2020

Bat Assessment

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Bat Eco Services

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NPWS licence C13/2020 (Licence to handle bats, expires 31st December 2022)
NPWS licence 08/2020 (Licence to photograph/film bats, expires 31st December 2022)
NPWS licence DER/BAT 2019-138 on expiry (Survey licence, expires 29th March 2022).

Statement of Authority: Dr Aughney has worked as a Bat Specialist since 2000 and has undertaken extensive survey work for all Irish bat species including large scale development projects, road schemes, residential developments, wind farm developments and smaller projects in relation to building renovation or habitat enhancement. She is a monitoring co-ordinator and trainer for Bat Conservation Ireland. She is a co-author of the 2014 publication *Irish Bats in the 21st Century*. This book received the 2015 CIEEM award for Information Sharing. Dr Aughney is a contributing author for the Atlas of Mammals in Ireland 2010-2015.

All analysis and reporting is completed by Dr Tina Aughney. Data collected and surveying is completed with the assistance of a trained field assistant.

Client: Cairn Homes

Project Name & Location: Cairn Homes SHD Residential Development, Cookstown Rd., Enniskerry, Co. Wicklow.

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
9th March 2020	Draft 1	Cairn Homes
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12th March 2021	Final	Cairn Homes – uploaded to BOX
22nd April 2021	Final with minor correction	

Purpose

This document has been prepared as a Report for Cairn Homes. Only the most up to-date report should be consulted. All previous drafts/reports are deemed redundant in relation to the named site.

Bat Eco Service accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned and prepared.

Carbon Footprint Policy

It is the policy of Bat Eco Services to provide documentation digitally in order to reduce carbon footprint. Printing of reports etc. is avoided, where possible.

Bat Record Submission Policy

It is the policy of Bat Eco Services to submit all bat records to Bat Conservation Ireland database one year post-surveying. This is to ensure that a high level bat database is available for future desktop reviews. This action will be automatically undertaken unless otherwise requested, where there is genuine justification.

Executive Summary

Project Name & Location: Cairn Homes SHD Residential Development, Cookstown Rd., Enniskerry, Co. Wicklow.

Proposed work: Proposed residential development.

Bat Survey Results - Summary

Bat Species	Roosts	Foraging	Commuting
Common pipistrelle *Pipistrellus pipistrellus*		√	√
Soprano pipistrelle *Pipistrellus pygmaeus*		√	√
Nathusius' pipistrelle *Pipistrellus nathusii*			
Leisler's bat *Nyctalus leisleri*		√	√
Brown long-eared bat *Plecotus auritus*		√	√
Daubenton's bat *Myotis daubentonii*		√	√
Natterer's bat *Myotis nattereri*		√	
Whiskered bat *Myotis mystacinus*			
Lesser horseshoe bat *Rhinolophus hipposideros*			

Bat Survey Duties Completed (Indicated by red shading)

Tree PBR Survey	◯	Daytime Building Inspection	◯
Static Detector Survey	◯	Daytime Bridge Inspection	◯
Dusk Bat Survey	◯	Dawn Bat Survey	◯
Walking Transect	◯	Driving Transect	◯
Trapping / Mist Netting	◯	IR Camcorder filming	◯
Endoscope Inspection	◯	Other	◯

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Contents

1. Introduction

Bat Eco Services was commissioned by Cairn Homes to undertaken a bat survey of the proposed development lands at Cookstown Road, Enniskerry, Co. Wicklow. While the current planning application is for one field located at the address above, the bat survey was completed for two fields, the second of which is not part of this planning application.

1.1 Relevant Legislation & Bat Species Status in Ireland

A small number of these animal and plant species are protected under Irish legislation (Nelson, *et al.,* 2019). The principal Irish legislation is the Wildlife Act 1976 (as amended). Amendments to the Wildlife Act and its Statutory Instruments have enacted and amended protection of individual species, notably in order to comply with EU legislation or other international agreements. The Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC) are the main EU legislation resulting in the legal protection of species in Ireland. The Acts and Statutory Instruments which list species within the broad taxonomic groupings are referred to in the relevant sections.

1.1.1 Irish Legislation

The Wildlife Act 1976 (Number 39 of 1976) as amended, in particular by the Wildlife (Amendment) Act 2000 (Number 38 of 2000). The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. The regulations that give rise to the protection of animal species under the Wildlife Acts are detailed in the relevant sections. See www.npws.ie/ legislation for further information.

The codes used for national legislation are as follows:

- WA = Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 and other relevant amendments
- FPO = Flora (Protection) Order, 2015 (S.I. No. 356 of 2015)

1.1.2 EU Legislation

The Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC) are the legislation transposed into Irish law *inter alia* by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended.

The codes used for the Habitats Directive (Council Directive 92/43/EEC) are:

- Annex II Animal and plant species listed in Annex II
- Annex IV Animal and plant species listed in Annex IV
- Annex V Animal and plant species listed in Annex V

The main aim of the Habitats Directive is the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) which are considered threatened in the EU territory. The listed habitats and species represent a considerable proportion of biodiversity in Ireland and the Directive itself is one of the most important pieces of legislation governing the conservation of biodiversity in Europe.

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of

conservation status for 59 habitats and 60 species. There are three volumes with the third listing details of the species assessed.

1.1.3 IUCN Red Lists

The International Union for the Conservation of Nature (IUCN) coordinates the Red Listing process at the global level, defining the categories so that they are standardised across all taxa. Red Lists are also produced at regional, national and subnational levels using the same IUCN categories (IUCN 2012, 2019). Since 2009, Red Lists have been produced for the island of Ireland by the National Parks and Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA) using these IUCN categories. To date, 13 Red Lists have been completed. The Red Lists are an assessment of the risk of extinction of each species and not just an assessment of their rarity. Threatened species are those species categorised as Critically Endangered, Endangered or Vulnerable (IUCN, 2019) – also commonly referred to as 'Red Listed'.

1.1.4 Irish Red List - Mammals

Red Lists in Ireland refer to the whole island, i.e. including Northern Ireland, and so follow the guidelines for regional assessments (IUCN, 2012, 2019). The abbreviations used are as follows:.

- RE Regionally Extinct
- CR Critically Endangered
- EN Endangered
- VU Vulnerable
- NT Near Threatened
- DD Data Deficient
- LC Least Concern
- NA Not Assessed
- NE Not Evaluated

There are 27 terrestrial mammals species in Ireland, which includes the nine resident bat species listed. The terrestrial mammal, according to Marnell *et al.,* 2019, list for Ireland consists of all terrestrial species native to Ireland or naturalised in Ireland before 1500. The IUCN Red List categories and criteria are used to assess that status of wildlife. This was recently completed for the terrestrial mammals of Ireland. Apart from the two following two mammal species (grey wolf *Canis lupus* (regionally extinct) and black rat *Rattus rattus* (Vulnerable)), the remaining 25 species were assessed as least concern in the most recent IUCN Red List publication by NPWS (Marnell *et al*., 2019).

1.1.5 Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the Habitats Directive (Directive 92/43/EEC), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is a notifiable action and a derogation licence has to be obtained from the *National Parks and Wildlife Service* before works can commence. 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 and Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposes the EU Habitats Directive into Irish law). The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

There are eleven recorded bat species in Ireland, nine of which are considered resident. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species.

A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310). Irish bat species list (please see main body of text for more information in individual bat species) is presented in Table 1. The current status of the known bat species occurring in Ireland is given in the Table 1 below.

Table 1: Status of the Irish bat fauna (Marnell *et al.*, 2019).

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species ^			
Daubenton's bat *Myotis daubentonii*	Least Concern	Least Concern	Least Concern
Whiskered bat *Myotis mystacinus*	Least Concern	Least Concern	Least Concern
Natterer's bat *Myotis nattereri*	Least Concern	Least Concern	Least Concern
Leisler's bat *Nyctalus leisleri*	Least Concern	Least Concern	Least Concern
Nathusius' pipistrelle *Pipistrellus nathusii*	Least Concern	Least Concern	Least Concern
Common pipistrelle *Pipistrellus pipistrellus*	Least Concern	Least Concern	Least Concern
Soprano pipistrelle *Pipistrellus pygmaeus*	Least Concern	Least Concern	Least Concern

Brown long-eared bat *Plecotus auritus*	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat *Rhinolophus hipposideros*	Least Concern	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat Myotis brandtii	Data deficient	Least Concern	Least Concern
Greater horseshoe bat *Rhinolophus ferrumequinum*	Data deficient	Near threatened	Near threatened

^ Roche *et al.,* 2014

1.2 Relevant Guidance Documents

This report has been prepared in accordance with 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) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). 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.
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

Based on the information collected during the desktop studies and bat surveys, the bat ecologist assigns, where possible, an ecological value to each bat species recorded based on its conservation status at different geographical scales (Table 2). For example, a site may be of national ecological value for a given species if it supports a significant proportion (e.g. 5%) of the total national population of that species.

Table 2: The six-level ecological valuation scheme used in the CIEM Guidelines (2016) Ecological Value

Ecological Value	Geographical Scale of Importance
International	International or European scale
National	The Republic of Ireland or the island of Ireland scale (depending on the bat species)
Regional	Province scale: Leinster
County	County scale: Co. Wicklow

Local	Proposed development and immediate surroundings
Negligible	None, the feature is common and widespread

Impacts on bats can arise from activities that may result in:

- Physical disturbance of bat roosts e.g. destruction or renovation of buildings
- Noise disturbance e.g. increase human presence, use of machinery etc.
- Lighting disturbance
- Loss of roosts e.g. destruction or renovation of buildings
- Modifications of commuting or foraging habitats
- Severance or fragmentation of commuting routes
- Loss of foraging habitats.

It is recognised that any development will have an impact on the receiving environment, but the significance of the impact will depend on the value of the ecological features that would be affected. Such ecological features will be those that are considered to be important and potentially affected by the proposed development.

The guidelines consulted recommend that the potential impacts of a proposed development on bats are assessed as early as possible in the design stage to determine any areas of conflicts.

1.2.1 Assessment Criteria

Different parameters are considered for the assessment of the potential impact(s) of a proposed development on local bat populations. Reporting may consider all or some of the criteria presented below, depending on the nature of the project being assessed.

The ecological value of the bat populations of the survey site will be completed, where possible, according to Table 2, Section 1.2 (CIEEM, 2016).

With reference to the guidelines listed in Section 1.2 and the judgement of the bat specialist, the impacts proposed project on local bat populations will be assessed, where possible, using the following criteria:

- Impact Quality using the parameters Positive, Neutral or Negative Impact (based on EPA, 2017)

Table 2b: Criteria for assessing impact quality based on EPA, 2017,

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

Negative	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).

- Impact Significance of potential impact parameters on specific bat species in relation to particular elements (e.g. roosting sites, foraging area and commuting routes) are assessed with reference to the following:
    - Table 6.1 of Kelleher & Marnell, 2006;
    - the known ecology and distribution of the bat species in Ireland;
    - bat survey results including type of roosts (if any recorded), pattern of bat usage of the survey area, level of bat activity recorded etc.
    - and bat specialist experience.

  The scale of impact used in this report is divided in five categories (in increasing scale of impact):
    - Minor Impact
    - Minor-Moderate Impact
    - Moderate Impact
    - Moderate to Major Impact
    - Major Impact

- Overall Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 2c (based on EPA, 2017).

Table 2c: Criteria for assessing significance of effects based on EPA, 2017,

Significance of Effects	Definition
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 baseline 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

The following terms will be used, where possible and applicable, when quantifying the duration of the potential effects (selected from EPA, 2017):

- Temporary – effects lasting less than a year
- Short-term – effects lasting 1 to 7 years
- Medium term – effects lasting 7 to 15 years
- Long term – effects lasting 15 to 60 years
- Permanent – effects lasting over 60 years
- Reversible – effects that can be undone, for example through remediation or restoration

Finally, how the impacts differ during the construction and operational phases will be presented, if applicable.

Specific guides utilised in the assessment process and mitigation design are:

- Table 6.1 in Kelleher & Marnell, 2006 (Page 47)
- Figure 21 in Kelleher & Marnell, 2006 (Page 49)
- P 60 - 64 in Kelleher & Marnell, 2006 in relation to roost design
- Schofield, H. (2008). *The Lesser Horseshoe Bat Conservation Handbook*. Herefordshire, England: The Vincent Wildlife Trust in relation to roost design
- Table 4.1 in Collins, 2016 (Page 35)
- Table 7.3 in Collins, 2016 (Page 52)
- Appendix 1 (Criteria for Bat Roosts of National or International Importance) in NRA (2006)

1.3 Project Description

1.3.1 Site Location

The proposed development site in the current planning application is comprised of one large agricultural field surrounded by an external boundary of mature trees and hedgerows. There is a newly built school west of the northern boundary of the proposed development site while the remainder of this boundary is comprised of sparse mature treelines. The survey area is represented by Figure 1b (aerial photograph) below covering two agricultural fields.

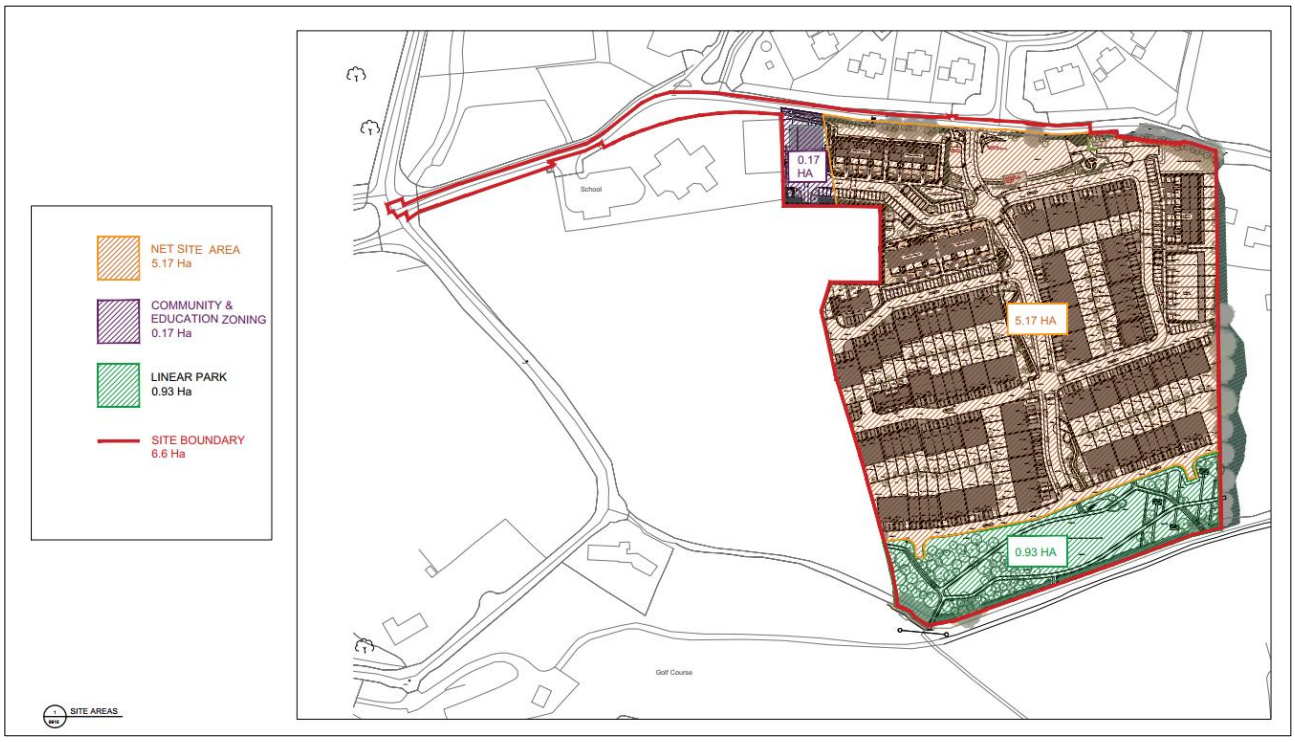


Figure 1a: Proposed development area (Source: Cairn Homes).

Figure 1b: Survey area (Source: Google Maps).

1.3.2 Proposed Project

The development will consist of the construction of 165 no. dwellings and associated ancillary infrastructure as follows:

A) 105 no. 2 storey houses (49 no. 3 bedroom houses [House Types B, B1, & B2], 56 no. 4 bedroom houses [House Types A, D, E & E1];

B) 56 no. apartments/duplex apartments in 6 no. 3 storey buildings – (28 no. 2 bedroom apartments and 28 no. 3 bedroom duplex apartments) all with terrace;

C) 4 no. 1 bedroom Maisonette dwellings in a 2 storey building;

D) Part 2-storey and single storey creche (c. 510 sq. m - including storage);

E) Open space along southern boundary of c. 0.93 hectares [with pedestrian connections to boundary to '*Lover's Leap Lane'* to the south and to boundary to the east and west], hard and soft landscaping (including public lighting) and open space (including boundary treatment), communal open space for duplex apartments; regrading/re-profiling of site where required [including import/export of soil as required] along with single storey bicycle/bin stores and ESB substation;

F) Vehicular access (including construction access) from the Cookstown Road from a new junction as well as 313 no. car parking spaces and 150 no. cycle spaces;

G) Surface water attenuation measures and underground attenuation systems as well as connection to water supply, and provision of foul drainage infrastructure (along the Cookstown Road to existing connection at junction with R760) and provision of underground local pumping station to Irish Water specifications;

H) 3 no. temporary (for 3 years) marketing signage structures [2 no. at the proposed entrance and 1 no. at the junction of the R760 and the Cookstown Road] and a single storey marketing suite (c. 81 sq.m) within site;

I) All ancillary site development/construction/landscaping works, along with provision of footpath/public lighting to Powerscourt National School pedestrian entrance and lighting from Powerscourt National School entrance to the junction of the R760 along southern side of Cookstown Road and pedestrian crossing across Cookstown Road.

Figure 1c: Proposed development layout (Source: Cairn Homes).

1.3.3 Bat Survey Aims

The aims of the bat survey at the proposed project site are as follows:

- Collect robust data following good practice guidelines to allow an assessment of the potential impacts of the proposed project on local bat populations, both on and off-site (where possible);
- Facilitate the design of mitigation, enhancement and monitoring strategies for local bat populations recorded;
- Provide baseline information with which the results of post-construction monitoring surveys can be compared to, where appropriate;
- Provide information to enable NPWS and planning authorities to reach robust decisions with definitive required outcomes;
- Assist clients in meeting their statutory obligations;
- Facilitate the conservation of local bat populations.

Survey are comprised of many different types may differ from site to site depending on the goals of the survey. The following is a brief description of main types of surveys that can be completed. The surveys deemed suitable for a particular project is determine on a case-by-case basis.

- Emergence (dusk) surveys: surveying of buildings or structures to determine whether such building/structure is a bat roost. Undertaken from 10 minutes prior to sunset to 90 minutes after sunset.
- Walking transect: bat surveys completed on-foot where the surveyor(s) walk the survey site from 10 minutes prior to sunset to at least 110 minutes after sunset. Often this survey is completed post an emergence survey and therefore may be undertaken for a longer period of time after sunset.
- Driving transect: bat survey complete in a car and undertaken according to a strict survey protocol. Surveying is completed from 40 minutes after sunset till the end of the planned survey route. This is only undertaken for large survey area with a well-defined public road structure. Routes are planned and mapped prior to surveying.
- Dawn surveys: surveying of buildings or structures to determine whether such building/structure is a bat roost. Undertaken from 90 minutes prior to sunrise to 10 minutes after sunrise.
- Static surveys: placement of automated recording devices within the survey area. The units are set up during the daylight hours and left in place to record during the hours of darkness.
- Additional surveys required may include trapping / netting of bats. But this type of surveying is only undertaken where specific information is required (e.g. to determine if a roost is a maternity colony).

2. Bat Survey Methodology

2.1 Daytime Inspections

One purpose of daytime inspections is to determine the potential of bat roosts within the survey area. Due to the transient nature of bats and their seasonal life cycle, there are a number of different type of bat roosts. Where possible, one of the objectives of the surveys is to be able to identify the types of roosts present, if any. However, the determination of the type of roost present depends on the timing of the survey and the number of bat surveys completed. Consequently, the definition of roost types, in this report, will be based on the following:

Table 3: Bat Roost Types (Collins 2016).

Roost Type	Definition	Time of Survey
Day Roost	A place where individual bats or small groups of males, rest or shelter in the daytime but are rarely found by night in the summer.	Anytime of the year
Night Roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single bat on occasion or it could be used regularly by the whole colony.	Anytime of the year
Feeding Roost	A place where individual bats or a few bats rest or feed during the night but are rarely present by day.	Anytime of the year
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.	Outside the main maternity and hibernation periods.
Swarming Site	Where large numbers of males and females gather. Appear to be important mating sites.	Late summer and autumn
Mating Site	Where mating takes place.	Late summer and autumn
Maternity Site	Where female bats give birth and raise their young to independence.	Summer months
Hibernation Site	Where bats are found, either individually or in groups in the winter months. They have a constant cool temperature and humidity.	Winter months in cold weather conditions
Satellite Roost	An alternative roost found in close proximity to the main nursery colony and is used by a few individuals throughout the breeding season.	Summer months

2.1.1 Building & Structure Inspection

Structures, buildings and other likely places that may provide a roosting space for bats are inspected during the daytime for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past. Inspections are undertaken visually

with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

2.1.2 Tree Potential Bat Roost (PBRs) Inspection

Trees that may provide a roosting space for bats are classified using the Bat Tree Habitat Key (BTHK, 2018) and the classification system used is from Collins (2016). The Potential Roost Features (PRFs) listed in this guide are used to determine the PBR value of trees.

Trees identified as PBRs are inspected during the daytime, where possible, for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past.

A series of inspections are undertaken. Phase 1 inspections aims to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections are undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs, if visible. To aid this Phase 1 inspection, tree reports, if available, are consulted to supplement that data collected.

Phase 2 inspections are, generally, recommended once a complete list of trees that have been identified as PBRs, and are mark for felling in order for the proposed development to be undertaken. The Phase 2 inspection will generally involve a closer examination of individual trees using a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope) and where required (and/or possible), height surveys are completed using a ladder. If a tree is deemed to be a roost site then further surveying involving dusk and dawn surveys of the actual trees may be recommended to determine what bat species are present etc.

Table 4: Tree Bat Roost Category Classification System (Collins, 2016).

Tree Category	Description
1 High	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2 Moderate	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3 Low	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4	Trees have no potential.

2.1.3 Bat Habitat & Commuting Routes Mapping

The survey site is assessed during daytime walkabout surveys, in relation to potential bat foraging habitat and potential bat commuting routes. Such habitats are classified according to Fossit, 2000 (Appendix 1, Table 1.B) while hedgerows are classified according to BATLAS 2020 classification (Bat Conservation Ireland, 2015) (Appendix 1, Table 1.A). Bat habitats and commuting routes identified are considered in relation to the wider landscape to determine landscape connectivity for local bat populations through the examination of aerial photographs.

2.2 Night-time Bat Detector Surveys

2.2.1 Dusk & Dawn Bat Surveys

Dusk surveys are generally completed from 10 minutes before sunset to at least 100 minutes post sunset, however extended surveys were undertaken when a walking transect was undertaken.

Dawn surveys are completed from 90 minutes before sunrise to 10 minutes after sunrise. Surveys are completed during mild and dry weather conditions with air temperature 8^{o}C or greater. All bat encounters are noted during surveys.

The following equipment was used:

Surveyor 1 (Principal surveyor): Wildlife Acoustics Echo Meter Touch (Generation 1, Apple IOS) connected to iPad 2 (32 GB storage) and Petersson D200 Heterodyne Bat Detector.

Surveyor 2: Wildlife Acoustics Echo Meter Touch2 Pro (Android) connected to Samsung Galaxy Tab S3 and Petersson D200 Heterodyne Bat Detector.

Surveyor 3: Wildlife Acoustics Echo Meter Touch (Generation 1, Apple IOS) connected to iPad 2 (32 GB storage) and Petersson D200 Heterodyne Bat Detector.

Walking transects involve the surveyor(s) walking the survey area, noting the time, location and bat species encountered. If the mapping facility is used on the Wildlife Acoustics Echo Meter Touch2 Pro (Android) connected to Samsung Galaxy Tab S3, this is mapped using Google Earth with a KLM file produced for mapping purposes. Validation of bat records is completed by the principal bat surveyor prior to mapping. Otherwise, Irish Grid references are recorded and an excel file of bat record locations is produced for mapping.

2.2.2 Passive Static Bat Detector Survey

A Passive Static Bat Surveys involves leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to 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 period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

The microphone of the unit was position horizontally to reduce potential damage from rain. Bat Logger A+ units and Wildlife Acoustics Song Meter SM2, SM2 BAT+ SM4 Bat FS and SM3 BAT Platform Units 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. 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

The recordings are analysed using various software. Recordings made by SongMeter SM2 (Unit 2) is analysed using SongScope, SongMeter SM2Bat+ (Unit 4, 5), Song Meter Bat FS (Units 1-5),

SongMeter Mini Bat (Unit 1-10) and SongMeter 3 recordings are analysed using BatClassifyIreland and Wildlife Acoustics Kaleidoscope Pro. Elekon BatLogger A+ units are analysed using BatExplorer. Each sequence of bat pulses are noted as a bat pass to indicate level of bat activity for each species recorded. This is either expressed as the number of bat passes per hour or per survey night.

The following static units were deployed during this static bat detector survey:

Table 5: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM2 Unit 2 **SM2 Unit 4** **SM2 Unit 5**	Wildlife Acoustics SongMeter 2 Bat+	Passive Full Spectrum	SMX-US (connected directly to unit) SMX-U1 (connected directly to unit)
SM4 Unit 2 **SM4 Unit 3** **SM4 Unit 4** **SM4 Unit 5**	Wildlife Acoustics SongMeter 4 Bat FS	Passive Full Spectrum	SMM-U2, 4m cable
SM Mini 9 **SM Mini 10**	Wildlife Acoustics SongMeter Mini Bat	Passive Full Spectrum	SMM-U2

2.3 Desktop Review

2.3.1 Bat Conservation Ireland Database

A 1km search of the Irish Grid Reference O225168 was requested from Bat Conservation Ireland. In addition, data from the Irish Bat Monitoring Programme was also requested in relation to the Brown Long-eared Roost Monitoring Scheme and the All Ireland Daubenton's Bat Waterways Survey.

2.4 Survey Constraints

The following assessment has been completed in relation to Survey Constraints:

Table 6: Survey Constraint Assessment Results.

Category	Discussion
Timing of surveys	2017 – 1st and 2nd September 2019 – 26th to 29th August 2020 – 23rd to 26th May
Weather conditions	Suitable weather conditions for bat surveys
Survey effort **Daytime inspection** 3 hrs **Night-time survey** 16 hrs, 40 mins **Static surveillance** 149 hours **Total: 168 hrs, 40 mins**	Dusk surveys – 3 surveys, 1 in 2017 (1 surveyor), 1 in 2019 (2 surveyors) & 1 in 2020 (3 surveyors) Walking transects – 4 surveys, 1 in 2017, 2 in 2019 and 1 in 2020 Static surveillance – 2017 – 3 statics (1 night); 2019 – 4 statics (1 to 3 nights); 2020 – 2 statics (3 nights) Daytime tree survey (2019 and 2020)
Equipment	All in good working order

It is therefore deemed that the survey work completed is appropriate in order to complete the aims of the bat survey.

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Building & Structure Inspection

There are no buildings within the proposed development area.

There is a known maternity bat roost (brown long-eared bats) located in St. Patrick's Church of Ireland, which is adjacent to the northern boundary of the proposed development area. This roost would be of Local Importance.

3.1.2 Tree Potential Bat Roost (PBRs) Inspection

The following trees were inspected in consultation with the tree survey report (2017). There are 6 Category 1 trees and 12 Category 2 trees, the Category 1 trees being a higher Potential Bat Roost (PBR) value for bats.

Table 7: Tree PBR inspection results.

Tree No.	Tree Species	PRFs	Location	Value
3	Ash	Heavy ivy growth	Hedge 4	2
4	Ash	Heavy ivy growth	Hedge 4	2
5	Ash	Heavy ivy growth	Hedge 4	2
6	Ash	Heavy ivy growth	Hedge 4	2
7	Ash	Heavy ivy growth	Hedge 4	2
8	Oak	Heavy ivy growth, tree holes, dead wood	Hedge 4	2
10	Oak	Heavy ivy growth, tree holes, dead wood	Hedge 4	1
11	Beech	Heavy ivy growth	Hedge 4	2
12	Ash	Heavy ivy covered stump	Hedge 4	2
13	Oak	Heavy ivy growth, tree holes, dead wood	Hedge 4	1
14	Oak	Heavy ivy growth, tree holes, dead wood	Hedge 4	1
15	Oak	Heavy ivy growth, tree holes, dead wood	Hedge 4	1
18	Beech	Heavy ivy growth	Hedge 4	2
21	Beech	Dead wood, tree holes	Hedge 4	1
23	Ash	Heavy ivy growth	Hedge 2	2
28	Sycamore	Decay, ivy growth	Hedge 3	1
32	Ash	Heavy ivy growth	Hedge 3	2
34	Ash	Heavy ivy growth	Hedge 3	2

According to the Base-line Tree Survey Report (August 2019) three of the trees above (Tree Tag No. 12, 21 and 23) are recommended for removal while two trees (Tree Tag No. 5 and 8) are recommended for early removal (Blue highlight in Table 7). Location in Table 7 is based on drawing D1-TCP-Cookstown-08.19.pdf. Hedge 4 is located along the northern boundary, Hedge 3 is the eastern boundary and Hedge 2 is the southern boundary.

An updated tree survey report (Cookstown Arboricultural Report Draft.pdf – dated November 2020 by The Tree File Ltd.), Cookstown Tree Constraints Plan (drawing) and Cookstown Tree Impact Plan Draft.pdt (drawing) were also consulted. This report details potential conflicts of the proposed development with the protection of mature trees and treelines. The Cookstown Tree Impact Plan Draft.pdt (drawing) details that much of Hedge 3 (including Tree Tag No.s 32 and 34) and sections

of Hedge 4 (including Tree Tag No. 5) will be removed (Orange highlight in Table 7). This drawing also recommends the removal of Tree Tag No.s 28 (Hedge 3), 3 (Hedge 4) and 6 (Hedge 4) (Orange highlight in Table 7).

Therefore there is likely that 10 PBRs listed in Table 7 will be removed as a result of the proposed development.

3.1.3 Bat Habitat & Commuting Routes Mapping

The external boundary of the proposed development site is comprised of hedgerows (medium and sparse treeline hedgerow types) and mature trees. This provides continuous commuting and foraging habitat around the entire proposed development site. This also provides essential connectivity to the surrounding landscape.

3.2 Night-time Bat Detector Surveys

3.2.1 Building Roosts

While there are no buildings or structures within the proposed development area, there is an important roost located adjacent to the proposed development area. Saint Patrick's Church of Ireland is located adjacent to the northern boundary of the proposed development site. This is a known brown long-eared bat maternity roost (Bat Conservation Ireland Site Code 2125) and is monitored annually by local volunteer team for Bat Conservation Ireland as part of the Irish Bat Monitoring Programme. This structure has been surveyed since 2013 with a total of 24 surveys completed (3 surveys per year). The number of bats recorded in this structure has ranged from 9 individuals to 43 individuals (Please see Appendix 3 for more details).

3.2.2 Dusk Bat Surveys & Walking Transects

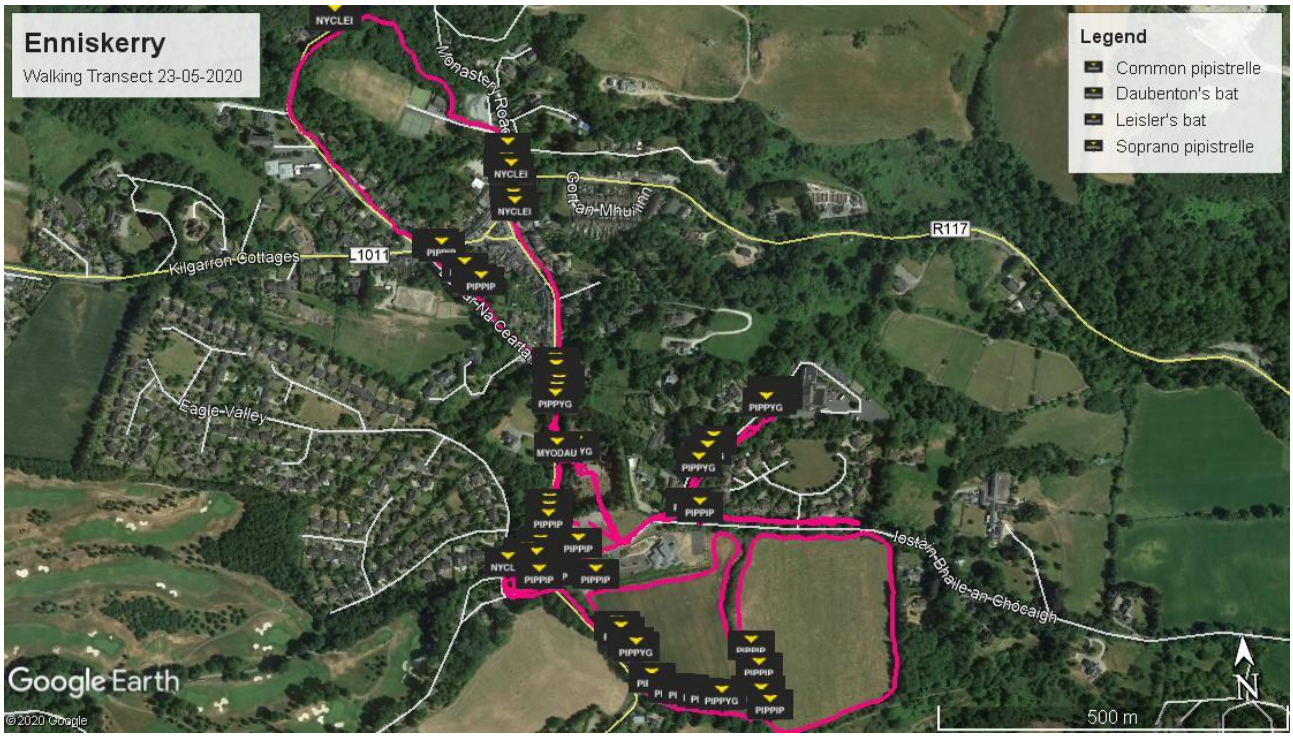
A large amount of surveying has been undertaken for this small survey area. All of the results are presented below.

3.2.2.1 2020 Surveys

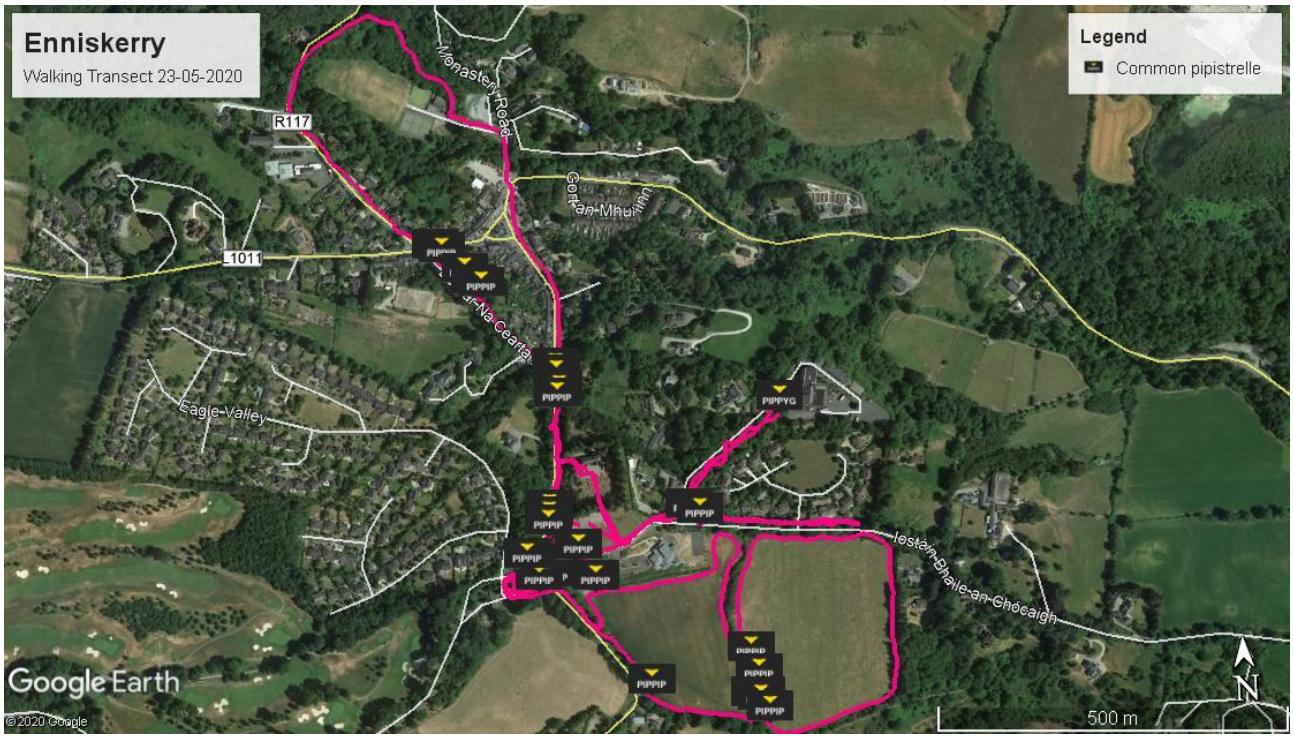
A walking transect was undertaken on the 23/5/2020. This was undertaken in the two agricultural fields of the survey area and the village of Enniskerry, Co. Wicklow. Four bat species were recorded during this walking transect, which began within the survey area before proceeding on local roads towards Enniskerry environs. Common pipistrelle was the most frequently recorded bat species followed by soprano pipistrelle. Leisler's bats were recorded foraging in the village while one encounter of Daubenton's bat was recorded along the treelined R760.

Figure 2: Walking transect completed on 23rd May 2020.

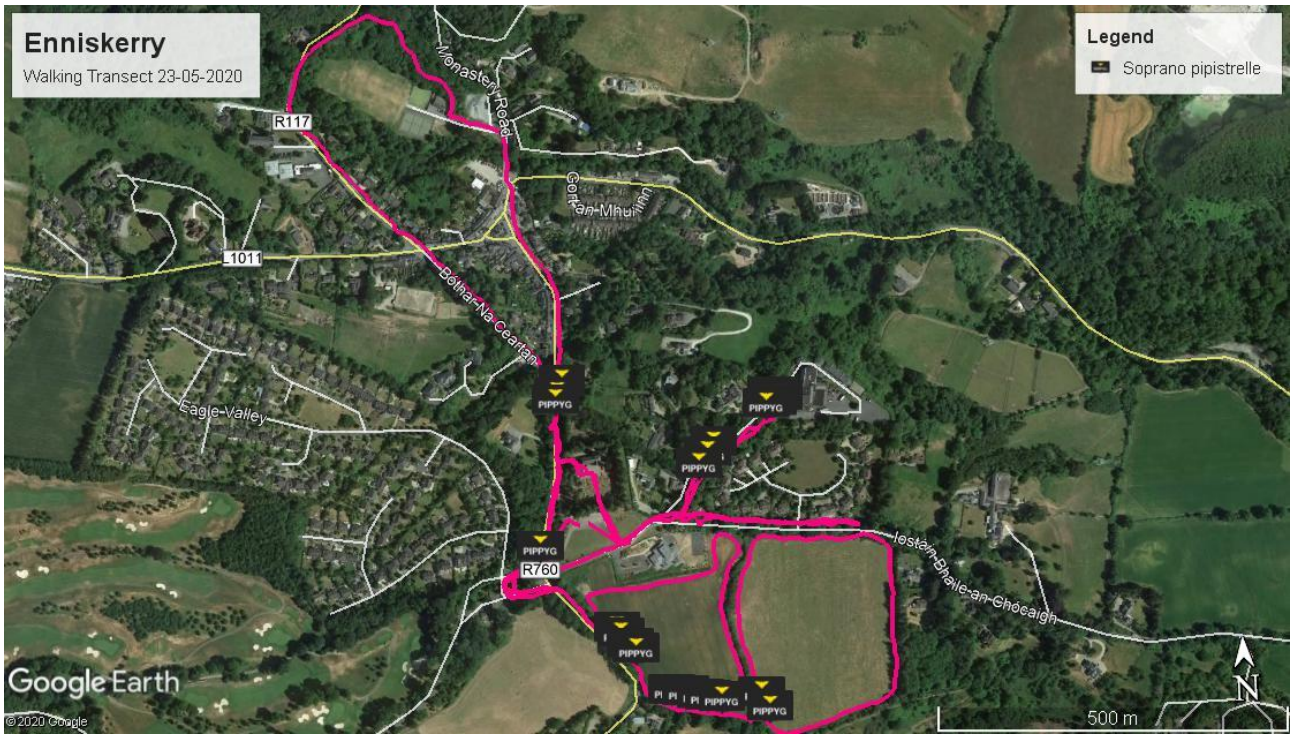
a) All bat encounters (Walking route shown in Pink line)



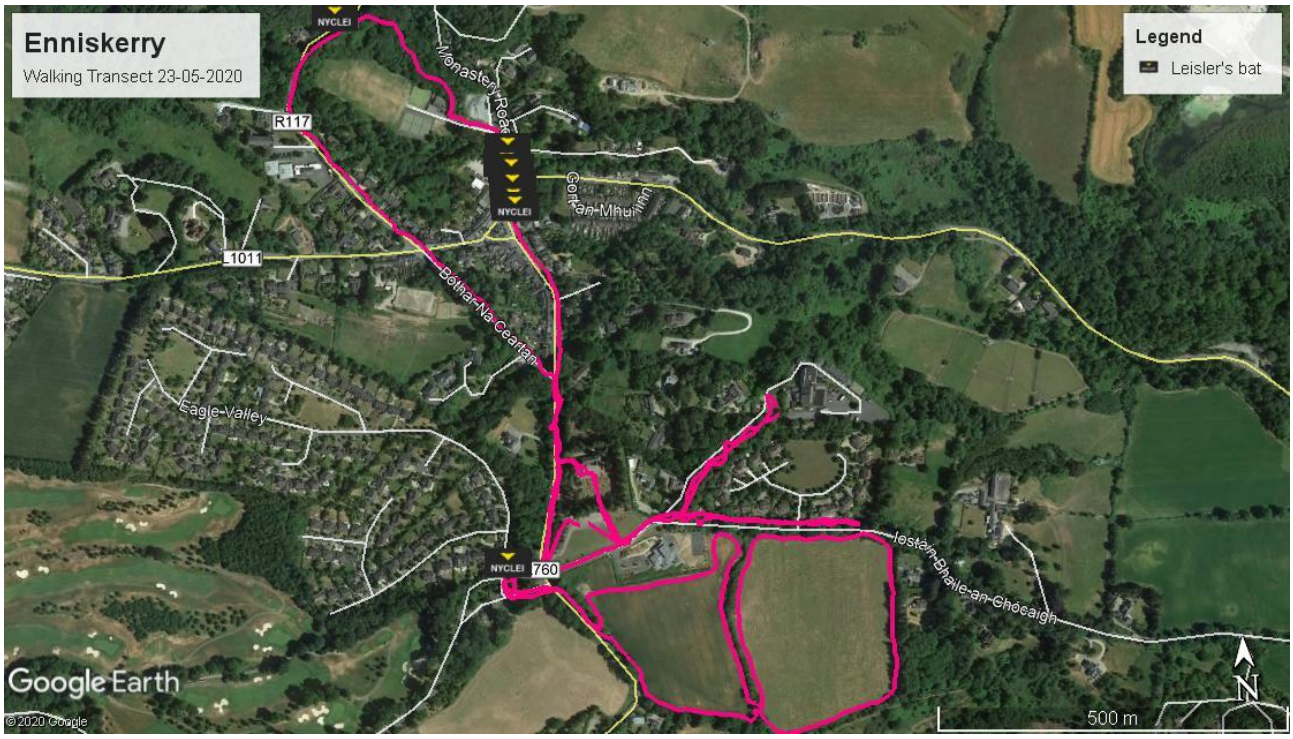
b) Common pipistrelle bat encounters (Walking route shown in Pink line)



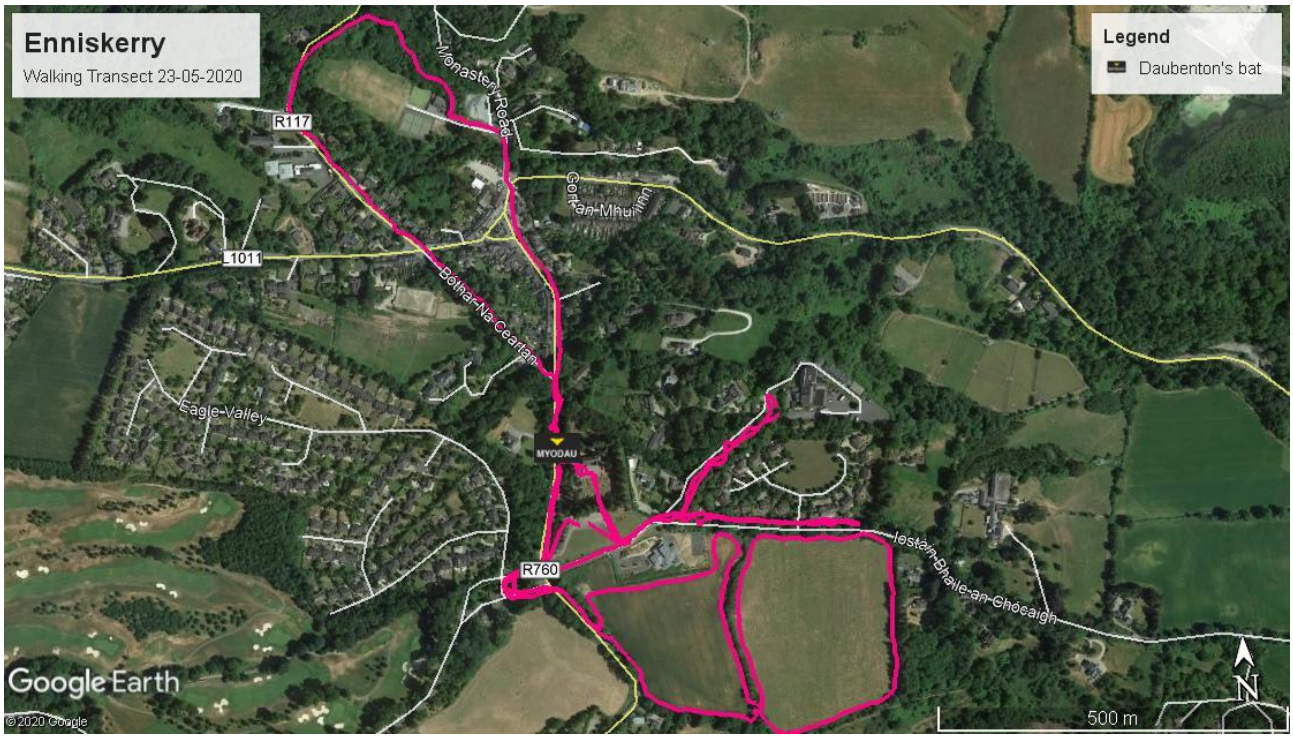
c) Soprano pipistrelle bat encounters (Walking route shown in Pink line)



d) Leisler's bat encounters (Walking route shown in Pink line)



e) Daubenton's bat encounters (Walking route shown in Pink line)



A dusk survey was undertaken on 26/5/2020 (weather conditions: full cloud cover, calm, dry and 14oC). Three surveyors were positioned in three separate locations of the field proposed to be developed (See Figure 2). The principal purpose of this dusk survey was to determine if any of the mature trees in vicinity of the surveyors are bat roosts and also to track the commuting routes of local bat populations.

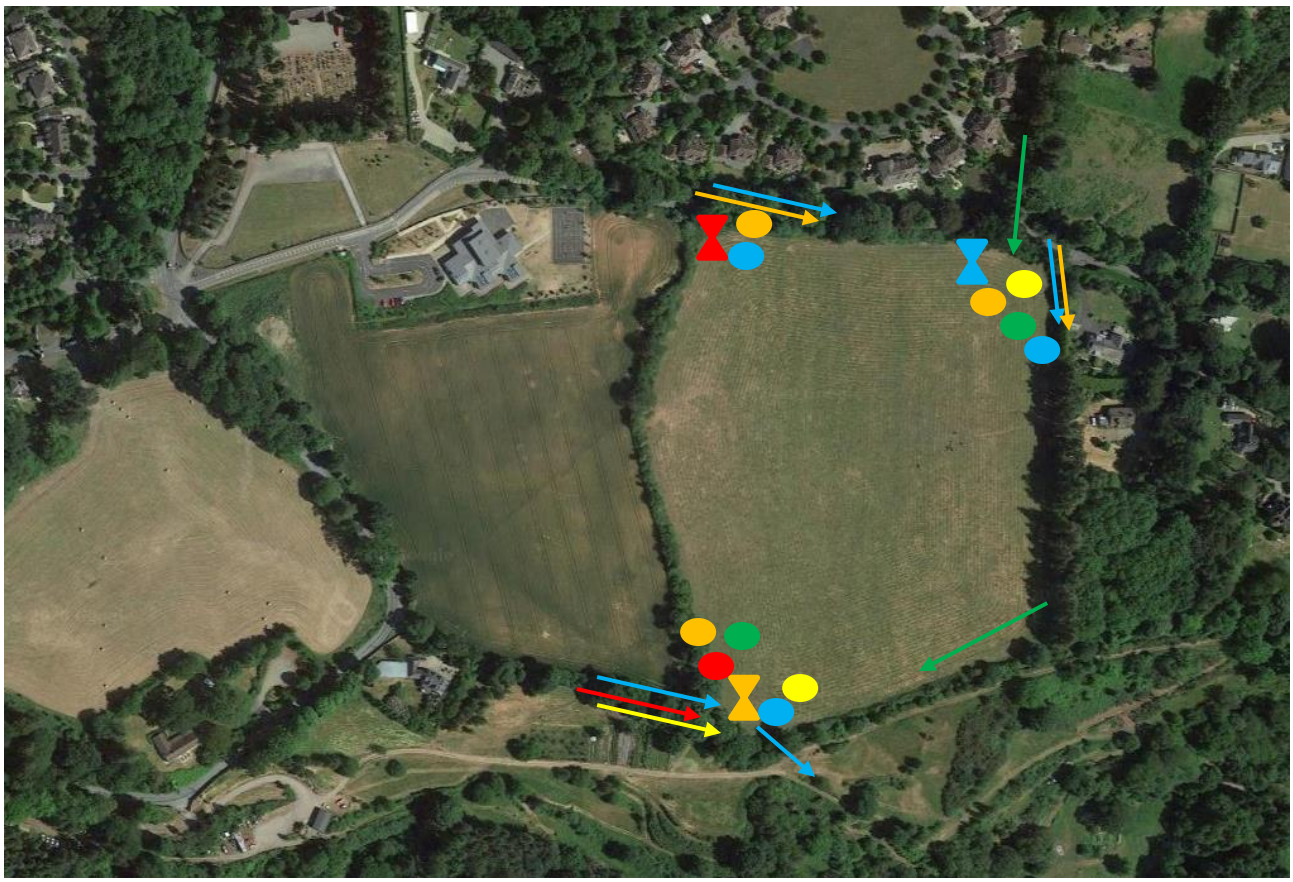


Figure 3: Aerial photograph of the proposed development area (Source: Google Maps). Location of surveyors during Dusk Survey (26/5/2020). Hour Glass Symbol - Orange = Surveyor 1, Blue = Surveyor 2 & Red = Surveyor 3. SPECIES COLOURS: Circles = foraging bats, Arrows = Direction of commuting. Orange = common pipistrelle, Blue = soprano pipistrelle, Red = *Myotis* spp., Green = Leisler's bat & Yellow = brown long-eared bat).

Surveyor 1 recorded five species of bat foraging along the treeline surveyed: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat and *Myotis* species. The principal commuting routes occurred from the adjacent field along the treeline. Leisler's bats were recorded continuously foraging above the surveyor while a number of brown long-eared bat and *Myotis* species bat passes were noted, including social calls of brown long-eared bats.

Surveyor 2 recorded the following bat encounters: Common pipistrelle – 20 passes, Soprano pipistrelle - 12 passes, Leisler's bat - 10 passes and one brown long-eared bat pass.

Surveyor 3 recorded the following bat species: soprano pipistrelle (7 bat passes) and common pipistrelle (10 bat passes).

Surveying did not confirm any bat roosts in the trees in vicinity of each of the three surveyors.

3.2.2.2 2019 Surveys

A dusk survey (weather conditions: overcast, dry, calm and 18^{o}C) was completed on 27/8/2019 with two surveyors, one surveyor (Surveyor 1) located in the south-west corner of the survey area (Field 1 adjacent to the current proposed application area) and a second surveyor (Surveyor 3) located along the northern boundary of the survey area. The aim of this survey was to document bats commuting to the proposed development area.

Surveyor 1 documented the following: the first bat was recorded at 20:37 hrs and this was a common pipistrelle commuting along the treeline and down the woodland tract along the boundary of the proposed development site. A soprano pipistrelle followed the same route at 20:38 hrs. A high level of bat activity was recorded in this area for both species named and there is likely to be roosts located near-by. The first Leisler's bat was recorded at 20:45 hrs. At 21:06 hrs *Myotis* species activity was recorded with a total of 5 passes of Daubenton's bat and then another 5 passes of Natterer's bat at 21:13 hrs. As it is was dark at this point, the roosting site was not located but it is likely that one of the three mature trees located in the corner of the field is a bat roost (Purple Square symbol, Figure 4). For the remainder of the survey, there was continuous bat activity along the woodland tract along the southern boundary of the proposed development site.

Surveyor 3 recorded the following: The first bat recorded was a Leisler's bat at 20:27 hrs commuting though the survey area in a north to south direction (Green arrow), the first common pipistrelle was recorded at 20:30 hrs and the first soprano pipistrelle was noted at 20:38 hrs. The bat activity was high for these three species of bat and was principally concentrated along the northern treeline boundary east of the new school. A brown long-eared bat was recorded entering the proposed development site in vicinity of the agricultural gate entrance to field 2 (Yellow arrow).

Following the dusk survey, a walking transect was completed of the two fields. During this survey the following bat species was recorded: common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat and brown long-eared bats. The location of these bat encounters are presented on the aerial photograph below (Coloured circles – correlates to the bat species encountered).

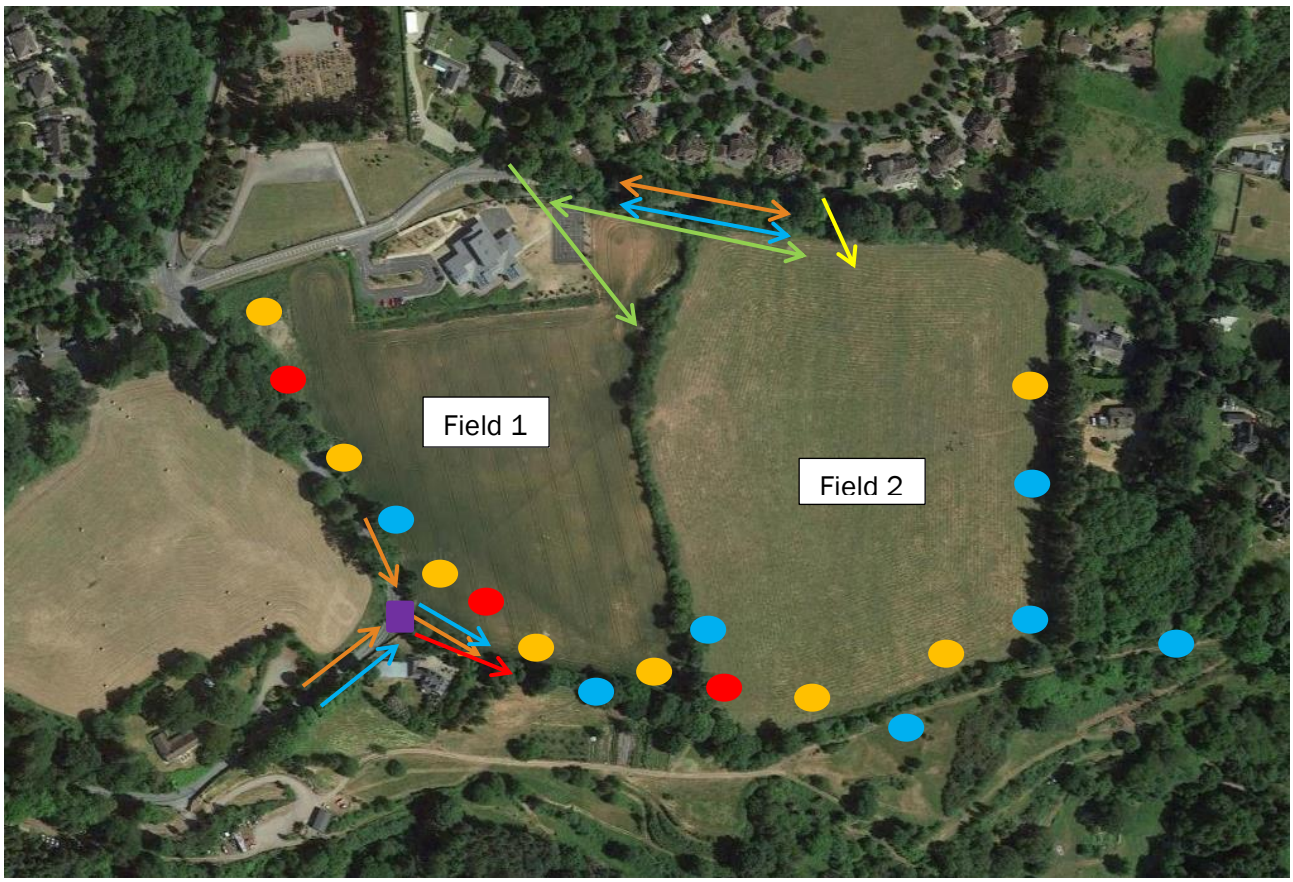


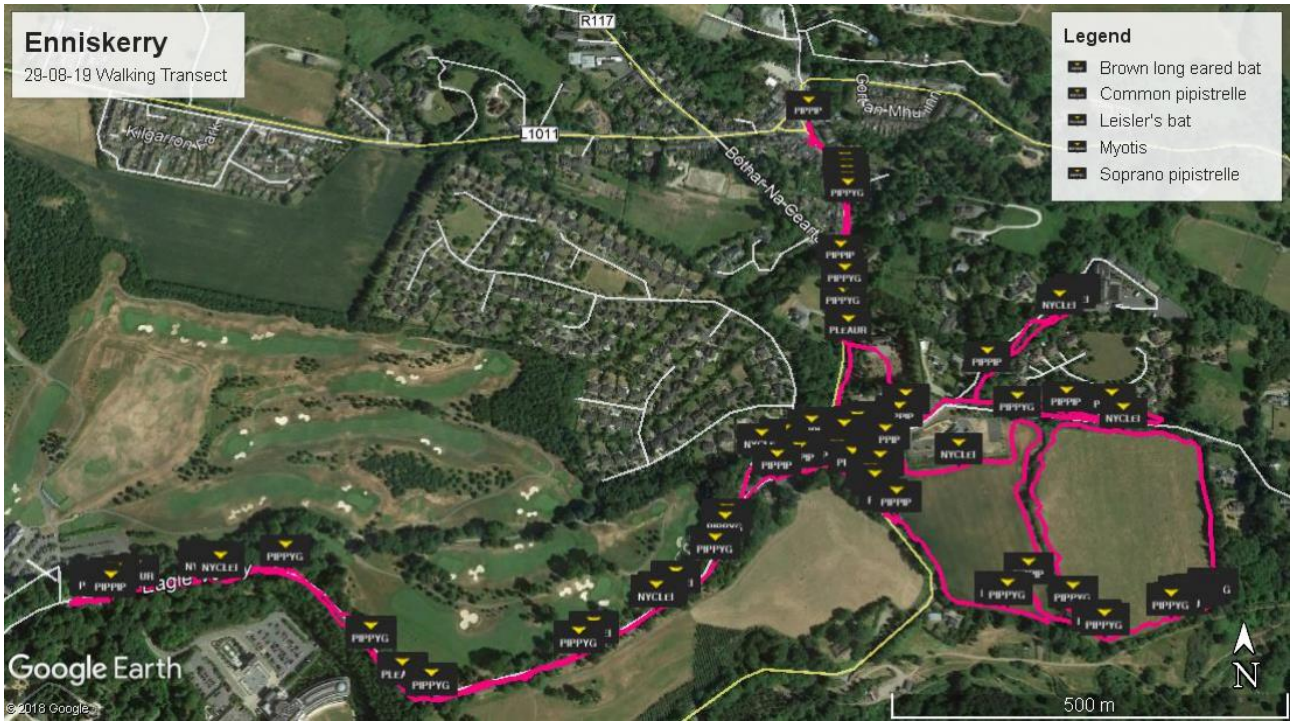
Figure 4: Aerial photograph of the proposed development area (Source: Google Maps). 2019 Dusk survey results: SPECIES COLOURS: Circles = foraging bats, Arrows = Direction of commuting. Orange = common pipistrelle, Blue = soprano pipistrelle, Red = *Myotis* spp., Green = Leisler's bat & Yellow = brown long-eared bat). Purple Square = tree roost.

A walking transect was completed on 29th August 2019 by Surveyor 2. The surveyor walked the proposed development area, adajcent field and along the local road network of Enniskerry, Co. Wicklow (represented on Pink Line on aerial photographs presented below). Five species of bat was recorded: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat and *Myotis* species. The majority of the bat activiy recorded was in the north-west of survey area or adjacent field to the current planning application.

Brown long-eared bats are a difficult species to detect once it has emerged from the roost (due to it's quiet echolocation calls). Consequently the number of bat encounters for this species during the walking transect is important and potentially depicts the disperal routes for this species from the known brown long-eared bat roost in St. Patrick's Church of Ireland. This is complemented by the results of Dusk Survey completed in 2017 which recorded three similar dispersal routes for emerging individuals of this species.

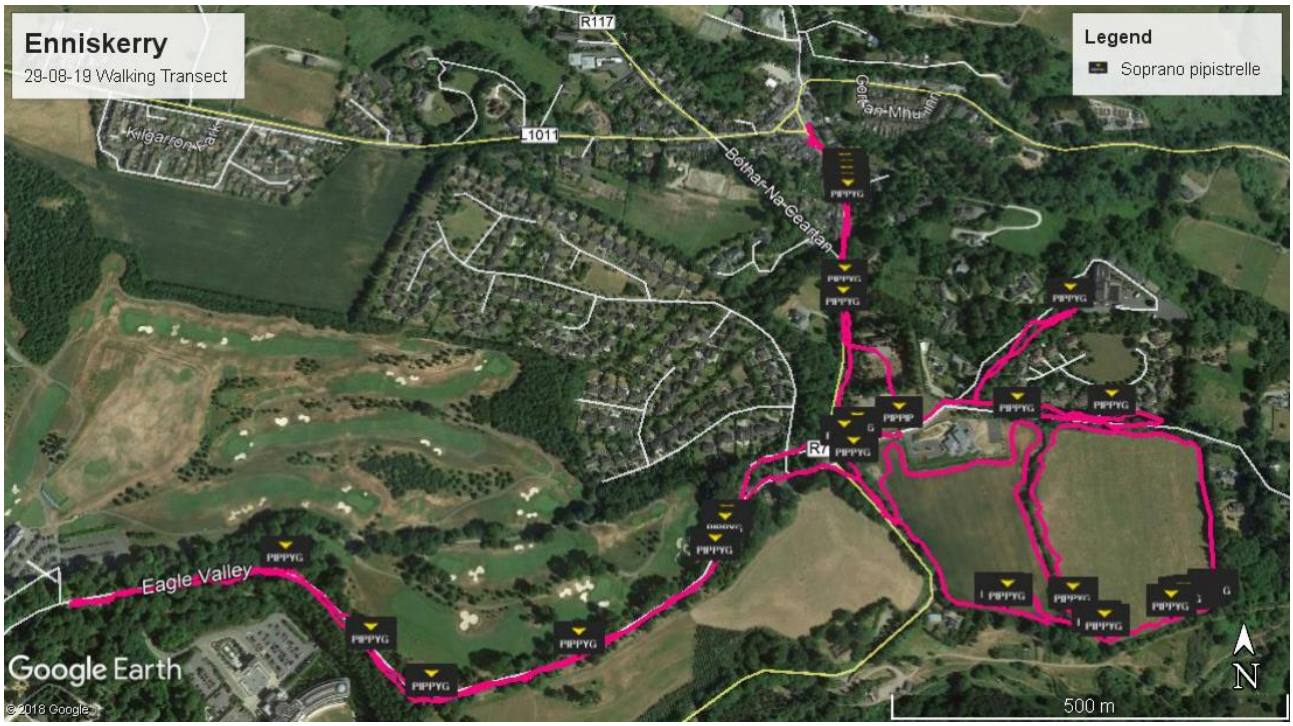
Figure 5: Walking transect completed on 29th August 2019.

f) All bat encounters (Walking route shown in Pink line)

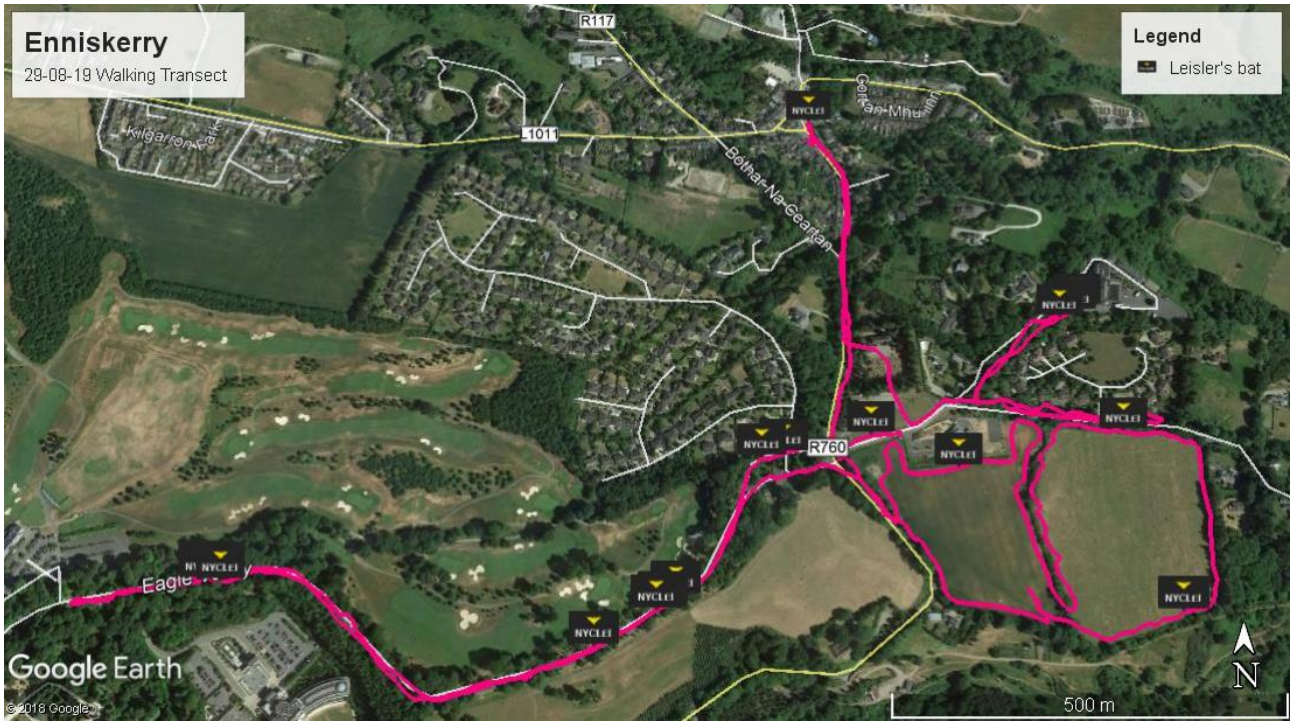


g) Common pipistrelle bat encounters (Walking route shown in Pink line)

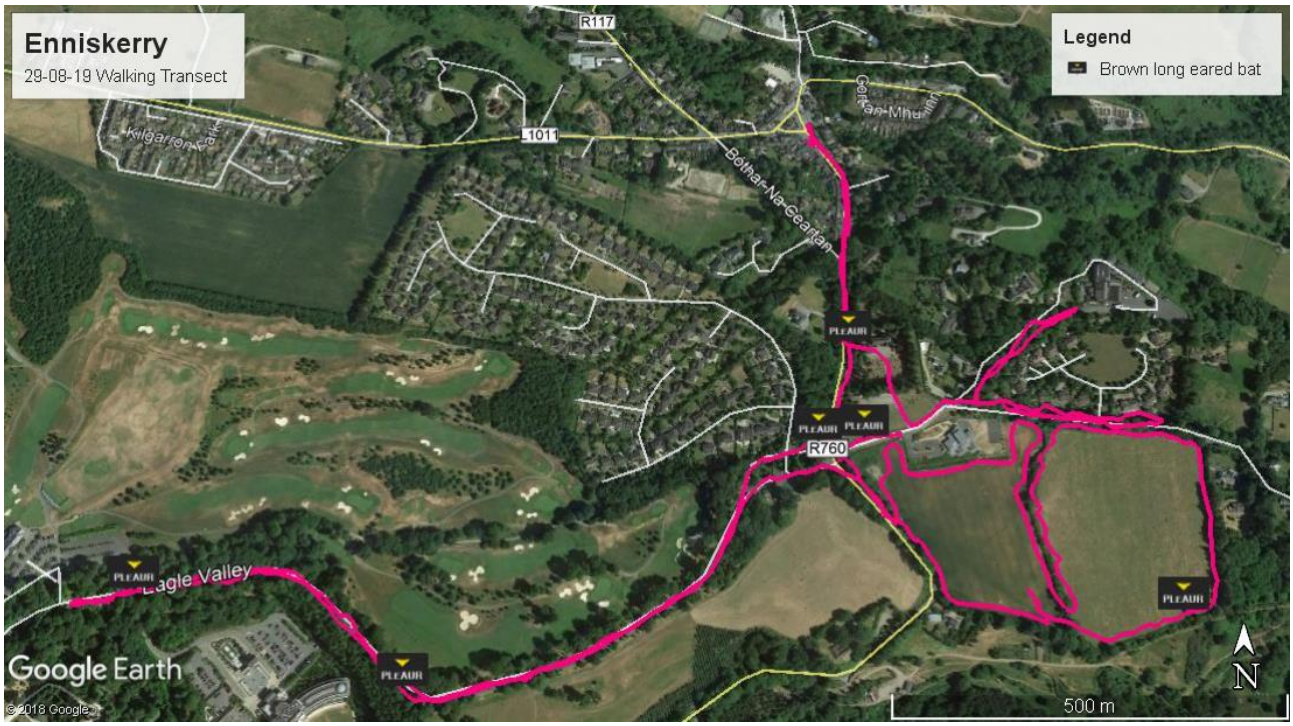
h) Soprano pipistrelle bat encounters (Walking route shown in Pink line)



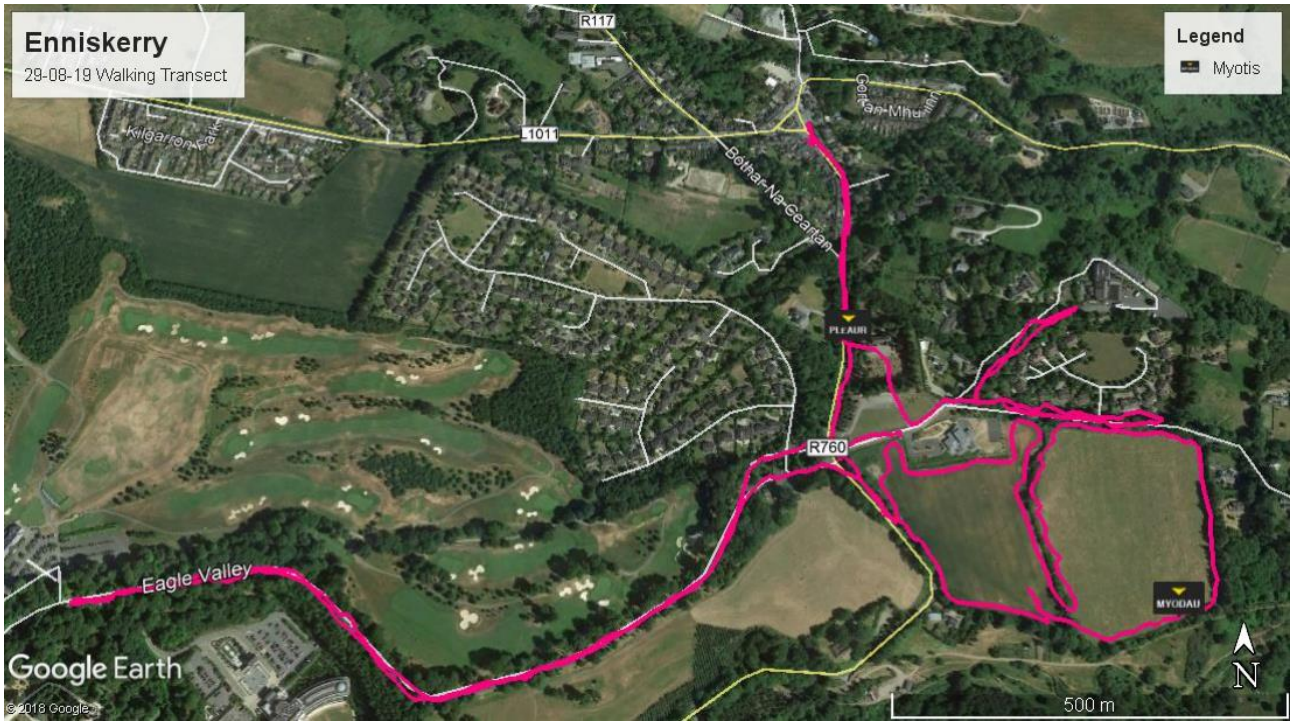
i) Leisler's bat bat encounters (Walking route shown in Pink line)



j) Brown long-eared bat encounters (Walking route shown in Pink line)



k) *Myotis* species bat encounters (Walking route shown in Pink line)



3.2.2.3 2017 Surveys

In 2017, the dusk survey was completed on 1st September (weather conditions: cloudy, dry, calm and 16ºC). The start of the survey was undertaken along the public road adjacent to the school and St. Patrick's Church of Ireland. Brown long-eared bats were recorded emerging from the church from 20:36 hrs and were noted to commute in three directions (Yellow arrows). Individuals commuted west towards wooded areas and potentially the Powerscourt Estate. The landscape of Enniskerry is highly suitable for this species of bat due to the high density of mature trees, treelines and woodland in a highly connected landscape with two river valleys. This coupled with low levels of lighting along the R760 and treelines of the public road adjacent to Cookstown Cottages.

Individual bats of common pipistrelle, soprano pipistrelle and Leisler's bats were recorded commuting through the proposed development site along the internal field boundary of the survey area. These bats commuted from the direction of Enniskerry village to foraging habitats along the River Dargle. The level of commuting bats was high. Four species of bat were recorded foraging within the proposed development site but levels of foraging were low. As surveying continued towards the arable fields, bat activity was less with only the three common bat species recorded: common pipistrelle, soprano pipistrelle and Leisler's bat. The results of this dusk survey is present on the aerial photograph below.

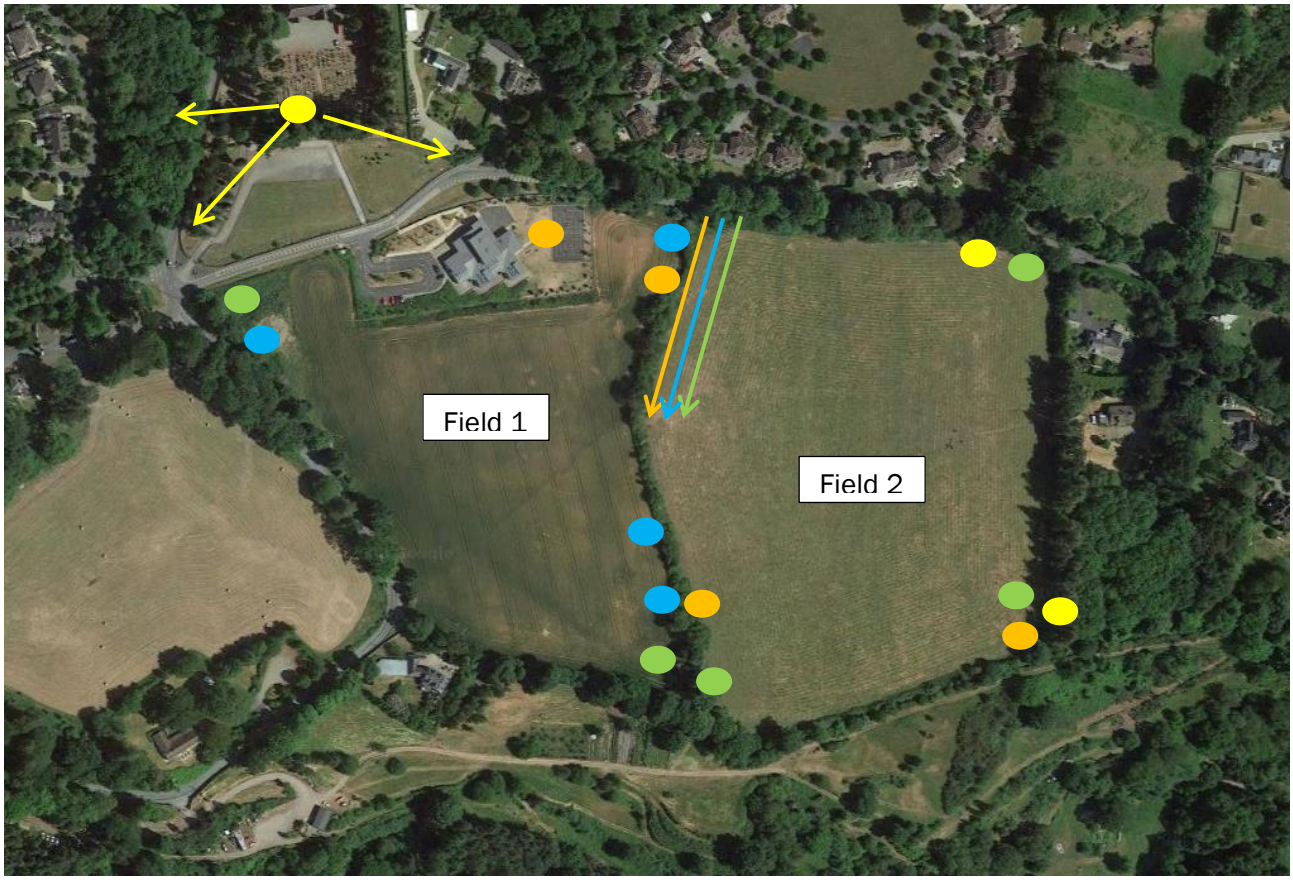


Figure 6: Aerial photograph of the proposed development area (Source: Google Maps). 2017 Dusk survey results: Orange = common pipistrelle, Blue = soprano pipistrelle, Red = *Myotis* spp., Green = Leisler's bat & Yellow = brown long-eared bat).

3.2.3 Passive Static Bat Detector Survey

The following table summarises the results recorded on the static units deployed in 2017, 2019 and 2020 (Please see Figure 7 for static locations and Appendices for a full break down of hourly results in relation to 2017 and 2019 results). At least five species of bat was recorded: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat, Daubenton's bat and *Myotis* species.

Table 8: Results of Static Bat Detectors deployed during Static Bat Detector Surveys 2017, 2019 & 2020.

Static Code	Location Description	Grid Reference	Survey Period	Bat Species	Bat Activity Value (/hr)
SM2 Unit 4	Orange Star	O2259916781	1/9/2017 to 2/9/2017 1 night	CP: 25 passes SP: 96 passes Leis: 11 passes	Low Medium Low
SM2 Unit 2	Blue Star	O2282116689	1/9/2017 to 2/9/2017 1 night	CP: 6 passes SP: 9 passes Leis: 7 passes BLE : 2 passes	Low Low Low Low
SM2 Unit 3	Red Star	O2274616919	1/9/2017 to 2/9/2017 1 night	CP: 27 passes SP: 17 passes Leis: 5 passes BLE : 3 passes	Low Low Low Low
SM4 U2	Red cross	O2236316839	26/8/19 to 27/8/19 1 night	Night 1 CP: 165 passes SP: 41 passes Leis: 10 passes BLE : 11 passes Myotis : 28 passes	 Medium Low Low Low Low
SM4 U3	Yellow cross	O2260716656	26/8/19 to 29/8/19 3 nights	Night 1 CP: 586 passes SP: 1,137 passes Leis: 18 passes BLE : 2 passes Myotis : 5 passes Night 2 CP: 1,388 passes SP: 1,255 passes Leis: 50 passes Myotis : 12 passes Night 3 CP: 308 passes SP: 902 passes Leis: 34 passes Myotis : 2 passes	 High High Low Low Low High High Low Low Medium High Low Low
SM4 U4	Blue cross	O2258716820	26/8/19 to 29/8/19	Night 1 CP: 9 passes SP: 75 passes	 Low Low

			3 nights	Night 2 CP: 6 passes SP: 13 passes Night 3 CP: 45 passes SP: 60 passes Myotis : 2 passes	 Low Low Low Low Low
SM4 U5	Green cross	O2282416819	26/8/19 to 28/8/19 2 nights	Night 1 CP: 283 passes SP: 42 passes Leis: 31 passes Night 2 CP: 22 passes SP: 11 passes Leis: 4 passes	 Medium Low Low Low Low Low
Mini 9	Orange circle	O2268716626	23/5/20 to 26/5/20 3 nights	Night 1 CP: 142 passes SP: 114 passes Leis: 9 passes Myotis : 8 passes Daub : 11 passes Night 2 CP: 36 passes SP: 112 passes Leis: 10 passes Night 3 CP: 63 passes SP: 47 passes Leis : 40 passes BLE : 1 pass	 Medium Medium Low Low Low Low Low Medium Low Low Low Low Low
Mini 10	Purple circle	O2287316885	23/5/20 to 26/5/20 3 nights	Night 1 CP: 46 passes SP: 138 passes Leis: 96 passes Myotis : 7 passes Daub : 2 passes BLE : 1 pass Night 2 CP: 32 passes SP: 192 passes Leis: 107 passes BLE : 1 pass Night 3 - None	 Low Medium Medium Low Low Low Low Medium Medium Low

Note : CP = common pipistrelle, SP = soprano pipistrelle, Leis = Leisler's bat, Myotis = Myotis species, Daub = Daubenton's bat,& BLE = brown long-eared bat.

Figure 7: Aerial photograph of the proposed development area (Source: Google Maps). Location of the static units.

As a general guide, activity level is determined as follows: Low = <10 bat passes/hr; Medium = >10 - <50 bat passes/hr; High = >50 bat passes/hr). The static units recorded for approximately 8 hours per night. Therefore the activity levels for each bat species is presented in the Table 8 (Bat Activity Value column).

NOTE: The behaviour of bats during commuting and foraging greatly influences the level of bat passes recorded on static units. The number of bat passes do not equate to the number of bats flying past the static unit. Pipistrellus species tended to foraging as they commute and therefore are regularly observed flying up and down a treeline or hedgerow before moving on in the landscape. Leisler's bats fly high in the sky and therefore can be observed flying fast through the landscape, occasionally foraging over treetops as they commute. As a consequence, Pipistrellus species bat activity tends to result in a higher number of bat passes recorded on static units compared to Leisler's bats. In relation to other bat species recorded, as they tend to be less common in the landscape compared to common pipistrelles, soprano pipistrelles and Leisler's bats, their recorded presence is notable. Exceptions to this would include Daubenton's bats on a waterway or a static located adjacent to a known bat roost.

Common pipistrelles and soprano pipistrelles were recorded at all nine static surveillance stations. Leisler's bats were recorded at eight of the nine surveillance static stations. *Myotis* species was recorded at five of the nine station surveillance stations, all three in operation in 2019 which were located along the western and southern boundary of the proposed development site and in 2020 located along the southern and eastern boundary of the proposed development site. These coincide the high level of *Myotis* species activity recorded in the south-west corner of the survey area during the 2019 dusk survey. Brown long-eared bat was recorded at four of the nine station surveillance stations, all of which were in operation in 2019 which were located along the western and southern boundary of the proposed development site and in 2020 located along the southern and eastern boundary of the proposed development site.

The static units indicate that the western boundary of Field 1 and the southern boundary are vey important for local bat populations. The level of bat activity recorded during static surveillance in 2017 is lower than that recorded in 2019 and 2020. The static unit located at the Yellow Cross point in 2019 recorded a very high level of bat activity for common pipistrelles and soprano pipistrelles. In addition, all five species of bat consistently recorded during the numerous surveys completed in 2019 were recorded at this point. This emphasises the important of the western and southern boundaries of the survey area for commuting and foraging bats.

3.3 Desktop Review

3.3.1 Bat Conservation Ireland Database

A 1km search of the Irish Grid Reference O225168 was requested from Bat Conservation Ireland. This search results in:

Roosts – 2 (Soprano pipistrelle - 296 individuals & Brown long-eared bat – highest number recorded was 43 individuals).

Transects – 2 (Daubenton's bat, Leisler's bat, soprano pipistrelle – along the River Dargle).

Ad Hoc Observations – 2 (Leisler's bat, common pipistrelle, soprano pipistrelle, brown long-eared bat and *Myotis* species).

The All Ireland Daubenton's Bat Waterways Survey (Irish Bat Monitoring Programme) is comprised of 1km walking transects surveyed by volunteer teams annually in the month of August. The following 1km monitoring transects are located in vicinity of Enniskerry, Co. Wicklow:

- Site Code 1008 Glencullen Bridge (Glencullent River) – Daubenton's bats recorded.
- Site Code 1252 Tinehinch Bridge (River Dargle) – Daubenton's bats recorded.
- Site Code 1274 Knocksinck Nature Reserve (Glencullen River) - Daubenton's bats recorded.
- Site Code 1285 Glencullen/Dargle confluence - Daubenton's bats recorded.

3.4 Other Permitted Developments in the Area

There are two permitted developments located adjacent to this planning application:

- Planning Reg. Ref. 19/871 (27 no. dwellings) in adjacent field (west).
- Planning Reg. Ref. 16976 development comprising 6 no. detached, two-storey dwellings on 0.9ha. located in field to the north-east.

4. Bat Ecological Evaluation

4.1 Bat Species Recorded & Sensitivity

Six species of bat was recorded during these bat surveys: common pipistrelle, Leisler's bat, brown long-eared bat, Natterer's bat, Daubenton's bat and soprano pipistrelle. A high level of bat activity was recorded for common and soprano pipistrelles while lower levels of bat activity was recorded for the remainder four bat species.

There are no confirmed bat roosts within the proposed development area. Individual brown long-eared bats from a known maternity roost was recorded commuting to the proposed development site and foraging along the external boundary treelines.

In relation to the bat evidence collected by this report, it is deemed, according to Table 2, that the bat populations recorded within the survey area are of Local Importance.

4.2 Bat Foraging Habitat & Commuting Routes

The external boundaries of the proposed development site are used as commuting and foraging habitat by six species of bat. A higher level of activity was recorded along the southern field boundary of the proposed development site.

The adjacent field (Field 1) external boundaries are also important for local bat populations and overall had a higher level of bat activity compared to Field 2 (field of current planning application).

4.3 Zone of Influence – Bat Landscape Connectivity

The proposed development area is located south of the town of Enniskerry, Co. Wicklow. This landscape area is characterised by large tracts of mature trees associated with the village, St. Patrick's Church of Ireland, Powerscourt House and Gardens, River Dargle valley, River Glencullen valley, Knocksink Woodland to name but a few. This landscape is highly connected and therefore highly suitable for local bat populations. As a result, six species of bat was recorded in the survey area.

Figure 8: Aerial photograph of the wider landscape of Enniskerry, Co. Wicklow (proposed development site marked by Red Square) (Source: Google Maps).

4.4 Landscape Plan

The following document was consulted in relation to landscaping for the proposed development: Landscape Report & Outline Landscape Specification (dated: 8th December 2020). In this report, the general aims are noted to be and depicted by the Landscape Master Plan (Figure 9a):

"The landscape strategy aims to integrate the new built development with the existing landscape and create a network of attractive and usable open spaces while contributing to the local biodiversity. The character of the landscape proposed is one of native woodland, wildflower meadow, large woodland trees and tree copses with structure shrub planting, formal clipped hedges, streams and pools and large open lawn areas. The public green areas are designed as landscape spaces that offer the opportunity for meeting, walking and formal and informal play."

Figure 9a: Landscape Master Plan (Dated: 3/3/2021).

A Linear Parkland is proposed along the southern boundary of the proposed development site. The Landscape Report & Outline Landscape Specification (dated: 8th December 2020 states the following:

"This large linear open space has been designed as an ecological park with the aim of strengthening local biodiversity while offering a range of uses to residents of the local area. This approach creates new habitats for local flora and fauna and encourages easier movement of smaller mammals through the site. Breaks in the tree and shrub planting have been created to establish a visual connection between the proposed park area and the streetscape, encouraging residents and passersby to utilise the park and to allow a high level of passive supervision. New connections are also provided to the amenity walks to the south to The 'Lovers Leap' and surrounds."

This is an important area for local bat populations, so retaining existing treelines / hedgerows and increasing such with additional planting is an important element to reduce the potential impact of the proposed development on local bat populations. It is important to ensure that the entire southern boundary of the Linear Parkland has a canopy height of 5m+ to provide a dense treeline/hedgerow for commuting bat species, specifically brown long-eared bats, Natterer's bat and Daubenton's bats. Any proposed planting should consist of native tree and shrub plant species.

Figure 9b: Linear Parkland (Source: Landscape Report & Outline Landscape Specification, dated: 8th December 2020).

To ensure the value of this area for bats, it is important that the any artificial lighting associated with the proposed development does not spill into this area. The LUX level should be 0 in the Linear Parkland. It is also recommended that bat boxes, required as part of mitigation, are installed in this area to provide roosting sites for local bat populations.

The north-eastern and eastern boundary of the proposed development are also important elements to allow continued commuting for local bat populations. It is also important to ensure that there is a dark corridor to allow brown long-eared bats to cross the existing public road (Cookstown Road) along the northern boundary of the proposed development site and commute towards the River Dargle valley located along the southern boundary. Therefore, it is important to ensure that the entire eastern boundary and north-eastern corner of the proposed development site has a canopy height of 5m+ to provide a dense treeline/hedgerow.

The Landscape Report & Outline Landscape Specification (dated: 8th December 2020) presents a boundary strategy and states the following:

"The proposed strategy for this boundary is to retain all the large trees other than those that require removal due to being assessed by the arborist as unsuitable for retention regardless of the proposed development. To achieve this successfully a range of design and mitigation measure were required to avoid any conflict with the trees. The trees will be incorporated into the scheme and supplemented with additional tree planting. The hedgerow will be retained and enhanced with additional planting and maintenance measures to improve its structure and form."

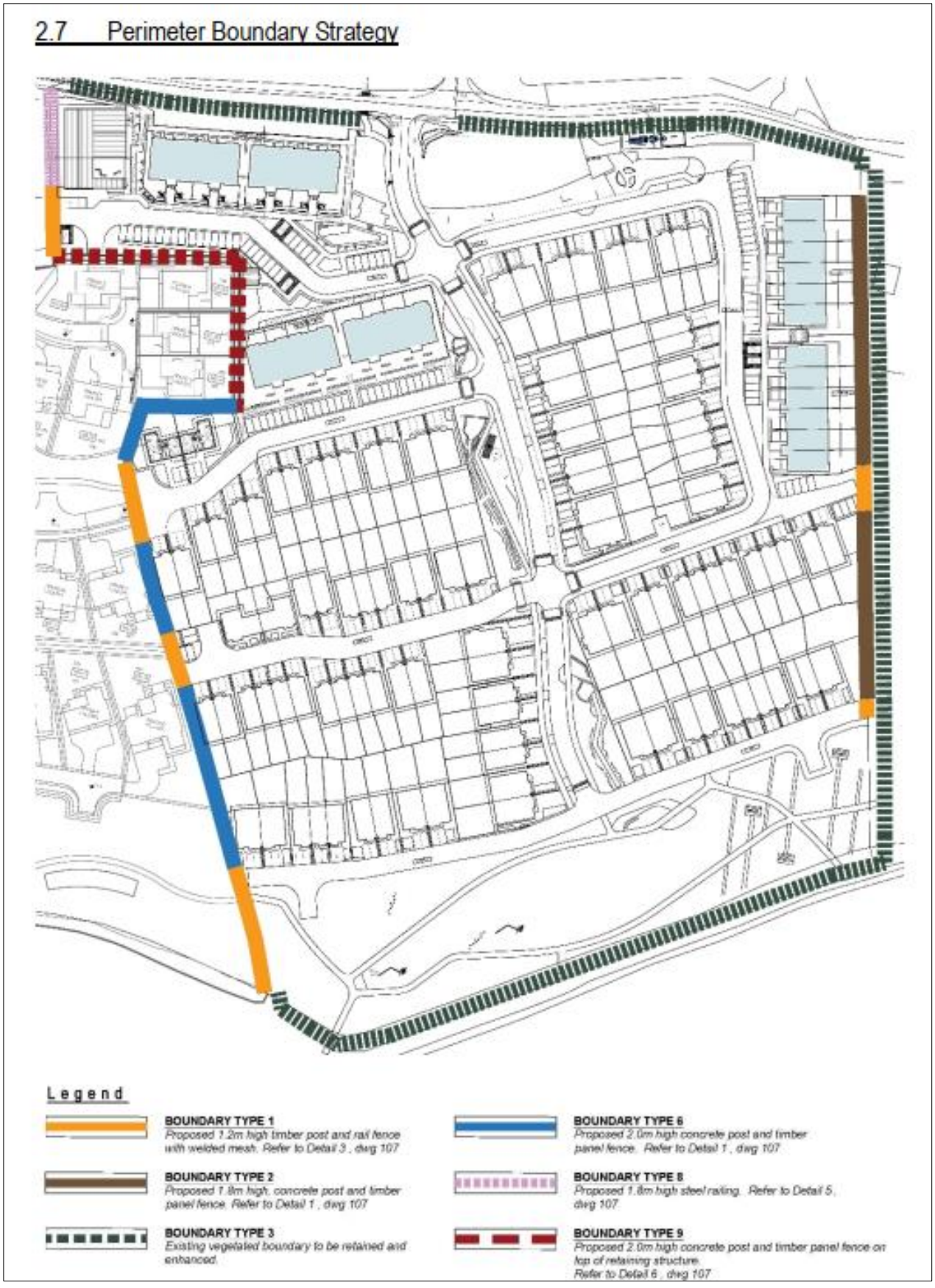


Figure 9c: Perimeter Boundary Strategy (Source: Landscape Report & Outline Landscape Specification, dated: 8th December 2020).

4.5 Lighting Plan

The lighting plan for the proposed development site was designed by Sabre Electrical Services Ltd. Due to the fact that the northern boundary of the proposed development is Cookstown Road, the lighting plan was required to incorporate the public street lighting along this road and in vicinity of the adjoining primary school. As a consequence, the assessment of the lighting plan will be undertaken separately for:

- The proposed development site
- Cookstown Road including the primary school

4.5.1 Proposed Development Site

The layout of the lighting for the proposed development is presented in Figure 9d (Please consult Sabre Electrical Services Ltd. Public Lighting Layout and report for greater details). The luminance projection in LUX levels are presented on this plan (series of lines of different colours, which represent different LUX levels). The proposed luminance levels range from 1.05 LUX to 17.21 LUX (average 5.33 LUX).

Within the proposed development site and as stated under Section 4.4, the following LUX levels are required to reduce the potential impact of the proposed development on local bat populations, with specific reference to light sensitive bat species (e.g. brown long-eared bats):

- The LUX level should be 0 in the Linear Parkland (southern boundary).
- The LUX level should be 0 within the north-eastern corner and eastern boundary hedgerow/treeline.

This has been achieved with the lighting plan as presented on Figure 9d.

4.5.2 Cookstown Public Road

The public street lighting along Cookstown Road is projected as two separate grids (Grid 2 & 3). The section of the public road in Grid 2 is projected to have a maximum level of 29.68 LUX with a minimum of 1.56 (average 7.93 LUX). In Grid 3 (further along Cookstown Public Road towards the proposed development site entrance) the range of luminance levels ranges from 1.8 to 23.80 LUX (average 7.79 LUX). This far exceeds what is recommended to allow light sensitive bats to commute in the area and will be a barrier to light sensitive bat species, particularly brown long-eared bats roosting in St. Patrick's Church.

However in Grid 3, the extent of the lighting has been reduced east of the entrance of the proposed development site. This will ensure that there is a dark zone to allow bats to commute across the public road to the north-eastern corner of the proposed development site and therefore along the eastern boundary of the proposed development site.

Communication from Sabre Electrical Services Ltd have stated that the column height is set at 6m to reduce the height that luminance from street lighting will be shining from. Therefore in other areas along Cookstown Public Road, if there is tall tree vegetation adjacent to the public road, particularly on either site of the road, this will allow light sensitive bats species such as brown long-eared bats to travel through the tall vegetation canopy and hop-over the public road in the safety of darkness.

Wicklow Co. Co. has a policy to dim public lighting by 25% between the hours of 00:00 – 06:00 as standard practice (pers. comm. Sabre Electrical Services Ltd.). This dimming would reduce the LUX levels during the principal hours of foraging for local bat populations, particularly during the summer

months which is when the brown long-eared bat maternity roost occupies St. Patrick's Church (brown long-eared bats tend to occupy their maternity roost from May to September).

Figure 9d: Public Street Lighting layout (SES 15200 RevE.pdf - Source: Sabre Electrical Services Ltd., dated: 10/3/2021).

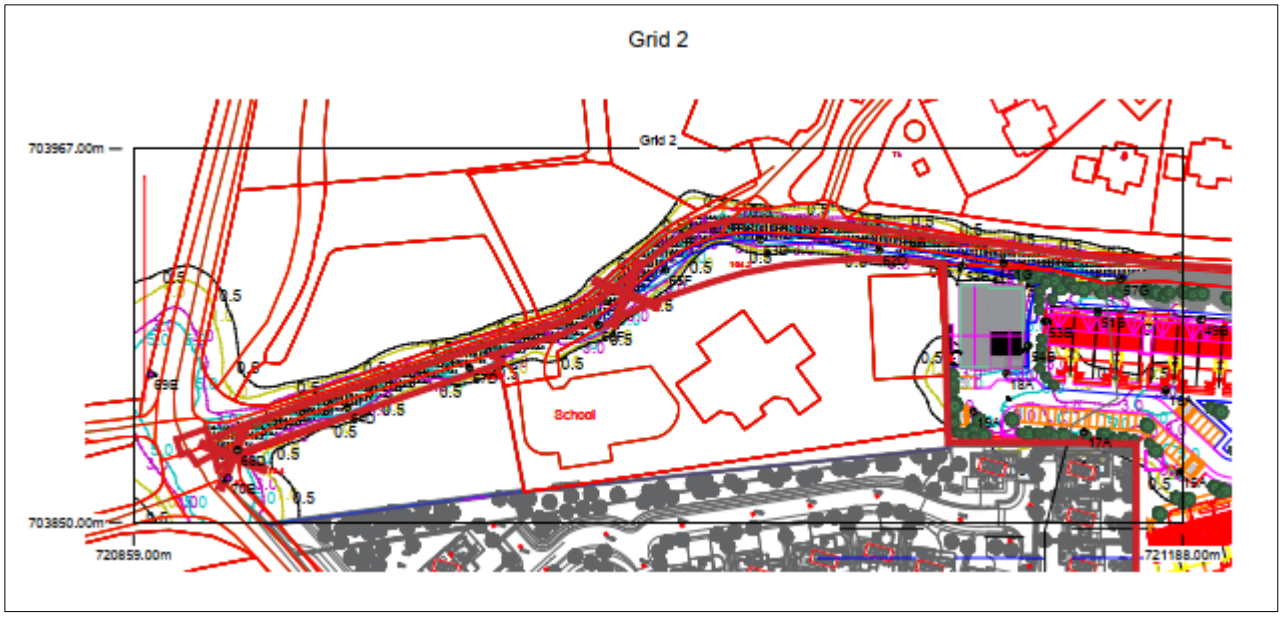


Figure 9e: Public Street Lighting layout along the Cookstown Public Road (SES 15200 RevE.pdf - Source: Sabre Electrical Services Ltd., dated: 10/3/2021).

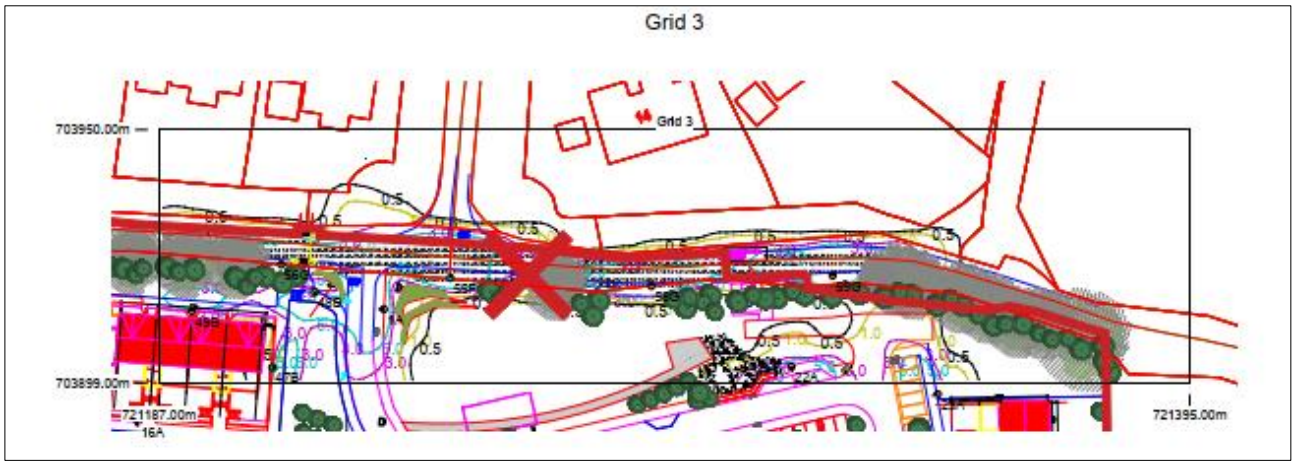


Figure 9f: Public Street Lighting layout along the Cookstown Public Road (SES 15200 RevE.pdf - Source: Sabre Electrical Services Ltd., dated: 10/3/2021).

5. Impact Assessment & Mitigation

The following bat species have been recorded during this bat survey: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat, Natterer's bats and Daubenton's bats. This represents six of the nine residence bat species known to Ireland and six of the eight species of bat known to be resident in Co. Wicklow. All bat species recorded during this Bat Survey are Annex IV species under the EU Habitats Directive and all have a Favourable Status in Ireland.

The presence of bats was given consideration at the design phases of the proposed development. For this ecological assessment, the habitats adjacent to the proposed 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. A tree assessment in relation to Potential Bat Roosts (PBRs) was undertaken and this was compared to the Landscape plan to determine which trees will be felled. While a large number of trees were identified as PBRs, approximately 10 PBR trees will be felled as a result of the removal of hedgerows, treelines and woodland. Overall, extensive retention and enhancement of linear habitat features are proposed as part of the landscape strategy for the proposed development site.

- Foraging and commuting areas were recorded extensively throughout the proposed development area primarily along hedgerows and treelines adjacent to the proposed development area, particularly for common and soprano pipistrelles, brown long-eared bats and Natterer's bats / *Myotis* species. The exception to this is Leisler's bats, which is a bat species that fly high over the landscape. They are not a reliant on linear habitats to traverse through the landscape.

- An extensive array of buildings is located adjacent to the survey area and a known brown long-eared roost monitored by the Irish Bat Monitoring Programme is located to the north of the proposed development site.

1 *agricultural grasslands/arable fields*.

This habitat is present within the survey area as agricultural blocks surrounded by linear habitats. These agricultural blocks and associated hedgerows/treeline boundaries provides foraging habitat for all of the bat species recorded. May be considered as Medium ecological value.

2 *hedgerow and treeline boundaries, access tracks*.

These habitat types are present around the boundaries of the survey area. Such provide wildlife corridors and foraging areas for many bat species. Bat roosts may be present in mature trees or larger ivy-covered trees. These linear habitats are also essential for commuting bats. May be considered as High ecological value.

5.1 Potential Impacts

Bat fauna within the survey area will be affected by both the construction phase and operational phase of the proposed development.

5.1.1 Construction Phase

5.1.1.1 Linear Habitats

There are a number of trees deemed to have roosting potential for bats as well as extensive treeline/hedgerow around the proposed development site. This is connected to the wider landscape site. As a consequence, bat activity was recorded for all of the bat species note along the boundary habitats.

It is recommended that that the northern, eastern and southern boundary habitats remain in place and are planted with additional native tree and shrub species. The Landscape Plan will ensure that the eastern and southern boundary will be retained, with additional planting proposed for the southern boundary which will be designed as a Linear Parkland.

The western boundary will not be retained and this will result in the loss of a medium size hedgerow. Some trees within this boundary will be retained.

Sections of the northern boundary will be removed to facilitate entrance to the proposed development site. The removal of vegetation in this area is likely to have a higher impact on local bat populations, as there is extensive mature trees within this boundary. Therefore, minimal removal and additional planting is recommended.

In summary the proposed development will result in the removal of approximately 400m of hedgerow and treeline habitat as well as agricultural grassland. This will impact on commuting and foraging bats and potentially impact on roosting sites within the trees located in the hedgerow and treeline. The impact of this habitat loss is considered to be moderate negative. The bulk of the roadside treeline and southern hedgerow are to be retained.

5.1.1.2 Infrastructure

The construction and operation of infrastructure to support the proposed development (e.g. roads and street lighting etc.) will impact on linear habitats. This will result in the loss of some treelines/hedgerows and as a consequence commuting and foraging habitats. The proposed development will require short sections of linear habitats to be removed or partially removed to make way for the development along with approximately 10 mature trees deemed to have a PBR value. However the provision of the Linear Park along the southern boundary will provide foraging and commuting habitat for local bat populations.

The lighting of infrastructure will also potentially impact on foraging and commuting bats as mentioned above.

5.1.2 Operational Phase

5.1.2.1 Lighting of the general area.

In general, lighting of developments post works (i.e. public street lighting plan) may negatively impact on all bat species in relation to commuting, roosting and foraging potential. But the degree of impact is dependent on how sensitive the particular bat species is to lighting as some bats are tolerant of lighting. It is also dependent on the type of lighting installed and the location of such lighting.

Leisler's bats are tolerant of street lighting. Common pipistrelles and soprano pipistrelles will tolerate low levels of lighting while brown long-eared bats and *Myotis* species (Natterer's bat and Daubenton's bat) are lighting sensitive bat species.

It is important that there is are dark zones between the principal bat foraging and roosting areas to allow safe commuting for local bat populations. This is particularly important in the area that brown long-eared bats from a known maternity roost enter the proposed development site and where bats are foraging and commuting along the southern boundary of the proposed development site. As a consequence there is need for a dark zone around the proposed development site as shown in the aerial photograph below (Figure 10). It is also important that foraging areas are also dark zones. This is to ensure that local bat populations can continue to forage and commuting in the immediate landscape, especially for the local brown long-eared maternity roost.

Figure 10 also illustrate brown long-eared bat commuting routes from the maternity roost in St. Patrick's Church. Individuals cross the public road at three points and it is important reduce public lighting planned, where possible, to allow bats to continue to travel.

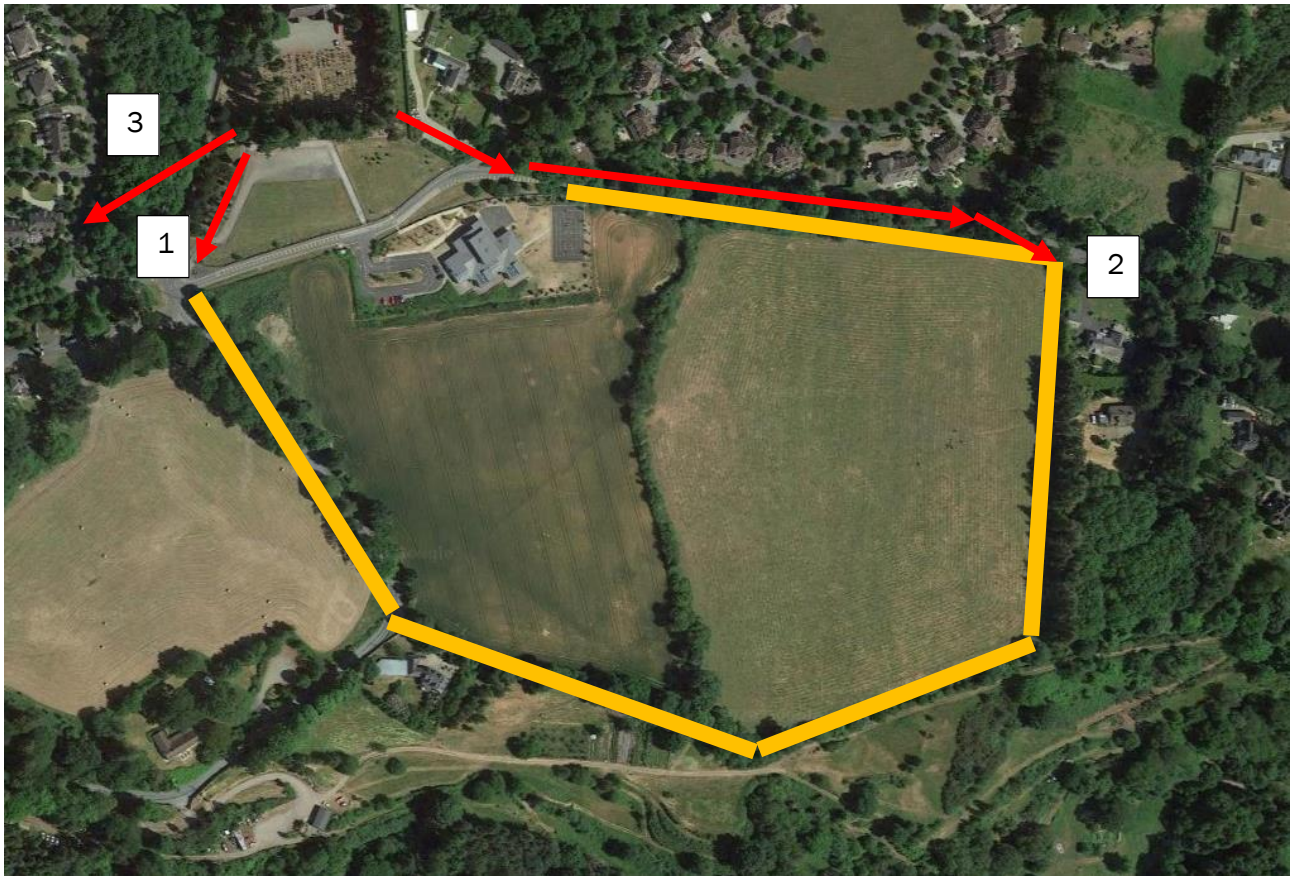


Figure 10: Aerial photograph of survey area indicating important bat commuting dark zones. Red arrows in indicate approximate commuting route used by brown long-eared bats roosting in St. Patrick's Church (Source: Google Maps).

Location 1 (Figure 10) – this location is outside the remit of the proposed developers because public lighting of Cookstown Road and the junction of this road with the R760 is required to meet Health & Safety guidelines. However the proposed public lighting plan has incorporated the BCT lighting guidelines and reduced the column height to 6m. While the luminance levels are too high to allow light sensitive bats to fly across the road in this area , Location 3 (Figure 10) crosses the dark tree canopy along the R760 between St. Patricks Church and Eagle Valley laneways. This will not be impacted by the proposed public lighting scheme. Communication from the lighting specialists (Sabre Electrical Services Ltd) have indicated that a 25% dimming of public street lighting during specific hours of darkness is an operational policy of the local authority .

Location 2 (Figure 10) – this location is adjacent to the proposed development site. Due to the dense treeline between the northern boundary of the proposed development site and Cookstown Cottages, lighting sensitive bat species will be permitted to continue to travel along the treeline and fly across the road at Location 2 to continue to commute along the eastern boundary to foraging areas along the southern boundary and the Dargle River valley.

Where lighting is required (away from the areas described above), it should be designed to reduce its impact local bat populations. Therefore, ensuring that such are directional and that there are buffer zones to reduce light spillage onto the nearby woodlands and treelines will be important.

The Lighting Plan (Section 4.5), will achieve the recommended bat friendly lighting in two areas of the proposed development site: northern-eastern corner and south-eastern corner. However the public street lighting current LUX level is too high to facilitate movement of light sensitive bat species.

a) Operational post-development

The operation of the proposed development site as a residential development with open spaces will increase human usage of the site and as a consequence potential disturbance due to increased noise levels and lighting. However, as the proposed development site is primarily used as a commuting and foraging area for three common bat species, landscaping and lighting controls will reduce this impact. The two additional bat species recorded are considered to be light-sensitive bat species and will be impacted by the operation of the proposed development site. However, the location of the records of these two species were on the external treelines / hedgerows and therefore landscaping and retention of the boundary linear habitats is likely to reduce the impact of the operation of the proposed development on these bat species.

In the absence of mitigation the proposed development is considered to have an overall potential Moderate negative impact on local bat populations

However the public lighting of Cookstown road may have a Moderate Negative impact on the maternity roost located in St. Patrick's Church as a result of preventing this light sensitive bats species commuting across the road at crossing points recorded in the bat surveys. While the high level of treelines and woodland areas in vicinity of St. Patrick's Church will ensure that other commuting routes are available, the general extension of public street lighting needs to be considered in relation to its negative impacts on nocturnal biodiversity.

Table 9: Potential Negative Impact of the proposed development on the different bat species recorded during survey work.

Works	SP	CP	Leis	BLE	Myotis spp.
Lighting of development area - **Reduced foraging** - **Reduced commuting**	Minor to Moderate	Minor to Moderate	Minor	Moderate	Moderate
Removal of linear habitats	Minor to Moderate	Minor to Moderate	Minor to Moderate	Moderate	Moderate
Removal of trees	Minor to Moderate	Minor to Moderate	Minor to Moderate	Moderate	Moderate
Operation of the development site	Minor to Moderate	Minor to Moderate	Minor to Moderate	Moderate	Moderate
Infrastructure	Minor to Moderate	Minor to Moderate	Minor to Moderate	Moderate	Moderate

SP = soprano pipistrelle, CP = common pipistrelle, Leis = Leisler's bat, BLE = brown long-eared bat, Myotis: *Myotis* species (Incl. Natterer's bat etc.).

Without bat mitigation measures, the proposed development will have an overall Moderate negative impact on local bat populations (Table 9). According to Tables 2a and b (Section 1.2.1) the following is the assessment:

- Roost disturbance of maternity roost adjacent to proposed development site effects are assessed as **Permanent Moderate Negative Effects.**
- Habitat loss (potential roosting/foraging/ commuting habitat) effects on all bat species are assessed as **Permanent Slight to Moderate Negative Effects**.
- Roost loss of PBRs on all bat species are assessed a **Permanent Slight Negative Effects.**
- Disturbance and/or displacement effects on all bat species during the construction phase are assessed as **Short-term Slight to Moderate Negative Effect**

5.2 Cumulative Impacts of Additional Planning Applications

Two additional permitted developments are located adjacent to this proposed development. The bat survey results highlight the importance of treelines for commuting and foraging bat populations, particularly brown long-eared bats. The likely cumulative impacts on bats arising from the proposed SHD in cumulation with the two adjacent developments are likely to be in relation to further loss of commuting and foraging habitat during construction phase and increase lighting during operational phase.

The negative impacts include increased urbanisation may impact on local bat populations, particularly, brown long-eared bat colony in St. Patrick's Church. The cumulative impacts during construction are in relation to potential removal of tall vegetation removal along boundary treelines and hedgerows. The cumulative impacts during operation are in relation to outdoor street lighting that may further reduce dark zones for commuting and foraging light sensitive bat species. The impacts are assessed to likely be **Permanent Moderate Negative Effects.**

5.3 Mitigation Measures

The following mitigation measures are recommended to reduce the potential negative impact of the proposed development on local bat populations.

5.3.1 Protection of bat roosts in buildings

The proposed development is located adjacent to a known brown long-eared maternity roost. Therefore it is important that proposed works do not impact on this bat population. Measures to reduce impact will relate to proposed lighting and landscaping plans.

5.3.2 Lighting plan – Proposed Development

Nocturnal mammals are impacted by lighting. Therefore it is important that lighting installed within the proposed development site is completed with sensitivity for local wildlife while still providing the necessary lighting for human usage. The principal areas of concern are the treelines/hedgerows remaining within the proposed development area, greenway, woodlands, roosting areas (buildings and bat boxes) and treelined avenues. The following principles will be followed especially in relation to the general residential area and will also be implemented for the greenway and the active open area:

- Artificial lights shining on bat roosts, their access points and the flight paths away from the roost **must always be avoided**. This includes alternative roosting sites such as bat boxes. This is important in relation to the brown long-eared maternity roost in St. Patrick's Church.

- Lighting design should be flexible and be able to fully take into account the presence of protected species. Therefore, appropriate lighting should be used within a proposed development and adjacent areas with more sensitive lighting regimes deployed in wildlife sensitive areas.

- Dark buffer zones can be used as a good way to separate habitats or features from lighting by forming a dark perimeter around them. This should be used for habitat features noted as foraging areas for bats.

- Buffer zones can be used to protect Dark buffer zones and rely on ensuring light levels (levels of illuminance measured in lux) within a certain distance of a feature do not exceed certain defined limits. The buffer zone can be further subdivided in to zones of increasing illuminance limit radiating away from the feature or habitat that requires to be protected.

- Luminaire design is extremely important to achieve an appropriate lighting regime. Luminaires come in a myriad of different styles, applications and specifications which a lighting professional can help to select. The following should be considered when choosing luminaires. This is taken from the most recent BCT Lighting Guidelines (BCT, 2018).

    - All luminaires used will lack UV/IR elements to reduce impact.
    - LED luminaires will be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability.
    - A warm white spectrum (<2700 Kelvins will be used to reduce the blue light component of the LED spectrum).
    - Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.

- Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible. Ballard lighting should be considered for pedestrian and greenway areas, if deemed necessary.
- Only luminaires with an upward light ratio of 0% and with good optical control will be used.
- Luminaires will be mounted on the horizontal, i.e. no upward tilt.
- Any external security lighting will be set on motion-sensors and short (1min) timers.
- As a last resort, accessories such as baffles, hoods or louvres will be used to reduce light spill and direct it only to where it is needed.

Planting of screening will also be effectively used to prevent lighting spillage areas where bat foraging is recorded. In particular, lighting will not shine onto important commuting and foraging areas identified for local bat populations. Specific areas that need to be dark zones include crossing point No. 2 (Figure 10), the proposed Linear Parkland (southern boundary) and north-eastern corner of the proposed development site (See Section 4.5).

5.3.3 Landscaping plan

It is important to ensure that as much treelines / hedgerows are retained within the survey area, particularly on the boundary and in connection with the woodlands along the southern boundary.

In general, the following will also be followed:

- Any semi-natural habitats will be protected from potential damage construction phase and post-construction.
- The use of chemicals (weed killers, *etc*.) will be kept to a minimum within the development zone and will not be used in boundaries.

5.3.4 Removal of trees

a) Minimise the removal of mature trees, where possible.

b) Approximately 10 trees, deemed as PBRs, are proposed to be removed. If the trees are to be removed, planting will be undertaken to mitigate for tree removal and landscaping plans will planted “like for like” in relation to tree and shrub species removed. Consideration will be given towards hawthorn, blackthorn mix with individual ash, alder and birch to form a native tree hedge) and deciduous trees (native tree species include ash, oak, alder, birch).

c) A 2nd assessment of the trees proposed to be removed will be undertaken prior to tree removal to determine total number of trees to be felled and the tree felling procedure to be undertaken. This will be undertaken in consultation with the tree surgeons.

Where possible, trees, which are to be removed, should be felled on mild days during the autumn months of September, October or November or Spring months of February and March (felling during the spring or autumn months avoids the periods when the bats are most active).

An assessment of trees according to their PBR value determines the methodology of felling. Trees with PBR Category 1 are highly suitable for roosting bats and require more intensive procedures prior to felling. The trees identified within the survey area are PBR Category 1 and 2. The procedure to fell these is as follows:

- Category 1: Trees with roosting features (dead wood, tree holes etc.) should be checked prior to felling. It is recommended that they are physically checked (using an endoscope and high power torch) or a dusk/dawn surveys are completed to determine if bats are roosting within. A tree felling plan will be required in consultation with the tree surgeons. A bat box scheme will need to be erected prior to felling and in consultation with the bat specialist. Any trees showing crevices, hollows, *etc*., should be removed while a bat specialist is present to deal with any bats found. Such animals should be retained in a box until dusk and released on-site. Large mature trees will be felled carefully, essentially by gradual dismantling by tree surgeons, under supervision of a bat specialist. Care will be taken when removing branches as removal of loads may cause cracks or crevices to close, crushing any animals within.
- Category 2: Any ivy covered trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape.
- A bat box scheme is required to be erected prior to any tree felling. The number of bat boxes will be determined by the category and number of trees proposed to be felled. In principle this will follow the following:

  For every Category 1 trees to be felled – one bat box is required
  For every three Category 2 trees to be felled – one bat box is required

A minimum of 5 IFF Schwegler Woodcrete bats boxes (or equivalent flat open ended bat box) will be erected prior to tree felling to mitigate for tree felling. These will be erected within the Linear Park under supervision by the bat specialist.

Bat boxes scheme will be provided and to ensure that bats use the bat boxes, they will be sited carefully and this will be undertaken by a bat specialist. Bat boxes will be erected prior to tree felling. Some general points that will be follow include:

- Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 3 metres above and below position of bat box.
- Diameter of tree should be wide and strong enough to hold the required number of boxes.
- Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations should be sheltered from prevailing winds.
- Bat boxes should be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of resident bats.
- It is recommended to erect a number of bat boxes on one tree at an array of aspects. South facing boxes will receive the warmth of the sun, which is necessary for maternity colonies. In large bat box scheme it is generally recommended to have three bat boxes arranged at the same height facing North, South-East and South-West. This ensures a range of temperatures are available all day. If the South facing boxes become warm, bats can safely remove to the cooler North facing box.
- Locations for bat boxes should be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes.

5.3.5 Construction Phase

During the construction phase the following will be undertaken:

- All construction lighting will be turned off each evening and at the weekend once day-time works are completed.
- All mature trees and habitats should be protection from construction works throughout the construction period.
- Bat mitigation measures implemented during construction (e.g. erection of bat boxes) will be protected during construction works.

5.3.6 Monitoring

Monitoring is recommended post-construction works. This monitoring should involve the following aspects:

- Inspection of bat boxes within one year of erection of bat box scheme/rocket box. Register bat box scheme with Bat Conservation Ireland. This should be undertaken for a minimum of 2 years.
- Monitoring of any bat mitigation measures. All mitigation measures should be checked to determine that they were successful. A full summer bat survey is recommended post-works. This is especially important in relation to lighting plans and its potential impact on the brown long-eared bat colony in St. Patrick's Church.
- Specific monitoring should be undertaken in relation to bats crossing the public street lighting zones and commuting along woodland, treelines and hedgerows in vicinity of the proposed development, adjacent lands and St. Patrick's Church. This should involve the following:
    - Static detectors should be erected at specific bat crossing locations (at least 3 locations) and public street lighting zones (at least 3 locations) and set to record for 10 nights. This should be undertaken during the prime bat activity season (months of May to August) during mild weather conditions.
    - LUX levels should be recorded during the hours of darkness (e.g. 00:00 hrs) and record LUX level directly below luminaire and/or bat crossing point where the static unit is erected. LUX levels should also be taken at 1m, 5m, 10m and 20m intervals. LUX levels should be taken a 1m height.
    - Dusk & Dawn Surveys at static locations should be undertaken for 120 minutes (as per Dusk & Dawn Surveys methodology).

5.4 Potential Impacts with Mitigation Measures Implemented

If the mitigation measures recommended in this report are strictly followed the potential residual impact of the proposed development (other than the public lighting along Cookstown Road) on local bat populations will be reduced to Minor-Moderate in relation to lighting sensitive bat species and Minor-Moderate, overall, for all other bat species.

- Roost disturbance of maternity roost adjacent to proposed development site effects are assessed as **Permanent Minor-Moderate Negative Effects.**
- Habitat loss (potential roosting/foraging/ commuting habitat) effects on all bat species are assessed as **Permanent Slight to Moderate Negative Effects**.
- Roost loss of PBRs on all bat species are assessed a **Permanent Slight Negative Effects.**
- Disturbance and/or displacement effects on all bat species during the construction phase are assessed as **Short-term Slight to Moderate Negative Effect**

Table 10: Potential residual impact of the proposed development on the different bat species recorded during survey work if mitigation measures are strictly implemented.

Works	SP	CP	Leis	BLE	Myotis spp.
Lighting of development area (excluding public lighting for Cookstown Road) - **Reduced foraging** - **Reduced commuting**	Minor	Minor	Minor	Minor-Moderate	Minor-Moderate
Removal of linear habitats	Minor to Moderate	Minor to Moderate	Minor	Minor-Moderate	Minor-Moderate
Removal of trees	Minor	Minor	Minor	Minor-Moderate	Minor-Moderate
Operation of the development site	Minor to Moderate	Minor to Moderate	Minor to Moderate	Minor to Moderate	Minor to Moderate
Infrastructure	Minor	Minor	Minor	Minor-Moderate	Minor-Moderate

SP = soprano pipistrelle, CP = common pipistrelle, Leis = Leisler's bat, BLE = brown long-eared bat, Myotis: *Myotis* species (Incl. Natterer's bat etc.).

5.4.1 Public Lighting of Cookstown Road

The proposed public lighting along Cookstown Road at the junction of R760 and adjacent to the primary school has been designed, as far as possible (e.g. reduced column height) to reduce the potential impact on commuting brown long-eared bats.

The potential impacting arising from the public lighting along the Cookstown Road on local bat populations is considered to be Permanent Moderate Negative effect in relation to light sensitive bat specie and Permanent Minor-Moderate Negative effect, overall, for all other bat species.

The operation of the public lighting along Cookstown Road is beyond the control of the Applicant and it is recommended that the following is considered by Wicklow County Council in order to further

reduce the potential impacts of public lighting along Cookstown Road on local bat populations described above, particularly the brown long-eared bat colony in St. Patrick's Church.

The LUX level for the public lighting will be too high and will act as a barrier for brown long-eared bats roosting in St. Patrick's Church commuting south towards the proposed development site at Location 1 (Figure 10). It is essential that LUX levels are reduced at certain sections of the public road (e.g. Figure 10 – Point 1) to allow bats to cross the road to connecting linear habitats (e.g. Figure 9c for a 25m zone). Wicklow Co. Co. has a policy to dim public lighting by 25% between the hours of 00:00 – 06:00 as standard practice (pers. comm. Sabre Electrical Services Ltd.). It is recommended that consideration be given to greater dimming (50%) for specific seasonal periods and greater number of hours during the - e.g. 11pm to 6am during the maternity season (May to August). Please note that in the height of the summer (May and June), dusk is approximately 11pm and dawn is approximately 3.30 am. Low lighting levels during the lactation period for brown long-eared bats is essential to allow females to emerge and forage before returning to suckle young.

(Please Note: lactation period is for approximately 8 weeks once pups are born. Bats only give birth to one pup, generally from May to mid-June. The pup is suckled exclusively on their mother's milk for approximately 8 weeks before reaching adult size. Female brown long-eared bats emerged approximately 30 minutes after sunset (during good weather conditions) to feed for approximately 1 hour within a 1.5km radius of the maternity roost before returning to suckle young. They will emerge again to feed further before returning to suckle and continue with this feeding pattern during the hours of darkness. This nightly pattern tends to be followed during the lactation period.)

6. Survey Conclusions

Six species of bat was recorded during these bat surveys: common pipistrelle, Leisler's bat, brown long-eared bat, Natterer's bat, Daubenton's bat and soprano pipistrelle. A high level of bat activity was recorded for common and soprano pipistrelles while lower levels of bat activity was recorded for the remainder four bat species.

Individual brown long-eared bats from a known maternity roost were recorded commuting to the proposed development site and foraging along the external boundary treelines.

All bat species recorded during this Bat Survey are Annex IV species under the EU Habitats Directive and all have a Favourable Status in Ireland. In relation to the bat evidence collected by this report, it is deemed, according to Table 2, that the bat populations recorded within the survey area are of Local Importance.

In the absence of mitigation the proposed development is considered to have an overall potential Moderate negative impact on local bat populations, primarily due to the public lighting scheme and removal of trees and linear habitats on bat species such as brown long-eared bats.

The presence of bats was given consideration at the design phases of the proposed development.

It is likely that 10 trees deemed as Potential Bat Roosts (PBRs) will be removed as a result of the proposed development. A minimum of 5 IFF Schwegler Woodcrete bats boxes (or equivalent flat open ended bat box) will be erected prior to tree felling to mitigate for tree felling. Felling will also be undertaken with due care for local bat populations.

Extensive lighting plans have been incorporated in the proposed development to reduce the potential impact of public lighting of the proposed development on local bat populations.

Landscaping measures will result in the development of the southern boundary as a Linear Parkland which will provide foraging areas for local bat populations. However, consideration is needed to ensure that external boundaries of the proposed development site (eastern and northern boundary) and boundary of the adjacent field is retained and enhanced to ensure that there is commuting routes to the park.

If the mitigation measures recommended in this report are strictly followed the potential impact of the proposed development, other than the public lighting along Cookstown Road on local bat populations will be reduced to Permanent Minor-Moderate in relation to light sensitive bat species and Minor-Moderate, overall, for all other bat species. The potential impacting of public lighting along the Cookstown Road on local bat populations is considered to be Permanent Moderate Negative effect in relation to light sensitive bat specie and Permanent Minor-Moderate Negative effect, overall, for all other bat species (for the avoidance of doubt, the dimming recommendations for the consideration of Wicklow County Council have not been considered in reaching this conclusion).

Overall, the potential impacts arising from the proposed development, in cumulation with the two adjacent developments, are considered to be a Permanent Moderate Negative effect, in relation to light sensitive bat species and Minor-Moderate Negative effect, overall, for all other bat species.

Monitoring is recommended, particularly in relation to the brown long-eared roost in St. Patrick's Church and potential impact from lighting along the public road and recommended monitoring measures are described in Section 5.3.6.

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8. Appendices

8.1 Bat Habitat & Commuting Route Classifications

Table 1.A: Hedgerow Category (Bat Conservation Ireland, 2015)

Type of Hedgerow / Treeline	Code	Description / Bat Potential
Small Hedgerow	**SH**	Hedgerow is less than approximately 1.5 m high, there are no, or very few, protruding bushes or trees. This type of hedgerow would provide little shelter to bats. 
Medium Hedgerow	**MH**	Hedgerow is approximately 1.5 to 3 m high. This type of hedgerow will provide foraging and commuting potential for bats. 
Sparse Treeline Hedgerow	**ST**	Hedgerow, low or medium in height, with individuals trees (where tree canopies, for the most part, do not touch).

		
Dense Treeline Hedgerow	**DT**	Large uncut hedgerows or treelines, dominated by mainly large tree or very tall scrub species (e.g. tall hawthorn, blackthorn or hazel), where the canopies are mostly touching. 

Table 1.B: Habitat Classification (Bat Conservation Ireland, 2015, based on Fossit, 2000)

Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land		Brackish waters		Caves		Grasslands	
Coastal structures		Springs		Freshwater marsh		Scrub	
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	
Sea cliffs/islets		Disturbed ground		Heath		Conifer plantation	
Sand dunes		Watercourse		Bog		Woodland	

8.2 Static Surveillance Results

2017 Static Surveillance Results

Cp = common pipistrelle, SP = soprano pipistrelle, Leis = Leisler's bat, BLE = brown long-eared bat & *Myotis* = *Myotis* spp.

Table 1: Songmeter 2 Unit 4

Time (hrs)	Leis	SP	CP
20:00-21:00	5 passes	89 passes	21 passes
21:00-22:00	1 pass	6 passes	3 passes
22:00-23:00	2 passes	1 pass	0 passes
23:00-00:00	3 passes	0 passes	1 pass
00:00-01:00	0 passes	0 passes	0 passes
02:00-03:00	0 passes	0 passes	0 passes
03:00-04:00	0 passes	0 passes	0 passes
04:00-05:00	0 passes	0 passes	0 passes
05:00-06:00	0 passes	0 passes	0 passes

Table 2: Songmeter 2 unit 2

Time (hrs)	Leis	SP	CP	BLE
20:00-21:00	1 pass	2 passes	2 passes	0 passes
21:00-22:00	1 pass	6 passes	1 pass	1 pass
22:00-23:00	2 passes	1 pass	2 passes	0 passes
23:00-00:00	3 passes	0 passes	1 pass	1 pass
00:00-01:00	0 passes	0 passes	0 passes	0 passes
02:00-03:00	0 passes	0 passes	0 passes	0 passes
03:00-04:00	0 passes	0 passes	0 passes	0 passes
04:00-05:00	0 passes	0 passes	0 passes	0 passes
05:00-06:00	0 passes	0 passes	0 passes	0 passes

Table 3: Songmeter 2 Unit 3

Time (hrs)	Leis	SP	CP	BLE
20:00-21:00	0 passes	8 passes	11 passes	1 pass
21:00-22:00	0 passes	5 passes	10 passes	0 passes
22:00-23:00	2 passes	1 pass	2 passes	1 pass
23:00-00:00	3 passes	0 passes	1 pass	1 pass
00:00-01:00	0 passes	0 passes	2 passes	0 passes
02:00-03:00	0 passes	2 passes	0 passes	0 passes
03:00-04:00	0 passes	0 passes	0 passes	0 passes
04:00-05:00	0 passes	0 passes	0 passes	0 passes
05:00-06:00	0 passes	1 pass	1 pass	0 passes

2019 Static Surveillance Results

Table 4: Songmeter 4 Unit 2

Date	Night	Time	CP	SP	Leis	BLE	My
24/08/2019	1	20:00	12	10	6	0	0
24/08/2019	1	21:00	28	2	0	0	7
24/08/2019	1	22:00	33	8	0	1	4
25/08/2019	1	23:00	12	9	0	0	7
27/08/2019	1	00:00	19	12	0	3	0
27/08/2019	1	01:00	15	5	0	4	2
27/08/2019	1	02:00	22	4	0	0	1
27/08/2019	1	03:00	2	0	2	2	3
27/08/2019	1	04:00	3	0	0	1	4
27/08/2019	1	05:00	31	1	8	0	0

Table 5: Songmeter 4 Unit 3

Date	Night	Time	CP	SP	Leis	BLE	My
24/08/2019	1	20:00	23	37	3	0	0
24/08/2019	1	21:00	141	151	4	1	1
24/08/2019	1	22:00	85	107	3	0	0
25/08/2019	1	23:00	75	126	6	0	0
27/08/2019	1	00:00	125	202	0	0	0
27/08/2019	1	01:00	19	154	1	1	1
27/08/2019	1	02:00	4	85	0	0	0
27/08/2019	1	03:00	17	80	1	0	0
27/08/2019	1	04:00	13	87	0	0	0
27/08/2019	1	05:00	107	145	3	0	3
27/08/2019	2	20:00	64	69	13	0	0
27/08/2019	2	21:00	179	108	13	0	2
27/08/2019	2	22:00	177	113	3	0	0
27/08/2019	2	23:00	192	147	1	0	0
28/08/2019	2	00:00	196	104	1	0	4
28/08/2019	2	01:00	157	177	11	0	0
28/08/2019	2	02:00	164	200	10	0	0
28/08/2019	2	03:00	148	149	9	0	3
28/08/2019	2	04:00	205	167	9	0	3
28/08/2019	2	05:00	149	198	6	0	2
28/08/2019	3	20:00	48	36	4	0	0
28/08/2019	3	21:00	59	49	1	0	1
28/08/2019	3	22:00	18	36	6	0	0
28/08/2019	3	23:00	8	35	6	0	0
29/08/2019	3	00:00	40	57	5	0	0
29/08/2019	3	01:00	61	207	5	0	0
29/08/2019	3	02:00	17	197	4	0	0
29/08/2019	3	03:00	29	100	0	0	0

29/08/2019	3	04:00	36	113	1	0	0
29/08/2019	3	05:00	40	108	6	0	1

Table 6: Songmeter 4 Unit 4

Date	Night	Time	CP	SP	Leis	BLE	My
24/08/2019	1	20:00	0	15	0	0	0
24/08/2019	1	21:00	8	64	0	0	0
24/08/2019	1	22:00	0	0	0	0	0
25/08/2019	1	23:00	0	0	0	0	0
27/08/2019	1	00:00	1	0	0	0	0
27/08/2019	1	01:00	0	0	0	0	0
27/08/2019	1	02:00	0	0	0	0	0
27/08/2019	1	03:00	0	0	0	0	0
27/08/2019	1	04:00	0	0	0	0	0
27/08/2019	1	05:00	0	11	0	0	0
27/08/2019	2	20:00	0	40	0	0	0
27/08/2019	2	21:00	3	20	0	0	0
27/08/2019	2	22:00	1	1	0	0	0
27/08/2019	2	23:00	0	1	0	0	0
28/08/2019	2	00:00	2	1	0	0	0
28/08/2019	2	01:00	1	0	0	0	0
28/08/2019	2	02:00	2	1	0	0	0
28/08/2019	2	03:00	0	1	0	0	0
28/08/2019	2	04:00	0	1	0	0	0
28/08/2019	2	05:00	0	7	0	0	0
28/08/2019	3	20:00	4	15	0	0	0
28/08/2019	3	21:00	4	7	0	0	0
28/08/2019	3	22:00	1	0	0	0	0
28/08/2019	3	23:00	0	7	0	0	0
29/08/2019	3	00:00	16	12	0	0	0
29/08/2019	3	01:00	0	1	0	0	0
29/08/2019	3	02:00	0	0	0	0	0
29/08/2019	3	03:00	0	0	0	0	0
29/08/2019	3	04:00	0	0	0	0	0
29/08/2019	3	05:00	24	33	0	0	2

Table 7: Songmeter 4 Unit 5

Date	Night	Time	CP	SP	Leis	BLE	My
24/08/2019	1	20:00	35	20	4	0	0
24/08/2019	1	21:00	134	5	7	0	0
24/08/2019	1	22:00	8	5	4	0	0
25/08/2019	1	23:00	22	8	1	0	0
27/08/2019	1	00:00	39	3	3	0	0
27/08/2019	1	01:00	18	5	2	0	0

27/08/2019	1	02:00	23	5	1	0	0
27/08/2019	1	03:00	3	3	2	0	0
27/08/2019	1	04:00	0	1	0	0	0
27/08/2019	1	05:00	36	7	11	0	0
27/08/2019	2	20:00	57	21	5	0	0
27/08/2019	2	21:00	16	9	7	0	0
27/08/2019	2	22:00	7	3	2	0	0
27/08/2019	2	23:00	10	8	2	0	0
28/08/2019	2	00:00	5	0	0	0	0
28/08/2019	2	01:00	0	0	0	0	0
28/08/2019	2	02:00	0	0	0	0	0
28/08/2019	2	03:00	0	0	0	0	0
28/08/2019	2	04:00	0	0	0	0	0
28/08/2019	2	05:00	0	0	0	0	0

Table 8: 2020 Mini Bat Static Unit Results

Date	SP	CP	Leis	Myotis	Daub	BLE
23/05/2020	114	142	9	8	11	0
24/05/2020	112	36	10	0	0	0
25/05/2020	47	63	40	0	0	1
Mini 9	**273**	**241**	**59**	**6**	**11**	**1**

Date	SP	CP	Leis	Myotis	Daub	BLE
23/05/2020	138	46	96	7	2	1
24/05/2020	192	32	107	0	0	1
25/05/2020	0	0	0	0	0	0
Mini 10	**330**	**78**	**203**	**7**	**2**	**2**

8.3 Brown Long-eared Bat Roost Count

Table 8: Brown long-eared bat counts for St. Patrick's Church of Ireland (Source: Bat Conservation Ireland, Irish Bat Monitoring Programme).

Site Code	Survey Date	No. of Bats	Type of Survey
2125	30/05/2013	21	External (emergence survey)
2125	26/06/2013	19	External (emergence survey)
2125	16/08/2013	28	External (emergence survey)
2125	15/06/2014	22	External (emergence survey)
2125	18/07/2014	43	External (emergence survey)
2125	13/08/2014	25	External (emergence survey)
2125	11/06/2015	25	External (emergence survey)
2125	25/07/2015	42	External (emergence survey)
2125	31/08/2015	29	External (emergence survey)
2125	31/05/2016	23	External (emergence survey)
2125	27/07/2016	19	External (emergence survey)
2125	30/08/2016	21	External (emergence survey)
2125	25/05/2017	17	External (emergence survey)
2125	26/07/2017	17	External (emergence survey)
2125	31/08/2017	25	External (emergence survey)
2125	11/06/2018	9	External (emergence survey)
2125	04/07/2018	31	External (emergence survey)
2125	29/08/2018	28	External (emergence survey)
2125	27/05/2019	13	External (emergence survey)
2125	09/07/2019	24	External (emergence survey)
2125	26/08/2019	23	External (emergence survey)
2125	020/6/2020	24	External (emergence survey)
2125	04/07/2020	12	External (emergence survey)
2125	28/08/2020	33	External (emergence survey)

Bat Conservation Ireland reports annually on the Irish Bat Monitoring Programme. The above figures are used to determine the population trends for brown long-eared bats in Ireland. This roost is part of 40+ roosts counted annually for the Brown Long-eared Bat Roost Scheme. This programme is funded by NPWS.

8.4 Species Profiles

Leisler's bat

This species was recorded primarily commuting through the survey area from the north to south direction during dusk surveys. Ireland's population is deemed of international importance and it is considered to be widespread across the island. The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820 km2). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.,* 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km. In addition, of all Irish bat species, Leisler's bats have the most specific roosting requirements. It tends to select roosting habitat with areas of woodland and freshwater.

Irish Status	**Near Threatened**
European Status	Least Concern
Global Status	Least Concern
Estimated Irish Population Size	73,000 to 130,000 (2007-2013) Ireland is considered the world stronghold for this species
Irish Population Trend	2003-2013 ↑
Estimate Core Area (km2) (Lundy *et al. 2011)*	52,820

Taken from *Roche et al., 2014*

The principal concerns for Leisler's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Tree felling
- Increasing urbanisation

Brown long-eared bat

This species was only encountered once during the walking transects (south-east of the survey area). This species is generally considered to be widespread across the island. The modelled Core Area for brown long-eared bats is a relatively large area that covers much of the island of Ireland (52,820 km^2) with preference suitable areas in the southern half of the island. The Bat Conservation Ireland Irish Landscape Model indicated that the brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5 km emphasising the importance of local landscape features for this species (Roche *et al.,* 2014).

Irish Status	**Least Concern**
European Status	Least Concern
Global Status	Least Concern
Estimated Irish Population Size	64,000 to 115,000 (2007-2012)
Irish Population Trend	2008-2013 Stable
Estimate Core Area (km^2) (Lundy *et al. 2011)*	49,929

Taken from *Roche et al., 2014*

Principal concerns for brown long-eared bats are poorly known in Ireland, but those that are relevant for this survey area are as follows:

- Loss of woodland, scrub and hedgerows
- Tree surgery and felling
- Increasing urbanisation
- Light pollution

Daubenton's bat

This species was recorded along a treeline/hedgerow within the survey area but outside the proposed development site. The modelled Core Area for Daubenton's bats is a relatively large area that covers much of the island of Ireland (41,285 km2) reflecting the distribution of sizeable river catchments. The Irish Landscape Model indicated that the Daubenton's bat habitat preference is for areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.,* 2014).

Irish Status	**Least Concern**
European Status	Least Concern
Global Status	Least Concern
Estimated Irish Population Size	81,000 to 103,000 (2007-2012)
Irish Population Trend	2008-2013 Stable
Estimate Core Area (km2) (Lundy *et al. 2011)*	41,285

Taken from *Roche et al., 2014*

Principal concerns for Daubenton's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Loss of woodland, scrub and hedgerows
- Tree surgery and felling
- Increasing urbanisation
- Light pollution

Common pipistrelle

This species was the most recorded species within the survey area and it generally considered to be the most common bat species in Ireland. The species is widespread and is found in all provinces. The modelled Core Area for common pipistrelles is a large area that covers much of the island of Ireland (56,485 km2) which covers primarily the east and south east of the area (Roche *et al.,* 2014). The Bat Conservation Ireland Irish Landscape Model indicated that the common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.,* 2014).

Irish Status	**Least Concern**
European Status	Least Concern
Global Status	Least Concern
Estimated Irish Population Size	1.2 to 2.8 million (2007-2012)
Irish Population Trend	2003-2013 ↑
Estimate Core Area (km2) (Lundy *et al. 2011)*	56,485

Taken from *Roche et al., 2014*

Principal concerns for common pipistrelles in Ireland that are relevant for this survey area are as follows:

- Renovation or demolition of derelict buildings.
- Tree felling
- Increasing urbanisation (e.g. increase in lighting)

Soprano pipistrelle

This species was the second most recorded species within the survey area and it generally considered to be the second most common bat species in Ireland. The species is widespread and is found in all provinces, with particular concentration along the western seaboard. The modelled Core Area for soprano pipistrelle is a large area that covers much of the island of Ireland (62,020 km2). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Estimated Irish Population Size	0.54 to 1.2 million (2007-2012)
Irish Population Trend	2003-2013 ↑
Estimate Core Area (km2) (Lundy *et al. 2011)*	62,020

(Taken from Roche *et al.,* 2014)

Natterer's bat

This species was encountered frequently roosting in the buildings and foraging along the avenues and treelines. However, *Myotis* species echolocation calls were regularly recorded on the static units, many of which are likely to be this species, especially in relation to the static units located away from waterbodies. The modelled Core Area for Natterer's bats is a relatively large area that covers much of the island of Ireland (52,864km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.,* 2014). Therefore, it is likely that this species is more widespread within the survey area.

Irish Status	**Least Concern**
European Status	Least Concern
Global Status	Least Concern
Estimated Irish Population Size	Unknown
Irish Population Trend	Unknown
Estimate Core Area (km^2) (Lundy *et al. 2011)*	52,864

Taken from *Roche et al., 2014*

Principal concerns for Natterer's bats in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements;
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore careful site specific planning for this species is required in order to ensure all elements are maintained;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).