys and habitat classification for the areas containing the Proposed Wind Farm, Substation , grid connection and TDR were completed. These surveys were completed during 19 - 21 September 2023, with additional follow-up surveys on 3 April and 30 September 2024.

During habitat surveys, a search for non-native invasive plant species was undertaken. The survey focused primarily on the identification of invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (As Amended).

Desktop records

Historical records of invasive species plants from the relevant national datasets were assessed through the National Biodiversity Data Centre (search completed 25th April 2025). The invasive species listed in Table 1-1 have been recorded within the 10km grid square (N73) overlapping the main windfarm and substation site. A total of five invasive plant species have been recorded in this 10km grid square, of which two (Japanese knotweed (*Fallopia japonica*), and Rhododendron (*Rhododendron ponticum*)) are listed in Schedule III under Regulations 49 and 50 of the EC (Birds and Natural Habitats) Regulations 2011, which makes it an offence to cause the spread of plant species listed on the Schedule.

Invasive species of flora recorded within 1km grid squares that overlap the grid connection route are also detailed in Table 1-1.

Table 1-1: Invasive Species within 10 km grid square N73 which encompasses the proposed Wind Farm site and Substation, and 1 km grid squares overlapping the Turbine Delivery Route (TDR) (Source: NBDC)

Common Name	Scientific Name	Year of Last Record	Location of Record	Legal status	Invasive Impact
Wind Farm/Substation					
Sycamore	*Acer pseudoplatanus*	2020	N765 384 – c. 380m north of Proposed Wind Farm	None	Medium Impact
Cherry Laurel	*Prunus laurocerasus*	2005	N710 345 - c. 2km west of Proposed Wind Farm	None	High Impact
Rhododendron	*Rhododendron ponticum*	2022	c. 100m east of Proposed Wind Farm/c. 170m north-east of T9 In woodland c. 25m from access track south of T8	Schedule III	High Impact
Japanese Knotweed	*Fallopia japonica*	2021	N733 393 - c. 2.8 km north-west of Proposed Wind Farm	Schedule III	High Impact
Butterfly-bush	*Buddleja davidii*	2019	N760 373 - overlapping existing access track north of T9 N766 375 & N766 374 - c. 230m south of proposed substation	None	Medium Impact

Common Name	Scientific Name	Year of Last Record	Location of Record	Legal status	Invasive Impact
TDR					
Cherry Laurel	*Prunus laurocerasus*	2005	N7134	None	High Impact
Sycamore	*Acer pseudoplatanus*	2005	N7134	None	Medium Impact

Invasive Species Recorded During Surveys

An individual Rhododendron bush c. 2m x 3m in extent was recorded in mixed broadleaved/conifer woodland adjacent to a section of proposed access track south of T8. This Schedule III invasive species was also recorded in conifer plantation c. 170m north-east of T9, as indicated by the desktop record.

Sycamore was recorded within mixed broadleaved/conifer woodland within the proposed substation footprint, and was noted to be common in open parts of recently replanted conifer plantation to the south of the proposed substation. It was also recorded in hedgerows at TDR points of interest.

Butterfly Bush was recorded along existing forestry tracks north of T9 and south of the proposed substation.

Cherry Laurel was recorded at two TDR points of interest (POI 1 & 3).

Snowberry (*Symphoricarpos albus*), another invasive species, was identified during ecological survey. This record is c. 15m from the proposed T7 - T8 access track. Snowberry is a medium impact invasive species.

Table 1-2: Invasive Species recorded onsite

Common Name	Scientific Name	Location of Record	Legal status	Invasive Impact
Sycamore	*Acer pseudoplatanus*	In substation footprint and replanted conifer blocks in north of site TDR POIs: 5, 6, 7 & 14	None	Medium Impact
Cherry Laurel	*Prunus laurocerasus*	Existing Coillte entrance in north (adjacent domestic property boundary) TDR POIs: 1 & 3	None	High Impact
Rhododendron	*Rhododendron ponticum*	c. 100m east of Proposed Wind Farm/c. 170m north-east of T9	Schedule III	High Impact

Common Name	Scientific Name	Location of Record	Legal status	Invasive Impact
		In woodland c. 25m from access track south of T8		
Butterfly-bush	*Buddleja davidii*	N760 373 - overlapping existing access track north of T9 N766 375 & N766 374 - c. 230m south of proposed substation	None	Medium Impact
Snowberry	*Symphoricarpos albus*	ITM 0674913 0736546 - c. 15m from proposed T7 - T8 access track	None	Medium Impact

The locations of invasive species stands relative to proposed infrastructure are shown in Figure 1-1.

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Legend

- Proposed Development Boundary
- Road widening - Access tracks
- Road widening - Temp. Access Tracks
- Access Track
- Temporary Access Track
- Blade Transfer Area
- Construction Compound
- Passing Bays
- Turbine Hardstanding
- Turbine Swept Path
- Berms
- Substation
- Cable Route
- Turbines

Invasive Species

- Sycamore indicative extent
- Butterfly-bush
- Cherry Laurel
- Rhododendron ponticum
- Snowberry

TITLE:	Invasive Species
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	1.1
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:20,000	REVISION: 0
DATE: 23/04/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 2 Kilometers

2. INVASIVE SPECIES ACCOUNTS

The International Union for Conservation of Nature (IUCN) in their 'IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species' 2000 report describes non-native invasive species (referred to as an invasive species) as:

> *"an alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity".*

The five invasive/non-native species below were recorded within the proposed site. The species in bold are included in the Third Schedule, the remaining species are identified in Kelly et al., (2008). Accounts of these species, summaries of their ecology, distribution, growth, and management periods are included below.

- Sycamore (*Acer pseudoplatanus*)
- Cherry Laurel (*Prunus lauroceracus*)
- Rhododendron (*Rhododendron ponticum*)
- Butterfly Bush (*Buddleja davidii*)
- Snowberry (*Symphoricarpos albus*)

2.1 Sycamore (*Acer pseudoplatanus*)

2.1.1 Species Ecology

The sycamore tree can grow up to 35m tall and has a distinctive fruit with wings, which are the main mechanism through which this tree spreads. Originally it was thought to be damaging to native woodlands and to support a much narrower range of diversity than native species. However, it has been shown to support a wide range of lichens and other species. The principal concern would be sycamore dominated woodlands, though sycamore seedlings are out competed by ash under sycamore canopy and vice versa, suggesting that there is a pattern of succession in mixed woodlands. Undisturbed woodlands have relatively few trees compared to disturbed sites, even when sycamore trees are present at nearby sites. Poor growth in dry conditions suggests that careful management of forests can mitigate any effects of sycamore invasion. Sycamore is of medium invasive impact when growing in native woodland areas.

	
Bark on a mature tree.	Palmately lobed leaf with blunt teeth showing black spots.
	
Yellow-green flowers hanging in racemes.	Long-winged, hairless fruits hanging in pairs held at right angles.

Figure 2-1: Characteristic features of sycamore (Source: www.wikipedia.org and www.woodlandtrust.org.uk)

2.1.2 Timeframe

Control and disposal of plant material is best carried out in spring before seeds are produced. As is common with invasive species, careful monitoring and follow-up applications of herbicides may be necessary.

2.2 Cherry Laurel (*Prunus lauroceracus*)

2.2.1 Species Ecology

Cherry Laurel is an evergreen shrub can reach heights of 10m and forms dense thickets of either a single stem or multiple stems (especially if it has been trimmed). It has thick, 5-15cm long oblong-ovate leaves; glossy green on top surface and pale underneath. Leaves are arranged alternately on short leaf stalks and leaf edges are toothed with pointed tips. Small white fragrant flowers are held in clusters (racemes) and flowers are comprised of five petals and many yellow stamens. The clustered fruits are purple/black and cherry like and are eaten and dispersed by birds, this plant is also spread vegetatively via layering and suckering. Cherry Laurel is often found growing alongside *Rhododendron ponticum* in woodland and, like rhododendron, forms dark thick stands and local fauna do not eat it. This plant outgrows native species and shades them out. Cherry Laurel was initially planted as an ornamental shrub and has now spread across Ireland. Cherry Laurel has been assessed by the National Biodiversity Data Centre as having a risk of High Impact on native biodiversity.

Clusters of white flowers

This evergreen leaves alternate on stem with short leaf stalks.

Fruit in clusters.

Figure 2-2: Characteristic Features of Cherry Laurel (Source: www.kingcounty.gov)

2.2.2 Timeframe

Cherry Laurel can be cut down at any time of year; the herbicide glyphosate can also be applied throughout the year, however May to October inclusive is a sub-optimal period. Of principle concern when cutting and/or moving vegetation or surrounding soil is the movement of viable seeds. As such the optimal time for cutting is outside the flowering and fruiting period.

2.3 Rhododendron *(Rhododendron ponticum)*

2.3.1 Species Ecology

This densely branched evergreen shrub is widespread across Ireland and can grow to a height of 5m, producing purple flowers May-June. Leaves are 6-20cm long, dark green and shiny, elliptical to oblong in shape, untoothed and held in dense terminal clusters (racemes). It spreads through abundant seed dispersal and vegetative layering. Rhododendron is found on a wide variety of habitats, forming dense stands. It reduces native plant cover through competition for light and by releasing toxic chemicals produced by its roots into the surrounding soil. Also, rhododendron can host fellow invasive species *Phytophthora ramorum* (sudden oak death), which can affect several tree species. It has been assessed by the National Biodiversity Data Centre as having a high risk of impact on native Irish species.

	
Bell-shaped flowers.	Dark green and shiny leaves held in dense terminal racemes.

Figure 2-3: Characteristic features of rhododendron (Source: www.wildflowersofireland.net)

2.3.2 Timeframe

Rhododendron can be cut down at any time of year; the herbicide glyphosate can also be applied throughout the year, however May to October inclusive is a sub-optimal period. Of principle concern when cutting and/or moving vegetation or surrounding soil is the movement of viable seeds. As such the optimal time for cutting is outside the flowering and fruiting period.

2.4 Butterfly Bush (*Buddleja davidii*)

2.4.1 Species Ecology

The Butterfly Bush is a multi-stemmed shrub that can reach 4m in height. From June to September, the arching branches bear conical panicles of lilac flowers, which may occasionally be white, pink, red or purple. Leaves are long and serrated along the edges. In the winter, flower heads and seed capsules remain despite the plant being deciduous. Up to 3 million seeds are produced per plant and can remain dormant in the soil for many years. Butterfly Bush is common throughout Ireland. It spreads through abundant seed dispersal by wind and draught behind vehicles. While being a valuable source of nectar, especially for butterflies, it can cause structural damage to buildings by rooting in cracks in masonry. Butterfly Bush has been assessed as having a risk of Medium Impact to native biodiversity by the National Biodiversity Data Centre.

"Buddleja davidii Budleja Davida 2015-08-30 01" by Agnieszka Kwiecień, Nova is licensed under CC BY-SA 4.0.(https://commons.wikimedia.org/w/index.php?curid=64364967)

Figure 2-4: Flowers and leaves of Butterfly Bush

2.4.2 Timeframe

Optimal time for treatment and/or movement of material is outside of flowering and seed-bearing periods and treatment should be undertaken in winter and spring.

2.5 Snowberry (*Symphoricarpos albus*)

2.5.1 Species Ecology

Snowberry is a deciduous shrub that can grow up to 2.5m tall, producing small dense clusters of white flowers and white berry-like fruits. It is found in a wide variety of habitat types and spreads mainly by vegetative means through sprouting, but also by rhizomes and potentially by seeds dispersed by birds eating the fruits. Snowberry is found extensively throughout Ireland and impacts habitats and species as it forms dense thickets that outcompete native vegetation. Snowberry is classified by the National Biodiversity Data Centre as having a low risk of impact on native Irish species.

"J20171012-0029—Symphoricarpos albus var laevigatus—RPBG" by John Rusk is licensed under CC BY 2.0. (https://www.flickr.com/photos/12303842@N00/37092360283)

Figure 2-5: Snowberry berries and leaves

2.5.2 Timeframe

Snowberry comes into flower from June to September; their berries are ripe in Autumn. As such, the optimal time for treatment would be outside the flowering and fruiting period.

3. PROPOSED MEASURES FOR MANAGEMENT OF INVASIVE SPECIES

3.1 Recommended Measures

While it is extremely important and more efficient to contain invasive species at the point of infestation, care shall also be taken to ensure the management plan (Section 4) is adhered to ensure that invasive species are not spread outside the works area. Furthermore, none of these invasive species will be planted as part of landscaping the proposed project.

Invasive Species Ireland (ISI) notes that invasive non-native species are the second greatest threat (after habitat destruction) to worldwide biodiversity. Invasive species negatively impact Ireland's native species; changing habitats and ultimately threatening ecosystems which impacts on biodiversity as well as economics as they are costly to eradicate.

Through prevention, early detection, rapid response, eradication, and control measures, we can reduce the risk of their introduction, establishment, spread, and impact (Invasives.ie, 2025).

Specific consideration will be given to particular locations, due to their potential for disturbance during works. As a general rule, where invasive species are within the footprint of proposed works, they must be contained and disposed of correctly. Where they are outside the proposed footprint, avoidance can be relied on where feasible to prevent their spread. As such, options for avoidance, control and removal are detailed below.

3.1.1 Prevention of spread within the works footprint

Prevention of the spread of invasive species will be achieved by:

- The full implementation of the invasive species management plan (Section 4) in conjunction with a competent and experienced Invasive Species Specialist Contractor.
- Supervision of control measures and treatment works by an appropriately qualified ecologist or invasive species specialist.
- Raising awareness to site workers via toolbox talks given by a suitably qualified person as part of site inductions; informing workers what to look out for and what procedure to follow if they observe an invasive species.
- Only planting or sowing native species within the proposed project lands will be allowed.
- Where invasive species have been physically removed and soil disturbed, this soil will be seeded or replanted (including 5cm deep mulch) with native plant species. This will prevent erosion and the easy colonisation of bare soil by invasive species in the area.
- Unwanted material originating from the site (including soil, rhizomes and other material) will immediately be transported off site by an appropriately licensed waste contractor and disposed of properly at a suitably licenced facility, in accordance with the (NRA, 2010) guidelines, i.e., where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains rhizomes, flower heads or seeds will be disposed to licensed landfill. All disposals will be carried out in accordance with the Waste Management Acts.
- Signs will warn people working within the site that there is invasive species contamination.
- Ensure appropriate biosecurity measure are in place; these will include the Check Clean Dry method, along with those outlined below:
    - Remove the build-up of soil on equipment
    - Keep equipment clean

  - Do not move fouled equipment from one site to another
  - Footwear and clothing of operatives working near invasive species should be checked for seeds, fruits, knotweed rhizomes or other viable material before exiting invasive species control zones and/or the site
  - All vehicles exiting the site will be examined to prevent the transport of rhizomes, seeds and other plant material.
- Follow instructions provided for containment of invasive species (Section 3.2).

3.2 Containment

The three most common ways a site can become infested are:

- Importation of infested soil.
- Contamination on vehicles and equipment.
- Illegal dumping.

Containment of invasive species will be achieved by:

- A pre-construction survey to reconfirm the findings of the baseline survey during the growing season immediately prior to the construction phase. This will mark out the extent of invasive plant species. This survey shall inform the finalised draft of the invasive species management plan prior to the commencement of works. Prior to the construction phase, invasive species are to be treated (Section 3.4 for treatment methods).
- A licensed invasive species contractor shall be engaged to remove invasive plant species prior to development.
- Cordoning of invasive species outside the works footprint shall include a buffer of 1m the area of infestation. When larger buffers are required, this shall be specified in Section 3.4. This will prevent plants with underground rhizomes being transported to other sections of the site and it will also prevent contact with plants which could result in the transport of seed, fruit or vegetation to other parts of the site. No construction works will occur within exclusion zones prior to the eradication of invasive species.
- No contaminated soil (soil containing non-native invasive species material) or vegetation shall be removed from site unless proper biosecurity (Refer to Section 3.1 above) is observed and removal to a suitably licenced facility is carried out by an appropriately licensed waste contractor.
- New sightings of the invasive plant species identified at the proposed site shall be relayed to the contractor for invasive species control. These areas shall follow the same protocol as the current infected areas.
- It is possible, particularly in the first year of control, that new plants will sprout following the initial removal/treatment, either because shade suppression will be reduced or due to soil disturbance. As such, several additional visits will likely be required. Three visits, during May/June, July/August and September/October should be sufficient to catch all regrowth, although a cautionary approach is advisable and pending the outcome of initial visits, further monitoring and control measures may be required.

3.3 Limitation on Herbicide Use

Where a risk of transport of herbicide into the hydrological network exists, prioritisation of physical control over chemical methods must guide management strategies.

It is recommended to avoid spraying as an application method near rivers and drains, instead favouring application using 'weed wipers' or direct injection if herbicides are deemed necessary.

Any herbicides used near rivers or drains must be DAFM approved and also non-toxic to aquatic life.

3.4 Species-specific Measures

3.4.1 Sycamore (*Acer pseudoplatanus*)

Sycamore was recorded within mixed broadleaved/conifer woodland within the proposed substation footprint, and was noted to be common in open parts of recently replanted conifer plantation to the south of the proposed substation. It was also recorded in hedgerows at TDR points of interest (See Figure 1-1).

General site-wide control measures are not required; however, Sycamore should not be planted as part of landscaping. Control will instead focus on the correct disposal of cut material in areas where sycamore felling and trimming is required. Sycamore reproductive plant material is required to be carefully disposed of.

Any machinery used in areas infested by sycamore will be washed down thoroughly before exiting the area to ensure vector material is not transported to other parts of the site. Similarly, footwear and clothing of operatives working in areas of sycamore infestation will be checked and cleaned prior to exiting the area.

The contractor must appropriately dispose of Sycamore plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.

3.4.2 Cherry Laurel (*Prunus laurocerasus*)

Cherry Laurel was recorded at two TDR points of interest (POI 1 & 3) (See Figure 1-1).

The following general recommendations will also be adhered to as part of the plan:

- A buffer of 1m will be left around the individual Cherry Laurel plants to prevent damage to the plant which can result in the production of new stems which can make the plant more difficult to treat. Staff shall be made aware of this buffer zone when working within areas of infestation.
- Construction works will only be allowed within exclusion zones once the species has been fully eradicated.
- No treatment measures are to take place in these areas without supervision and agreement by the appointed invasive species specialist.
- Cherry laurel plant contains cyanide and as per good practice will only be handled with gloves. This plant will be disposed of via an appropriately licensed waste facility.
- Equipment, clothing and footwear will be checked following treatment operations or work in the vicinity of the species and cleared of fruits/seeds as necessary.

Four options for the treatment of Cherry Laurel have been proposed. Any one or a combination of these four options can be used to eradicate Cherry Laurel from the site and avoid the spread of the species.

3.4.2.1 Option 1 – Cut to stump and dig out stump

This method involves cutting the main stem of the plant down near ground level and digging out the stump and any visible roots. This option is not usually practical in areas where there are other invasive plants present as the disturbed soil can allow for the setting of seeds or the spread of rhizomes of adjacent species (ISI, 2012b).

3.4.2.2 Option 2 – Cut to stump and treat stump with herbicide

This method involves cutting the main stem of the plant down near ground level and applying herbicide to the freshly cut stump.

The herbicide concentrations used, and timings of applications vary according to which chemical is used. When treating many stems, vegetable dye added to herbicide is useful for highlighting the stems that have and haven't been treated. The use of a brush or other such applicator will provide an accurate application and prevent damaging adjacent non-target plants via spray drift. Please see table below for best treatment time (ISI, 2012b).

3.4.2.3 Option 3 – Cut to main stem and inject stem with glyphosate

This method involves the 'drill and drop' method where the main stem is cut, and a hole drilled into the cut. This provides a targeted application of glyphosate (25% solution). The main drawback to this technique is that the plant is left in place to rot away; which can take a decade or more. Please see table below for best treatment time (ISI, 2012b).

3.4.2.4 Option 4 - Cut back to stump and spray regrowth with chemicals

This application involves cutting a main stem down near ground level and then treating the new stems with herbicide. This method is the least effective as some stems may be missed and not treated. Also, the application of herbicide is generally via spraying which can result in adjacent non-target plants being killed off. Please see table below for best treatment time (ISI, 2012b).

The contractor must appropriately dispose of excavated waste, including soils containing Cherry Laurel plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 2m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.

Cutting	J	F	M	A	M	J	J	A	S	O	N	D
Glyphosate	J	F	M	A	M	J	J	A	S	O	N	D
Tryclopyr*	J*	F*	M*	A*	M*	J*	J*	A*	S*	O*	N*	D*
Ammonium sulphate	J	F	M	A	M	J	J	A	S	O	N	D

■ Optimum treatment time. Remember to consider breeding birds before embarking on a programme.
■ Suboptimum treatment time but can be effective. In the case of glyphosate based herbicides consider higher concentrations 25--100% during this time period.
* Suitable for treatment any time after cutting and appearance of new growth.

Figure 3-1: Best time for the treatment of Cherry Laurel and Rhododendron (ISI, 2012b)

3.4.3 Rhododendron (*Rhododendron ponticum*)

An individual Rhododendron bush c. 2m x 3m in extent was recorded in mixed broadleaved/conifer woodland adjacent to a section of the proposed hard stand south of T8 (located 8.5m from T8 hardstand felling buffer) (See Figure 1-1). This Schedule III invasive species was also recorded in conifer plantation c. 170m north-east of T9.

It is recommended to eradicate Rhododendron from the area near T8 prior to construction to prevent infestation of the proposed wind farm during the operational phase.

A combined methodology of both physical removal (cutting/uprooting of plants) and chemical control during March, April or October (inject or paint stump with herbicide) can be used for the removal of this species may use. Good hygiene practices such as wheel and bucket washes and inspection of footwear should be undertaken during eradication operations.

The treatment options provided above for Cherry Laurel in section 3.4.2 also to apply Rhododendron. Any one or a combination of these four options can be used to eradicate Rhododendron from the site and avoid the spread of the species.

As per the Schedule of Commitments the contractor must appropriately dispose of excavated rhododendron plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 2m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.

It should be noted that Schedule III species plant material cannot be moved offsite without a licence from the NPWS.

3.4.4 Butterfly Bush (*Buddleja davidii*)

Butterfly Bush was recorded along existing forestry tracks north of T9 and south of the proposed substation (See Figure 1-1).

3.4.4.1 Control

This species is likely to spread within the area regardless of potential transport by humans, due to its mode of spread (by wind). Nonetheless, efforts will be taken to prevent the spread of this species as follows:

- This plant is a prolific seeder and can reproduce vegetatively from cut stems. Any equipment used will be inspected and thoroughly cleaned, as will the footwear and clothing of operatives removing invasive species material. Any material arising from cleaning of equipment and footwear will be disposed of in a manner which will not cause the spread of invasive species.
- Disturbing ripe seed heads will be avoided during the turbine delivery by implementing an exclusion zone;
- Bags will be placed over the flower spikes where required to avoid dislodging and spreading seeds during the turbine delivery;
- Machinery will be checked for the presence of seed to avoid accidental transportation.

- The disturbance of soil provides the ideal circumstances for the seeds of this plant to germinate. Where any invasive species are physically removed from the ground (resulting in disturbance of soil), the soil will be covered with other material, re-seeded or planted (including 5cm high bark mulch) as soon is appropriate.

3.4.4.2 Treatment

Three options for the treatment of Butterfly-bush at the site are proposed. Any one or a combination of these three options may be used to eradicate Butterfly-bush from the site and avoid the spread of the species. However, the following general recommendations will be adhered to as part of the plan:

3.4.4.2.1 Option 1 – digging plant up/grubbing

While uprooting of young plants is possible, soil disturbance should be minimised (bare soil is an optimum environment for seed growth). Digging up of more mature plants is possible, however, it is important to plant the ground and have good groundcover as soon as is possible otherwise the seedlings of this plant will grow. All stems should also be removed as they can root to produce another plant (NRA, 2010).

3.4.4.2.2 Option 2 Cutting stump to near ground level and treating with herbicide

This option entails cutting the main stem of the plant down to near ground level and treating (brush on) the freshly cut stump with herbicide. This should be carried out during the growing season (NRA, 2010).

3.4.4.2.3 Option 3 – Foliar application of herbicide

During the growing season leaves should be sprayed with either triclopyr or glyphosate. This option is ideal for infestations comprised of young pants and treatment should be carried out at 6 monthly intervals. (NRA, 2010)

Herbicide should not be sprayed in or adjacent to rare plant receptor sites.

As per the Schedule of Commitments the contractor must appropriately dispose of butterfly-bush plant material and soil containing plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 0.5m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.

3.4.5 Snowberry (*Symphoricarpos albus*)

Snowberry (*Symphoricarpos albus*) was identified c. 15m from the proposed T7 - T8 access track (See Figure 1-1). If the current baseline persists, interaction with works is unlikely. Identification and cordoning of the infested area is required to ensure no construction access occurs.

Due to close proximity, the following recommendations will be adhered to, and one option is proposed for treatment:

- Snowberry is spread both by seed and suckering stems. A buffer area of 1m will be cordoned to alert site staff to their presence and prevent contact with plants, which could cause seeds to fall or become attached to machinery or people. Disturbed seeds may result in the propagation of a new snowberry population elsewhere.

- All staff shall be made aware of nature of threat via toolbox talks as part of site inductions. Toolbox talks shall be undertaken with all personnel accessing the site to ensure that the details of the invasive species management plan are adhered to and to raise awareness of the potential treat of invasive species.
- Areas of infestation will be fenced off from other works areas including a buffering distance of 1m to create exclusion zones.
- Construction works will not be allowed within exclusion zones until the species has been fully removed but may continue outside of these areas.
- No treatment measures to take place in these areas without supervision and agreement by appointed eradication specialist.
- All machinery and vehicles operating within areas of infestation to be thoroughly checked and if necessary, cleaned prior to leaving the area to protect against further spreading of snowberry.
- No material shall be taken from areas of infestation, unless for disposal. All material will be transported by an appropriately licensed waste contractor and received by an appropriately licensed facility.
- If operating within an area of known infestation all machinery, vehicles, equipment, footwear and clothing will need to be cleaned thoroughly (if necessary, using steam cleaners) in a contained area to avoid further contamination.

3.4.5.1 Option 1: Physical control

Excavation of the entire root system is considered to be an effective method of snowberry control. This must be done before the plants' seeds ripen in autumn. Plant matter from this process can be disposed of at a licenced landfill site.

Any reproductive plant material will be carefully disposed of following NRA (2010) Guidelines. Any equipment used will be inspected and thoroughly cleaned, as will the footwear and clothing of operatives removing invasive species material. Any material arising from cleaning of equipment and footwear will be disposed of in a manner which will not cause the spread of invasive species.

4. MANAGEMENT PLAN

The management of any invasive species is achieved by the assessment and mapping of the invasive species, containment once found, continual monitoring and record keeping as well as the safe disposal of invasive species material. It is recommended that surveys be carried out periodically at the site to monitor the extent of invasive flora and the success of the control and management measures. These can be carried out by FT, or a contractor specialised in invasive flora treatment. Monitoring shall continue during the construction period and as part of post construction monitoring to ensure successful control has been achieved. All invasive species which occur within the area utilised by people and machinery during the proposed construction works will be controlled/removed from the works area before commencement of works.

4.1 Containment

For the efficient use of resources, namely financial and physical effort, it is important to prevent the further spread of invasive species. Containment will be achieved using measure outlined in Section 3 and those presented below:

- Landholder to be informed of location of the invasive species and the management plan.
- Ensure anyone treating the infestation is a suitably qualified trained professional who follows the management plan.
- The site will be re-surveyed prior to treatment/construction works to confirm the findings of the original survey.

4.2 Schedule

Periodic re-surveying for all invasive species will be required, to ensure that treatment measures were effective, and to trigger further treatment if necessary. Refer to Table 4-1.

Please note that the schedule may require amendment following any given site visit.

Table 4-1: Schedule for Management of Invasive Species

Time	Details of Measures
Pre-construction (isolation of invasive species)	• A pre-construction survey (to reconfirm the findings of the initial survey) will be undertaken during the growing season to mark out the extent of invasive species within the footprint of the project prior to any works commencing on-site. • All invasive species observed shall include a suitable buffer (see Section 3.4) surrounding the area of infestation. This will prevent plants with underground rhizomes being transported to other sections of the site and it will also prevent contact with plants, which could result in the transport of seed, fruit or vegetation. • Treatment of invasive species using one or more of the treatment options proposed in Section 3. • Only once treatment has been completed and invasive species have been removed from within the area of works will works commence. • Toolbox talks on invasive species shall be given to all personnel accessing the site.

Time	Details of Measures
	• Disposal of all cut and excavated plant matter, if chosen to be processed off-site, must be done so through a licenced waste processor. Adequate licences may also be required for the transportation of Schedule III plant matter.
During Construction	• Following treatment, site to be monitored for signs of regrowth/spread to new areas. • Toolbox talks shall be given to all personnel accessing the site, informing them of the locations of the invasive species and instructing them not to enter these areas (unless they are licensed invasive species contractors or ecologists). • Designated curtailment areas will be demarcated for the transport of invasive species offsite. • Machinery to be used in the control of invasive species will be itemised, and only that specific machinery will be used for excavation/control measures. • The build-up of soil on equipment will be removed and fouled equipment will not be moved between sites, or between the curtailment area (demarcated areas with invasive species and for transport of invasives)/clean down area and the rest of the site. • Footwear and clothing of operatives working near invasive species will be checked for rhizomes, seeds, fruits, or other viable material before exiting the site. Boot brushes will also be utilised. • All vehicles exiting the site will be examined to prevent the transport of seeds/rhizomes/plant material. • If re-growth of invasive species is discovered, further treatment/control will be completed using the treatment methods detailed in Section 3. • Site to be monitored during works for signs of regrowth of all invasive species.
Post Construction	For 5 years following construction, site to be monitored annually for signs of regrowth of invasive species, triggering further control measures as required. Any maintenance work requiring clearance of vegetation will require an invasive species survey and if required control/eradication measures for the area being accessed prior to works.

4.3 Mapping, Evaluation and Record Keeping

During the preconstruction and construction phases the following will take place before control measures:

- Check that the area of infestation is still cordoned off and a warning/information sign is still in place
- Photographs of the area(s) of invasive species infestation
- Map the extent via recording GPS coordinates and measure the length and width of infestation (including above and below ground rhizome growth) and plot on map
- Evaluate the status/condition of the infestation
- Make sure the above steps are recorded

At the end of each site visit the recorded data should be compared with the findings of this report. Preparation of a short report on the progress of treatment following treatment works, and any subsequent monitoring.

4.4 Appropriate Disposal

4.4.1 Storage

All cut and excavated plant matter will be stored securely in line with the relevant treatment methodology. If invasive species vector material is required to be stored on site, it will be stored in a secure designated area with signage within the boundary of the proposed flood relief scheme.

4.4.2 Disposal

Disposal of plant matter and soil off-site will be completed through an appropriately licenced haulier and waste facility.

Disposal of any Schedule III plant material onsite will be completed in accordance with measures to ensure disposal does not lead to further spread of the species (see Section 3.4).

5. DISCUSSION AND CONCLUSION

There is a legal obligation not to spread plants listed on the Third Schedule of Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 to 2021; the relevant species at the proposed site and therefore that of principal concern is Rhododendron. The Rhododendron growth near T8 should be eradicated to prevent infestation of the proposed wind farm during the operational phase. The other growth (100m east of Proposed Wind Farm/c. 170m north-east of T9) should be monitored to ensure any potential for infestation of the proposed development from this source is detected in a timely manner.

A competent and experienced invasive species management contractor is required to be appointed to treat and control invasive species. A dedicated invasive species survey will be undertaken by the appointed contractor to re-confirm the findings of the previous survey and to identify any new areas of infestation or invasive species.

Both infested and treated areas will be appropriately demarcated and signed to prevent access by unauthorised personnel. Additionally, appropriate biosecurity measures to prevent spread of invasive species are required, as detailed in Section 3.

As noted in Section 4.2, surveys and if required treatment measures will be required if vegetation clearance or other works are required for maintenance.

5.1 Conclusion

The report details a programme for the mapping and control of invasive species at the proposed Drehid Wind Farm Site, proposed substation and TDR.

The plan will prevent the spread of identified non-native invasive species within and from any works areas and reduce the potential risk for the introduction and/or spread of new invasive species within the site pre, during and post construction.

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