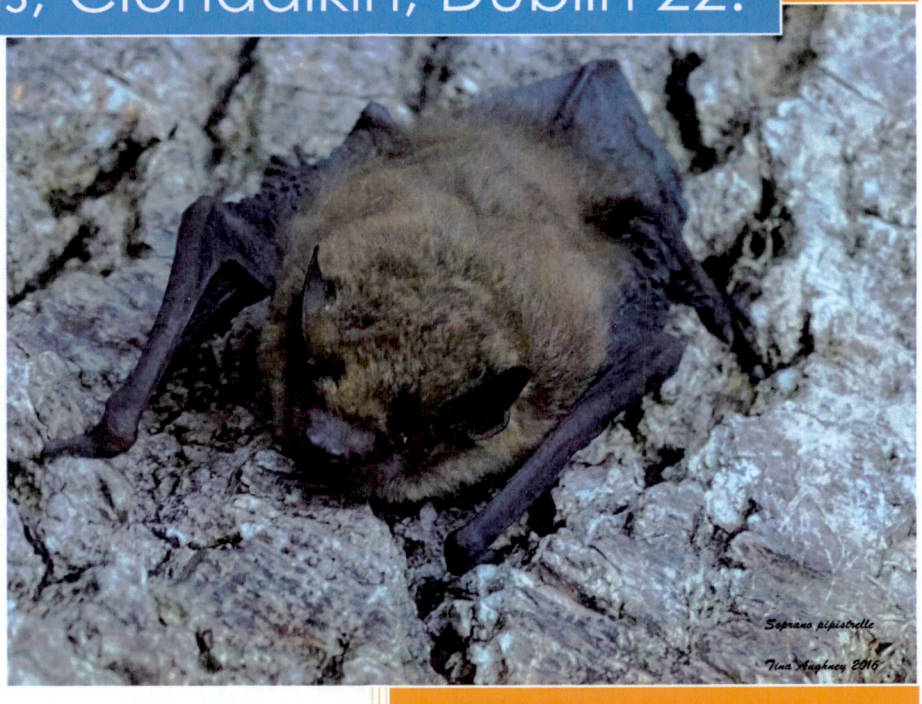
2022

# Bat Assessment: Clonburris T3, Clonburris, Clondalkin, Dublin 22.




Dr Tina Aughney
Bat Eco Services

Bat Eco Services, Ulex House, Drumheel, Lisduff, Virginia, Co. Cavan. A82 XW62.

***Licenced Bat Specialist:*** Dr Tina Aughney (tina@batecoservices.com, 086 4049468)
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 (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.

Mr. Shaun Boyle (Field Assistant) NPWS licence DER/BAT 2021-19 (Survey licence, expires 15th March 2022).

**Client:** Cairn Homes. Cairn Homes.

**Project Name & Location:** Clonburris, Clondalkin, Dublin 22

## Report Revision History

| Date of Issue | Draft Number | Issued To (process of issuing) |
|---|---|---|
| 19th October 2022 | Draft 1 | By email to CAIRNS |
| 15th November 2022 | Draft 2 | By email to CAIRNS |
| 22nd November 2022 | Draft 3 | By email to CAIRNS |
| 28th November 2022 | Final | By email to CAIRNS |

## 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:** Clonburris T3

**Proposed work:** 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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**Citation: Bat Eco Services (2022) Bat Assessment: Clonburris T3, Clondalkin, Dublin 22. Unpublished report prepared for Cairn Homes.**

Maps produced using OpenSourceMap on QGIS.

## Contents

# 1. Introduction

Bat Eco Services was commissioned by Cairns Homes to undertake a bat survey of lands under Cairn Homes ownership known as Clonburris, Clondalkin, Dublin 22. The proposed development site under the current planning application is a smaller section within this area. T3 is a proposed development on a site of c.3.45 hectares in the Clonburris South-West Development Area of the Clonburris Strategic Development Zone (SDZ)

## 1.1 Relevant Legislation & Bat Species Status in Ireland

### *1.1.1 Irish Statutory Provisions*

A small number of animals and plants are protected under Irish legislation (Nelson, *et al.,* 2019). The principal statutory provisions for the protection of animal and plant species are under the Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. 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 legislative instruments which are transposed into Irish law, *inter alia,* by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) ('the 2011' Regulations), 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.

Article 12 of the Habitats Directive requires Member States to take measures for the establishment of a strict protection regime for animal species listed in Annex IV(a) of the Habitats Directive within

the whole territory of Member States. Article 16 provides for derogation from these provisions under defined conditions. These provisions are implemented under Regulations 51 and 54 of the 2011 Regulations.

### *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 EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), 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 an offence. The most recent guidance document is "Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final".

Regulation 51(2) of the 2011 Regulations provides –

("*(2) Notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a licence granted by the Minister under Regulation 54, a person who in respect of the species referred to in Part 1 of the First Schedule—*

*(a) deliberately captures or kills any specimen of these species in the wild, (b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,*

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

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

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

shall be guilty of an offence."

The grant of planning permission does not permit the commission of any of the above acts or render the requirement for a derogation licence unnecessary in respect of any of those acts.

Any works interfering with bats and especially their roosts, may only be carried out under a derogation licence granted by National Parks and Wildlife Service (NPWS) pursuant to Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law).

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. 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 is presented in Table 1 along with their current status.

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

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (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.
- Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland (Version 1: Kelleher & Marnell, 2006).
- 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.
- Bat Conservation Trust (2018) Bats and artificial lighting in the UK: bats and the built environment series. Guidance Note 08/2019. BCT, London.
- Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final.
- EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Collins (2016) is the principal document used to provide guidance in relation to bat survey effort required but the level of surveying is assessed on a case-by-case basis taking into consideration the historical bat records for the survey area, presence of built, structures and trees potentially suitable for roosting bats and the presence of suitable bat habitats for foraging and commuting. Additional reference is made to this document in relation to determining the value of buildings, trees etc. as bat roosts. The tables referred to from this document are described in the following section and in the section on methodology.

Marnell *et al.* (2022) is referred to for guidance in relation to survey guidance (timing and survey design), derogation licences and mitigation measures.

### *1.2.1 Bat Survey Requirements & Timing*

With reference to Collins (2016) and Marnell *et al.* (2022), the information presented in this section is used to determine the bat survey requirements for the proposed development site. Collins (2016) provides a trigger list in relation to determining if a bat survey is required and this is presented Appendix 3 (Figure B) for reference. In addition, Chapter 2 of Collins (2016) discusses that a bat survey is required when proposed activities are likely to impact on bats and their habitats. The level of surveying is to be determined by the ecologist and these are influenced by the following criteria:

- Likelihood of bats being present;
- Type of proposed activities;
- Scale of proposed activities;
- Size, nature and complexity of the site;
- Species concerned;
- No. of individuals.

Collins (2016) also provides the following table detailing when different survey components should be undertaken.

**Table 2.2 Recommended UK survey times for survey types described in these guidelines.**

| Survey type | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| Preliminary ecological appraisal - fieldwork | | | | | | | | | | | | |
| Preliminary roost assessment - structures[a] | | | | | | | | | | | | |
| Emergence/re-entry survey for maternity or summer roosts[b] | | | | | | | | | | | | |
| Emergence/re-entry[c] survey for transitional roosts[b] | | | | | | | | | | | | |
| Emergence survey for mating roosts[b] | | | | | | | | | | | | |
| Hibernation survey - structures[a] | | | | | | | | | | | | |
| Preliminary ground level roost assessment - trees[d] | | | | | | | | | | | | |
| Potential roost feature (PRF) inspection survey - trees | | | | | | | | | | | | |
| Ground level bat activity survey - transects and automated/static | | | | | | | | | | | | |
| Pre-, during and post-hibernation - automated/static bat activity survey | | | | | | | | | | | | |
| Swarming survey | | | | | | | | | | | | |
| Back-tracking survey | | | | | | | | | | | | |
| Trapping survey[e] | | | | | | | | | | | | |
| Radio tagging and tracking survey[e] | | | | | | | | | | | | |

= optimal period

= sub-optimal period

= weather or location dependent (i.e. may not be suitable due to spring and autumn conditions in any one year or in more northerly latitudes). Note that October surveys are not acceptable in Scotland.

**Figure 1a:** Table 2.2 reproduced from Collins (2016).

### 1.2.1.1 Buildings & Structures

In Marnell *et al.* (2022), Table 3 (The applicability of survey methods) provides information on the type of surveys that can be undertaken according to the different seasons.

Marnell *et al.* (2022) states that it is more suitable to survey buildings in the summer months. The following is a summary of the principal points:

1. The presence of a significant bat roost (invariably a maternity roost) can normally be determined on a single visit at any time of year, provided that the entire structure is accessible and that any signs of bats have not been removed by others. However, a visit during the summer or autumn has the advantage that bats may be seen or heard.
2. Roosts used by a small number of bats, as opposed to maternity sites, can be particularly difficult to detect and may require extensive searching backed up (in summer) by bat detector surveys or emergence counts.
3. If the entire building is not accessible or signs of bats may have been removed by others, or by the weather, bat detector or exit count methodologies may be required to back up a limited search.

**Table 3.** The applicability of survey methods.

| Season | Roost type | Inspection | Bat detectors and emergence counts |
|---|---|---|---|
| Spring (Mar – May) | Building | Suitable (signs, perhaps bats) | Limited, weather dependent |
| | Trees | Difficult (best for signs before leaves appear) | Rarely useful |
| | Underground | Suitable (signs only) | Static detectors may be useful |
| Summer (June-August) | Building | Suitable (signs and bats) | Suitable |
| | Trees | Difficult | Limited; use sunrise survey |
| | Underground | Suitable (signs only) | Rarely useful |
| Autumn (September –November) | Building | Suitable (signs and bats) | Limited, weather dependent |
| | Trees | Difficult | Rather limited weather dependent; use sunrise survey? |
| | Underground | Suitable (signs, perhaps bats) | Static detectors may be useful |
| Winter (December-February) | Building | Suitable (signs, perhaps bats)) | Rarely useful |
| | Trees | Difficult (best for signs after leaves have gone) | Rarely useful |
| | Underground | Suitable (signs and bats) | Static detectors may be useful |

**Figure 1b:** Table 3 reproduced from Marnell *et al.* (2022).

The following table is used to determine the level and timing of surveys for buildings/structures with reference to the surrounding habitat. Buildings are assessed to determine their suitability as a bat roost and are described using the parameters Negligible, Low, Medium or High suitability in view of Table 2 from Marnell *et al.* (2022). The level of suitability informs the level of surveying and timing of surveys required based on Table 7.3 of Collins, 2016 (Note: These two tables are presented in Appendix 1 but a summary is provided in the table below).

**Table 2a: Building Bat Roost Classification System & Survey Effort (Adapted from Collins, 2016 and Marnell *et al.*, 2022).**

| Suitability Category | Description (examples of criteria) | Survey Effort (Timings) |
|---|---|---|
| **Negligible** | Building have no potential as a roost site<br>Urban setting, heavily disturbed, building material unsuitable, building in poor condition etc. | No surveys required. |
| **Low** | Building has a low potential as a roost site.<br>No evidence of bat usage (e.g. droppings) | One dusk or dawn survey. |
| **Medium** | Building with some suitable voids / crevices for roosting bats.<br>Some evidence of bat usage<br>Suitable foraging and commuting habitat present. | At least one survey in May to August, minimum of two surveys (one dusk and one dawn). |
| **High** | Building with many features deemed suitable for roosting bats.<br>Evidence of bat usage.<br>Largely undisturbed setting, rural, suitable foraging and commuting habitat, suitable roof void and building material. | At least two surveys in May to August, with a minimum of three surveys (at least one dusk survey and one dawn survey). |

#### 1.2.1.2 Trees

Marnell *et al.* (2022) recommends the following in relation to detecting roosts in trees:

- "The best time to carry out surveys for suitable cavities is between November and April, when the trunk and branches are not obscured by leaves. If inspection suggests that the tree has suitable cavities or roost sites, a bat detector survey at dusk or dawn during the summer may help to produce evidence of bats, though the nomadic nature of most tree-dwelling species means that the success rate is very low.
- It can also be difficult to pinpoint exactly which tree a bat emerged from. A dawn survey is more likely to be productive than a dusk one as swarming bats returning to the roost are much more visible than those leaving the roost. Because tree-dwelling bats move roosts frequently, a single bat-detector survey is unlikely to provide adequate evidence of the absence of bats in trees that contain a variety of suitable roosting places.
- Several dawn or dusk surveys spread over a period of several weeks from June to August will greatly increase the probability of detecting significant maternity roosts and is recommended where development proposals will involve the loss of multiple trees".

As a consequence, the BTHK (2018) Potential Roost Features (PRFs) list and the classification system adapted from Collins (2016) is recommended as part of the daytime inspection of trees to determine their PBR or Potential Bat Roost value. Details of the methodology followed is presented in Section 3.2.2.

#### 1.2.1.3 Underground Structures

Marnell *et al.* (2022) recommends the following in relation to underground structures:

1. Underground structures are used mainly for hibernation, so surveys should generally be carried out during the winter.

### *1.2.2 Evaluation & Assessment Criteria*

Based on the information collected during the desktop studies and bat surveys, an ecological value is assigned to each bat species recorded based on its conservation status at different geographical scales (Table 2b). 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 2b: The six-level ecological valuation scheme used in the CIEEM 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: County Dublin |
| **Local** | Proposed development and immediate surroundings |
| **Negligible** | None, the feature is common and widespread |

If bat roosts are recorded, their roost status is determined using Figure 20 from Marnell *et al.* (2022). This figure is presented below (Figure 1c). This figure is also used to determine the conservation significance of the roost in order to prepare appropriate bat mitigation measures.

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. In particular the Table 4 (presented as Figure 1d below) and Figure 20 (presented as Figure 1c) from Marnell *et al.* (2022) are referenced during this process.

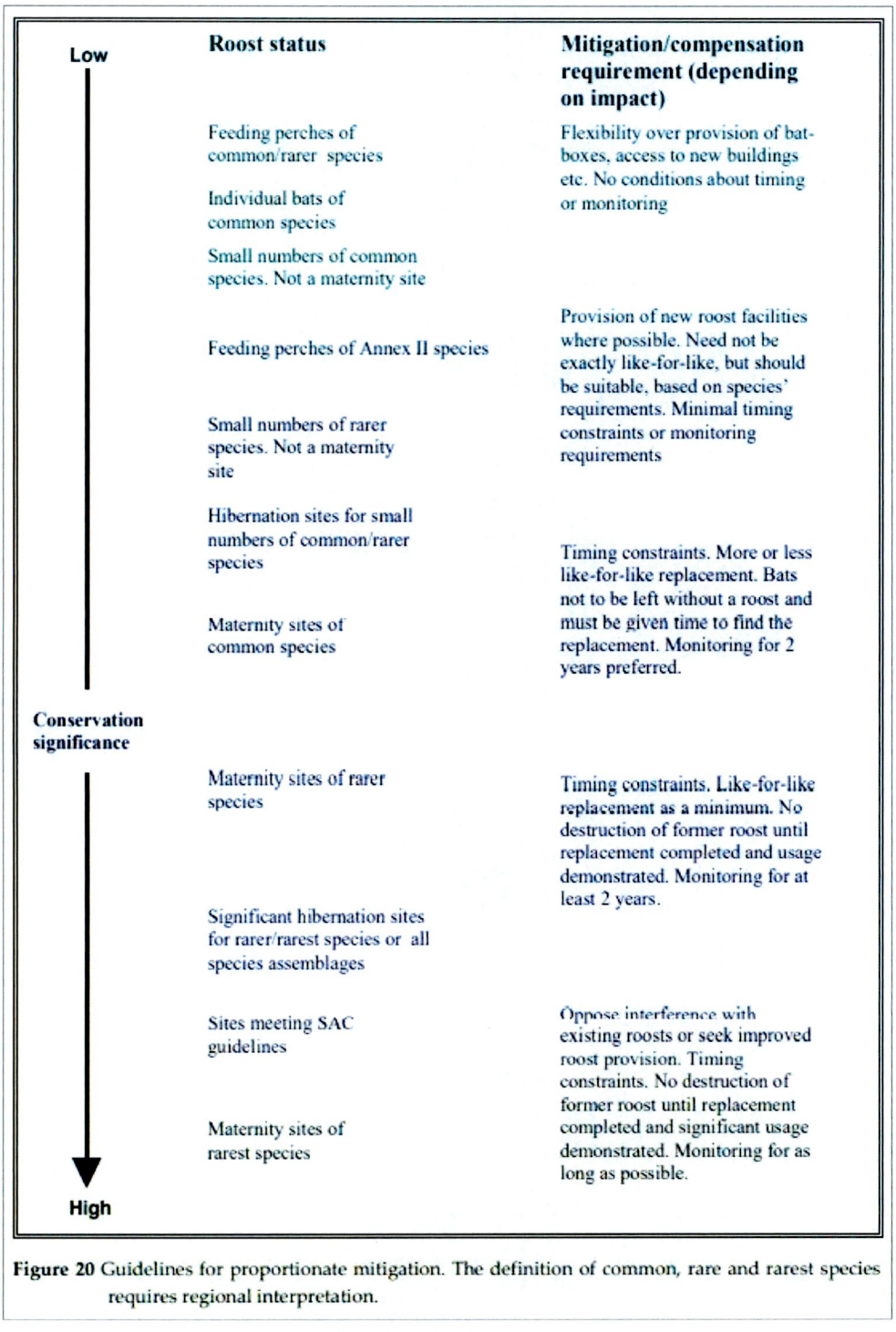


**Figure 20** Guidelines for proportionate mitigation. The definition of common, rare and rarest species requires regional interpretation.

**Figure 1c:** Figure 20 (p 46) Reproduced from Marnell *et al.* (2022).

**Table 4** The scale of main impacts at the site level on bat populations. [**NB** This is a general guide only and does not take into account species differences. Medium impacts, in particular, depend on the care with which any mitigation is designed and implemented and could range between high and low.]

| Roost type | Development effect | Scale of impact | | |
|---|---|---|---|---|
| | | Low | Medium | High |
| Maternity | Destruction | | | ✓ |
| | Isolation caused by fragmentation | | | ✓ |
| | Partial destruction; modification | | ✓ | |
| | Temporary disturbance outside breeding season | ✓ | | |
| | Post-development interference | | | ✓ |
| Major hibernation | Destruction | | | ✓ |
| | Isolation caused by fragmentation | | | ✓ |
| | Partial destruction; modification | | ✓ | |
| | Temporary disturbance outside hibernation season | ✓ | | |
| | Post-development interference | | | ✓ |
| Minor hibernation | Destruction | | | ✓ |
| | Isolation caused by fragmentation | | | ✓ |
| | Partial destruction, modification | | ✓ | |
| | Modified management | | ✓ | |
| | Temporary disturbance outside hibernation season | ✓ | | |
| | Post-development interference | | ✓ | |
| | Temporary destruction, then reinstatement | ✓ | | |
| Mating | Destruction | | ✓ | |
| | Isolation caused by fragmentation | | ✓ | |
| | Partial destruction | ✓ | | |
| | Modified management | ✓ | | |
| | Temporary disturbance | ✓ | | |
| | Post-development interference | ✓ | | |
| | Temporary destruction, then reinstatement | ✓ | | |
| Night roost | Destruction | ✓ | | |
| | Isolation caused by fragmentation | ✓ | | |
| | Partial destruction | ✓ | | |
| | Modified management | ✓ | | |
| | Temporary disturbance | ✓ | | |
| | Post-development interference | ✓ | | |
| | Temporary destruction, then reinstatement | ✓ | | |

**Figure 1d:** Table 4 (p 44) Reproduced from Marnell *et al.* (2022).

Different parameters are considered for the overall assessment of the potential impact(s) of a proposed development on local bat populations.

The overall impacts of the proposed project on local bat populations is assessed using the following criteria:

- Impact Quality using the parameters Positive, Neutral or Negative Impact (based on EPA, 2022, Table 3.4)

Table 2c: Criteria for assessing impact quality based on EPA, 2022,

| 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 4 of Marnell *et al.* (2022) (Figure 1a);
    - 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.
- Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 2d (based on EPA, 2022, Table 3.4).

Table 2d: Criteria for assessing significance of effects based on EPA, 2022.

| 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 probability and duration of the potential effects (selected from EPA, 2022, Table 3.4):

| | |
|---|---|
| **Describing the Probability of Effects**<br>Descriptions of effects should establish how likely it is that the predicted effects will occur so that the CA can take a view of the balance of risk over advantage when making a decision. | **Likely Effects**<br>The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented. |
| | **Unlikely Effects**<br>The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented. |
| **Describing the Duration and Frequency of Effects**<br>'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful. | **Momentary Effects**<br>Effects lasting from seconds to minutes. |
| | **Brief Effects**<br>Effects lasting less than a day. |
| | **Temporary Effects**<br>Effects lasting less than a year. |
| | **Short-term Effects**<br>Effects lasting one to seven years. |
| | **Medium-term Effects**<br>Effects lasting seven to fifteen years. |
| | **Long-term Effects**<br>Effects lasting fifteen to sixty years. |
| | **Permanent Effects**<br>Effects lasting over sixty years. |
| | **Reversible Effects**<br>Effects that can be undone, for example through remediation or restoration. |
| | **Frequency of Effects**<br>Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually). |

Figure 1e: Criteria for assessing significance of effects based on EPA, 2022 (Taken from Table 3.4),

This table continues to provide terminology in relation to "Describing the Types of Effects" as presented below.

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

Figure 1f: Criteria for assessing significance of effects based on EPA, 2022 (Taken from Table 3.4),

### *1.2.3 Bat Mitigation Measures*

#### 1.2.3.1 Bats & Lighting

All European bat species, including Irish bat species, are nocturnal. Light levels as low as typical full moon levels, i.e. around 0.1 LUX, can alter the flight activity of bats (Voigt *et al.* 2018). Any level of artificial light above that of moonlight can mask the natural rhythms of lunar sky brightness and, thus, can disrupt patterns of foraging and mating and might, for instance, interfere with entrainment of the circadian system.

Artificial light pollution is an increasing global problem (Rich and Longcore, 2006) and Artificial light at night (ALAN) is considered a major threat to biodiversity, especially to nocturnal species. As urbanisation expands into the landscape, the degree of street lighting also expands. Its ecological impacts can have a profound affect the behaviour of nocturnal animals including impacts on reproductive behaviours, orientation, predator-prey interaction and competition among others, depending on the taxon and ecosystem in question (Longcore and Rich 2004). It is considered by Hölker *et al.* (2010) to be a key biodiversity threat to biodiversity conservation. In relation to bats, the potential impacts of artificial night lighting can result in habitat fragmentation (Hanski, 1998), delay in roost emergence (Downs *et al.*, 2003) and a reduction in prey items.

In the context of behavioural ecology, lights can work to attract or repel certain animals. Many groups of insects, including moths, lacewings, beetles, bugs, caddisflies, crane flies, midges, hoverflies and wasps, can be attracted to artificial light (Eisenbeis and Hassel 2000; Frank 1988; Kolligs 2000). Attraction depends on the spectrum of light. In the context of street lights, white (mercury vapour) lamps emit a white light that includes ultraviolet. High pressure sodium lights (yellow) emit some ultraviolet, while low pressure sodium lamps (orange) emit no ultraviolet light (e.g. Rydell 2006). As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights and, particular bat species such as aerial insect predators, can exploit the swarming insects to their advantage. Such attraction can also take prey items away from dark zones where light sensitive species are foraging, thus reducing their likelihood of feeding effectively.

Rydell (2006) divides bats into four categories in terms of their characteristic behaviours at street lamps. The four categories are based on bat size, wing morphology and echolocation call characteristics which were highlighted by Norberg and Rayner (1987) to determine flight speed, manoeuvrability, and prey detection capabilities of bats. Rydell (2006) stated that the large, fast flying bats, which are confined to open airspace, fly high over lit areas and are rarely observed near ground level. None of these, typically large free-tailed bats (e.g. large species of the family Molossidae), are found in Ireland. The second category are the medium-sized fast flying species, including the *Nyctalus* species, which patrol the street well above the lights and can be seen occasionally as they dive for prey into the light cone. This group includes the Leisler's bat, which is found in Ireland. Rydell's third category describes the small but fast flying bats that are manoeuvrable enough to forage around light posts or under the lights, and includes the small *Pipistrellus* species of the old world, three of which are found in Ireland. The fourth category includes broad-winged slow flyers, most of which are seldom or never observed at lights. Slow flying bat species may be more vulnerable to predation by diurnal birds of prey and this may restrict their exploitation of insects around artificially illuminated areas (e.g. Speakman 1991). There are also the concerns that some bat species are more light sensitive and therefore actively avoid lit up areas. This is particularly relevant for lesser horseshoe bats. Therefore from this, we can categorise the suite of Irish bats species as follows (please note that the sensitivity category is the author's description):

Table 3: Potential light sensitivity of the Irish bat fauna using categories described by Rydell, 2006.

| Species: Common Name | Rydell Category | Sensitivity |
|---|---|---|
| **Daubenton's bat *Myotis daubentonii*** | Category 4 | Light sensitive |
| **Whiskered bat *Myotis mystacinus*** | Category 4 | Light sensitive |
| **Natterer's bat *Myotis nattereri*** | Category 4 | Light sensitive |
| **Leisler's bat *Nyctalus leisleri*** | Category 2 | Light tolerant |
| **Nathusius' pipistrelle *Pipistrellus nathusii*** | Category 3 | Semi-tolerant |
| **Common pipistrelle *Pipistrellus pipistrellus*** | Category 3 | Semi-tolerant |
| **Soprano pipistrelle *Pipistrellus pygmaeus*** | Category 3 | Semi-tolerant |
| **Brown long-eared bat *Plecotus auritus*** | Category 4 | Light sensitive |
| **Lesser horseshoe bat *Rhinolophus hipposideros*** | Category 4 | Light sensitive |

The ability of different bat species to exploit insects gathered around street lights varies greatly. Gleaning species such as *Myotis* bats rarely forage around street lights (Rydell and Racey, 1995). The ecological effects of illuminating aquatic habitats are also poorly known. Moore *et al.* (2006) found that light levels in an urban lake, subject simply to sky glow and not direct illumination from lights, reached the same order of magnitude as full moonlight.

All European bat species, including Irish bat species, are nocturnal. As a consequence, the scientific literature provides evidence that artificial lighting does impacts on bats. The degree of impact depends on the light sensitivity of the bat species and the type of luminaire. Lesser horseshoe bats are light sensitive and therefore adversely effected by the presence of lighting in all aspects of their life strategies (e.g. foraging, commuting, drinking and roosting).

The potential impacts of street lighting can be summarised as follows:

- Attracting Prey Items

Lights can work to attract or repel certain animals. Many groups of insects can be attracted to artificial light and this attraction depends on the spectrum of light. As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights. Such attraction can also take prey items away from dark zones where light sensitive species, such as lesser horseshoe bats, are foraging, thus reducing their likelihood of feeding effectively.

- Reducing Foraging Habitat

The research documents that there is less bat species diversity foraging in habitats lit up by artificial lighting. Only bat species considered to be light tolerant are generally able to exploit habitats with lighting present, but overall, all bat species activity tends to be less in lit up habitats compared to non-lit up habitats.

- Fragmenting The Landscape

Scientific evidence shows that lighting is a barrier to the movement of light sensitive bat species, such as lesser horseshoe bats. Light sensitive bat species will actively seek dark corridors to commute along and therefore the presence of lighting in commuting habitats will restrict their movement of such species in the landscape.

- Reducing Drinking Sites

There is increasing evidence that drinking sites for bats is an essential component for local bat population survival and that the presence of artificial lighting at waterbodies prevents bats from availing of this resource.

Lighting, including street lights come in an array of different types but for street lights they typically include High Pressure Sodium, Low Pressure Sodium, Mercury Vapour and the more modern Light Emitting Diodes (LED). An array of field-based research has been undertaken to document the potential impact of lighting on bat flight activity. LED lighting is predicted to constitute 70% of the outdoor and residential lighting markets by 2020. While the use of LEDs promotes energy and cost savings relative to traditional lighting technologies, little is known about the effects these broad-spectrum "white" lights will have on wildlife, human health, animal welfare, and disease transmission. As a consequence, a large array of research has been undertaken recently on the potential impact of LED on bats.

Stone *et al.* (2012) undertook research in relation to "Cool" LED street lights on an array of local bat species in England. Overall the presence of LED street lights had a significant negative impact on lesser horseshoe bats and *Myotis* spp. for all light treatments investigated while there was no sign impact of light treatment type on *Pipistrellus pygmaeus* (soprano pipistrelle – a common Irish bat species) or *Nyctalus* (Leisler's bats is part of this bat family and is a common Irish bat species)/*Eptesicus* species. This research paper also documented behavioural changes for the different bat species. Lesser horseshoe bats and *Myotis* spp. did not avoid lights by flying along the other side of the hedge but altered their commuting behaviour altogether. It was concluded that LEDs can fragment commuting routes causing bats to alter their behaviour with potentially negative conservation consequences. Lesser horseshoe bat activity was significantly lower during high intensity treatment than medium, but at all treatment levels (even as low as 3.6 LUX), activity was significantly lower than unlit control (LUX level measurements were taken at 1.7m at the hedge below the light).

Russo *et al.* (2017) investigated the impact of LED lighting on drinking areas for bats in Italy. Drinking sites are considered to be important components for the survival of local bat populations. Drinking sites were illuminated with a portable LED outdoor light emitting (48 high-power LEDs generated a light intensity of 6480 lm (4000–4500 K) at 25°C, two peaks of relative luminous flux at 450 and 590 nm). *Plecotus auritus* (brown long-eared bat – resident in Ireland), *Pipistrellus pygmaeus* (soprano pipistrelle – resident in Ireland) and *Rhinolophus hipposideros* (lesser horseshoe bat – resident in Ireland) did not drink when troughs were illuminated.

Rowse *et al.* (2018) researched the impacts of LED lights (portable lights, 97W 4250K LED on 10m high poles) in England on local bat populations. Treatments were either 100% light intensity; dimmed (using pulse width modulation) at 50% or 25% light intensity; and unlit. Sites were in suburban areas along busy roads but with vegetation and tree lines adjacent. High light levels (50% & 100% light treatments) increased activity of opportunistic *Pipistrellus pipistrellus* (common pipistrelle – resident in Ireland) but reduced activity of *Myotis* species group. Conversely 25% and unlit sites had no difference from each other. The research paper conclude that dimming could be an effective strategy to mitigate ecological impacts of street lights.

Wakefield *et al.* (2017) stated that an important factor to be aware of in relation to LED is the direction of the light projected. Therefore it is recommended that highly focused/shielded LEDS designed to filter out short wavelengths of light may should be used as they attract relatively fewer insects. Less insects attracted to street lights means less insects leaving dark zones where light sensitive bat species primarily feed.

Martin *et al.* (2021) showed that LED street lights lead to a reduction in the total number of insects captured with light traps in a wide range of families. Coleoptera and Lepidoptera orders were the most sensitive groups to ecological light pollution in the study area. The paper suggested that LED was the least attractive light system for most of the affected groups both because of its very little emitted short-wavelength light and because of its lower light intensity. They also concluded that reduction in insect attraction to LED could be even larger with current LED technologies emitting warmer lights, since other research showed that LED emitting "warmer white" colour light (3000 K) involves significantly lower attraction for insects than "colder white" LED (6000 K).

Wilson *et al.* (2021) investigate the impact of LED on biting insects and concluded because LED is highly malleable with regard to spectral composition, they can be tailored to decrease or increase insect catches, depending on situation. Therefore this design control of LED could greatly assist in reducing impact of street lighting on local bat populations.

Stone *et al.* (2015) reviewed the impacts of ALAN on bat roosts and flight paths in order to provide recommendations in relation to street lighting. The principal recommendations were to avoid lighting places where bats are present and to ensure that there are interconnected light exclusion zones and variable light regimes with reduced intensity of light in specific areas (e.g. important foraging and commuting habitats) as responses to street lighting may vary between species. It recommends that there should be a 'light threshold'.

#### *1.2.3.1.1 Lighting Guidelines – Effective Mitigation Measures*

As a consequence of this extensive amount of research there are two principal guideline documents available for best practice for effective mitigation relating to outdoor lighting.

EUROBATS (Voigt *et al.*, 2018) guidelines recommends the following:

- ALAN should be strictly avoided, and artificial lighting should be installed only where and when necessary coupled with the following:
    - Dynamic lighting schemes, where possible.
    - Use a minimal number of lighting points and luminaires on low positions in relation to the ground for minimising light trespass to adjacent bat habitats or into the sky.
    - Use focused light, e.g. by using LED or shielded luminaires which limit the light flux only to the required areas and prevent light trespass into adjacent bat habitats.
    - Create screens, either by erecting walls or by planting hedgerows or trees, to prevent light trespass, e.g. from illuminated roads, to surrounding bat habitats.
    - Exits of bat roosts and a buffer zone around them should be protected from direct or indirect lighting to preserve the natural circadian rhythm of bats.

This BCT (2018) guidelines provides a list of recommendations in relation to luminaire design, which is based on the extensive research completed to-date on the potential impact of lighting on bats, and therefore provides best practice mitigation measures. These recommendations are the basis of mitigation measures pertaining to bats listed in this report and are summarised as follows:

- All luminaires used should lack UV/IR elements to reduce impact.
- A warm white spectrum (<2700 Kelvins should be used to reduce the blue light component of the LED spectrum).
- Luminaires should have a peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Only luminaires with an upward light ratio of 0% and with good optical control should be used.
- Luminaires should be mounted on the horizontal, i.e. no upward tilt.
- Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible.
- Bollard lighting should be considered for pedestrian, parks and greenway areas, if deemed necessary.

### 1.2.3.2 Bat Box Schemes

Bat Boxes are frequently used as part of bat mitigation to retain local bat populations within an area proposed to be development. The NPWS Bat Mitigation Guidelines (Marnell *et al.* 2022) considers that where roosts of low conservation significance (Figure 20, Marnell *et al.* (2022)) are to be lost due to a development, bat boxes may provide an appropriate form of mitigation and the effectiveness depends on the type of bat box provided, which should be appropriate to the bat species.

**Table 7** The types of bat box used by different species.

| Species | Summer/ maternity | Summer/non breeding | Hibernation* | Notes |
|---|---|---|---|---|
| *Rhinolophus hipposideros* | N/A | N/A | N/A | Horseshoe bats cannot use bat boxes |
| *Myotis daubentonii* | H | H | | |
| *Myotis mystacinus* | H | H | | |
| *Myotis nattereri* | H | ? | | |
| *Pipistrellus nathusii* | H | H | | |
| *Pipistrellus pipistrellus* | C | C/H | C | H are rarely used as maternity roosts. |
| *Pipistrellus pygmaeus* | C | C/H | C | |
| *Nyctalus leisleri* | H | H | H? | |
| *Plecotus auritus* | H | H | | Maternity roosts |

Key

* Large well-insulated hibernation boxes may be more successful

N/A -not applicable; bat boxes should not be considered as replacement roosts

H – tree hollow-type box, providing a void in which bats can cluster

C – tree crevice-type box, with 25-35mm crevices

? – few data on which to base an assessment

**Figure 1g:** Table 7 (p 58) Reproduced from Marnell *et al.* (2022).

*1.2.3.2.1 Effectiveness of Bat Boxes as a Mitigation Measure*

Two publications that provide good scientific advise in relation to the effectiveness of bat boxes are presented below. McAney & Hanniffy (2015) reviewed the use of bat boxes in Ireland in relation to the bat usage of the following bat box schemes: 62 Schwegler boxes of three models erected in Portumna Forest Park (Bat box scheme consisted of 30x 1FF design, 30x 2FN design and 2x 1FW design); 50 2FN boxes erected in Coole-Garryland Nature Reserve and 50 2FN boxes erected in Knockma Nature Reserve of which 40 were later transferred to Glengarriff Nature Reserve County Cork. The bat box schemes were set up in March 1999 and data was collected up to 2015. Eight of the nine resident bat species were recorded roosting in bat boxes (lesser horseshoe bats cannot use bat boxes due to their need to fly, rather than crawl, into roosts). The main summary points are as follows:

- Leisler's, brown long-eared and *Pipistrellus* spp. were recorded in boxes at all three Galway woods, Daubenton's bat was only recorded in Garryland, Natterer's bat was only recorded in Glengarriff and whiskered/Brandt's was recorded just twice.
- There was a 31% chance of encountering a bat at Portumna Forest Park compared to 11.5% and 10% at Coole-Garryland Nature Reserve and Knockma Nature Reserve respectively.
- Pipistrellus spp. preferred 1FF boxes as this bat box design offer crevice-like roosting conditions. This species group also showed a seasonal preference with more bats present later in the season (visual observations confirmed the bats were using the boxes as mating roosts) and their numbers increased from the time that the bat box scheme was originally established.
- Brown long-eared bats preferred 2FN boxes that mimic holes in trees, the natural roosting sites for this species. This species also showed no seasonal pattern to their occurrence in the boxes. However one aspect of 2FN boxes that this report mentions is the high occupancy

by birds which can be an issue in relation to nesting material reducing the availability of bat boxes for roosting bats.
- Leisler's bat showed no preference for box model but showed a seasonal preference with more bats present later in the season.
- Aspect was not a significant factor for occupancy but most boxes received dappled sunshine for part of the day.
- The other factor that proved significant was the length of time the boxes were in place, with occupancy rates increasing for all three species, although in the case of pipistrelles this increase appears to have stabilised. So, although the boxes were occupied very quickly, it took several years before they were regularly occupied and before clusters of bats were formed and breeding was confirmed.

Collins *et al.* (2020) investigated the implementation and effectiveness of bat roost mitigation, which included bat boxes, in building developments completed between 2006 and 2014 in England and Wales. The bat species studied were: common and soprano pipistrelle, brown long-eared bat and *Myotis* species, all of which are present in Ireland. A summary of the main points relating to bat boxes are as follows:

- Bat boxes were the most frequently deployed roosting provision (i.e. alternative roosts), being installed at 64% (n = 71) of sites surveyed as a compensation or enhancement measure.
- Box frequencies ranged from 1 to 41 at sites where they were installed, with an average of 6.6 boxes per site.
- Bats, or evidence of bats, were recorded in 20% of these bat boxes.
- Bat boxes mounted externally on buildings showed the highest occupation rate regardless of species while Common pipistrelle showed a preference for these over tree mounted boxes; the opposite was true for soprano pipistrelle.
- The four most popular bat box models used by consultants in the study were all Schwegler woodcrete bat boxes. Bat presence was highest in the 1FF bat box design (32%, n = 53) and lowest for birds (8%). The tree-mounted 2F and wall-integrated 1FR/2FR models both demonstrated similar bat presence rates of 23% (n = 43) and 25% (n = 32) respectively. The 2FN tree-mounted model showed the lowest presence rate for bats (11%, n = 19) and the highest for birds (58%). There were also 26 timber bat boxes, none of which were used by bats.

The author has also erected a number of bat box schemes and, where possible, has completed occasional monitoring visits. One such example is a bat box scheme erected in Kileshandra, Co. Cavan which consists of 8 Schwegler woodcrete bat boxes of various designs. The bat boxes were erected on mature trees located in a linear woodland adjacent to a river. This bat box scheme was erected in 2012 as part of mitigation for the demolishment of a large derelict building where small satellite roosts were recorded for *Pipistrellus* spp. and Daubenton's bat. Two site visits have been completed since 2012 and during these visits the bat boxes were checked for evidence of bat usage. The first site visit was on 25/8/2015 and one bat box was occupied by a single Leisler's bat while the additional seven bat doxes had evidence of bat droppings (*Pipistrellus* spp. and *Myotis* spp.). During the second site visit (27/7/2019) four bat boxes were occupied by bats (Soprano pipistrelle x1 individual (adult male), Leisler's bat x1 individual (adult male) and two bat boxes with x16 Daubenton's bats and x10 Daubenton's bats respectively). Biometrics was recorded for the 12 of the bats (which included 10 of the Daubenton's bats recorded in the bat box with 16 individuals) and five of these Daubenton's bats were lactating females with the remaining five Daubenton's bats recorded as juveniles, thereby indicating that this bat box was used as a maternity roost. The remaining four bat boxes all had droppings within for *Pipistrellus* spp and Leisler's bats. This bat box scheme, while

just one example, demonstrates that when bat boxes are erected in an area with good bat habitat (bat survey documented a high level of bat activity for the named bat species), a high level of occupancy of bat boxes will occur.

In relation to bat boxes, Marnell *et al.* (2022), a document that provides guidelines that are considered to be practical and effective based on past experience, recommends that the design life of potential bat boxes, including essential maintenance, should be about 10 years, as this would be comparable with the lifespan of the tree roosts that bat boxes are designed to mimic. The guidelines continues by stating that the "This lifespan can be achieved with good quality wooden boxes and exceeded by woodcrete bat boxes or other types of construction that ensure any softwoods are protected from the weather and attack by squirrels" (note – this includes woodstone bat boxes).

In relation to the number of bat boxes recommended to be erected, Lintott & Mathews (2018) found that the greater the number of bat boxes deployed, the greater the probability of at least one of the boxes becoming occupied and that the odds of bats occupying at least one box increased by approximately 7% with each additional bat box that was deployed. Bat boxes are erected, as part of this proposed development, to mitigate for the loss of potential roosts in trees. Therefore the number of bat boxes are calculated according to the number of trees with additional boxes added for greater bat conservation value.

Therefore Schwegeler woodcrete bat boxes are recommended as a bat mitigation measure and the authors preference to use 1FF designs as this box is open at the bottom which reduces build-up of droppings (i.e. it is a self-cleaning bat box). Both McAney & Hannify (2015) and Collins *et al.* (2020) demonstrated that usage of this bat box design by bat species recorded in this survey report. This bat box is also less likely to be used by birds and therefore retaining it for bat usage between monitoring visits. To increase occupancy of bat boxes by bats it is important to erect bat boxes 4m or higher (to ensure that bat boxes are out of reach from disturbance by humans and predation by other mammals) and that they should be located where bats have been documented foraging and commuting. The aspect of the bat box is not an influencing factor in relation to occupancy. These recommendations have all been included in this report.

#### 1.2.3.3 Landscaping For Bats

Bats depend on the landscape for foraging, roosting and commuting. Different bat species will travel different distances, to and from their principal roosting sites, depending on their morphology, life stage and preferred foraging areas. Bats in Ireland are insect eating mammals and feed on an array of insects, whose populations are ultimately supported by vegetation. Areas of rich vegetation habitat tend to support higher abundances of insect populations and therefore a higher abundance of bats. In addition, many bat species rely on continuous linear habitats (e.g. treelines and hedgerows) to commute along. As a consequence landscaping as part of a proposed development project is an important element to the goal of retaining local bat populations.

The Bat Conservation Trust publication "Landscape and Urban Design for bats and biodiversity" (Gunnell *et al.,* 2012) is a resource for planning landscape design in our urban areas. This resource encourages measures to enhance existing bat foraging habitat, create water features such as ponds (drinking sites for bats and as a source of emerging insects), manage species rich grassland and planting of tall vegetation to ensure that exiting treelines and hedgerows are linked. It also recommends that use of landscaping as a means to creating dark zones or dark corridors for this mammal group to fly along in our lit urban areas. This is also support by the BCT Lighting Guidelines (BCT, 2018) where landscape design can be utilised to buffer potential light spillage from developments.

### 1.2.3.4 Seasonality of Bat Mitigation Measures

The NPWS Bat Mitigation Guidelines (Marnell *et al.* 2022) provides best practice guidance in relation to the timing of bat mitigation measures. It states that the most common and effective method of avoiding potential harm to a bat is to carry out the work at an appropriate time of the year. The following table provides a summary of timings.

**Table 5** Optimum season for works in different types of roosts.

| Bat usage of site | Optimum period for carrying out works (some variation between species) |
|---|---|
| Maternity | 1st October – 1st May |
| Summer (not a proven maternity site) | 1st September – 1st May |
| Hibernation | 1st May – 1st October |
| Mating/swarming | 1st November – 1st August |

**Figure 1h:** Table 5 (p 50) Reproduced from Marnell *et al.* (2022).

Timing of bat mitigation measures is relevant to the proposed tree felling of Potential Bat Roosts (PBRs). Felling is recommended outside the principal maternity season and during mild weather conditions (to avoid cold weather that would encourage bats to hibernate). This coupled with dusk/dawn surveys and additional daytime inspections is best practice to ensure that tree felling is completed without causing harm to potentially roosting bats. The preferred tree felling months also avoids the bird nesting season.

## 1.3 Project Description

### *1.3.1 Site Location*

The proposed residential development is located in Clonburris, Clondalkin, Dublin 22. It is a rectangular shaped site bounded to the north by a railway line and to the south by agricultural land. The small area of the proposed development site is part of a larger area (Blue Line) area. The proposed development site is agricultural land and the following figure shows the extent of the survey area for the bat assessment (Blue Line). The proposed residential development is known as Clonburris T3 and is marked as a Red Line on the figure below.

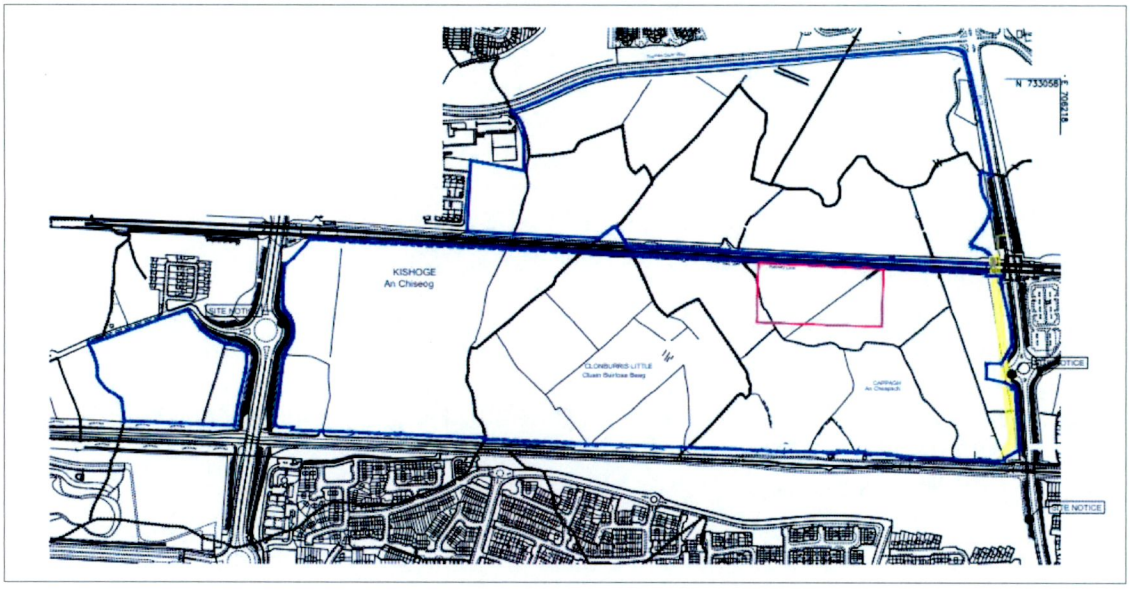


Figure 2a: Survey area for bat assessment (Blue Line) – Clonburris, Clondalkin, Dublin 22.

### *1.3.2 Proposed Project*

The development will consist of the construction of 157 no. dwellings on a site of c.3.45 hectares in the Clonburris South-West Development Area of the Clonburris Strategic Development Zone (SDZ) Planning Scheme 2019 as follows:

A) 81 no. houses comprising 4 no. 2-bedroom houses, 65 no. 3-bedroom houses and 12 no. 4-bedroom houses (all 2-no. storey with associated private open space and car parking);
B) 76 no. apartment units consisting of 26 no. 1-bedroom and 50 no. 2-bedroom units within Block 1 (4 no. storeys);
C) Vehicular access will be provided from the permitted street under SDZ21A/0022 and the permitted Clonburris Southern Link Street (SDZ20A/0021) and R113 (Fonthill Road) to the east;
D) All ancillary site development works including footpaths, landscaping boundary treatments, public and private open space areas, car parking (170 no. spaces) and bicycle parking (170 no. spaces), single-storey ESB sub-stations, bin and bicycle stores and all ancillary site development/construction works.

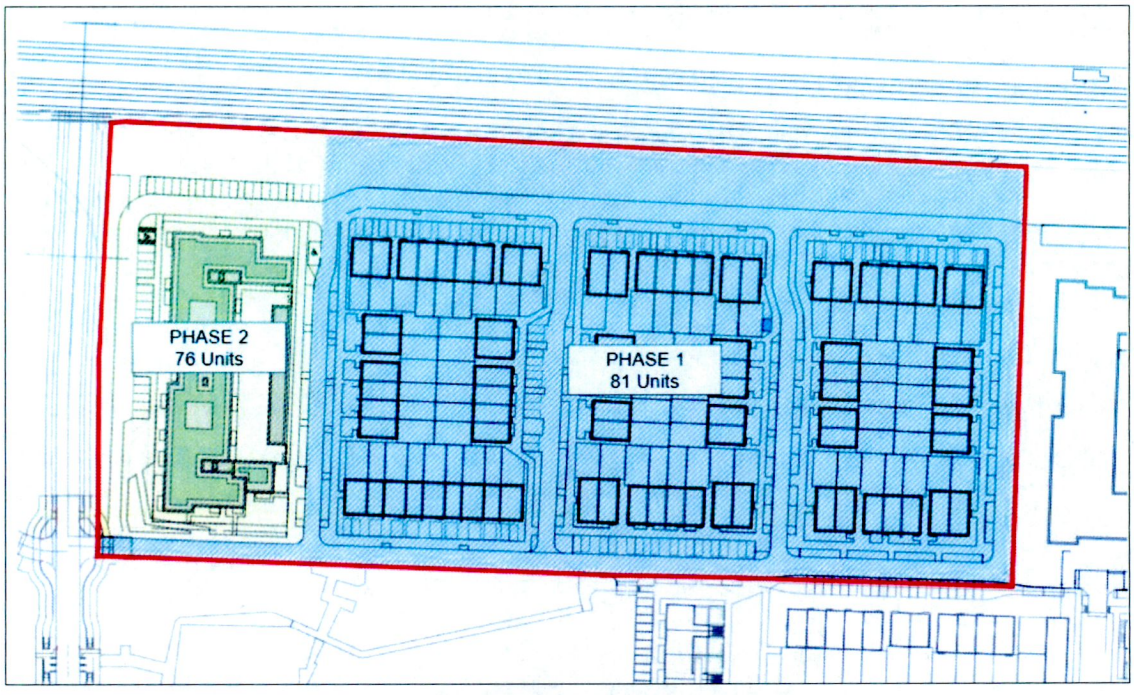

Figure 2b: Proposed layout of Clonburris T3, Clondalkin, Dublin 22.

## 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 5a: Bat Roost Types (adapted from 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).

Buildings were assessed to determine their suitability as a bat and described using the parameters Negligible, Low, Medium or High suitability in view of Table 2a presented in the previous section.

### *2.1.2 Tree Potential Bat Roost (PBRs) Inspection*

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

Trees identified as PBRs were 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) 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 were 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 were 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, where available, were 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 5c: Tree Bat Roost Category Classification System (adapted from Collins, 2016).**

| Tree Category | Description |
|---|---|
| 1<br>High | Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts |
| 2<br>Moderate | Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats; |
| 3<br>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<br>Negligible | Trees have no potential. |

### *2.1.3 Bat Habitat & Commuting Routes Mapping*

The survey site was assessed during daytime walkabout surveys, in relation to potential bat foraging habitat and potential bat commuting routes. Such habitats were classified according to Fossit, 2000 (Appendix 1, Table 1.B) while hedgerows were classified according to BATLAS 2020 classification

(Bat Conservation Ireland, 2015) (Appendix 1, Table 1.A). Bat habitats and commuting routes identified were 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 Bat Surveys*

Walking transects were completed as the principal means of gathering data for the Dusk Bat Surveys and involved the surveyor(s) walking the survey area, noting the time, location and bat species encountered. Mapping of bat encounters was undertaken using QGIS and an excel file produced for mapping purposes (ITM Irish grid reference co-ordinates). Validation of bat records was completed by the principal bat surveyor prior to mapping. Surveys were completed from 10 minutes before sunset to at least 130 minutes post sunset.

The following equipment was used:

Surveyor 1 (Principal surveyor): Anabat Walkabout Full Spectrum Bat Detector, Pettersson D240x Time Spectrum Detector and Petersson D200 Heterodyne Bat Detector.

Surveyor 2: Bat Logger M2 Spectrum Bat Detector, Wildlife Acoustics EchoMeter Touch Pro and Petersson D200 Heterodyne Bat Detector.

Surveyor 3: Anabat Scout Full Spectrum Bat Detector, Pettersson D240x Time Spectrum Detector and Petersson D200 Heterodyne Bat Detector.

### *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 and the habitat type of where the bat detector is location is not to allow interpretation of the results (e.g. Open verses Edge verses Closed habitat types – see table below). 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 positioned horizontally to reduce potential damage from rain. Wildlife Acoustics Song Meter SM4 Bat FS and Mini Bat FS 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. Audio files are a maximum of 15 seconds long and each audio file is taken as a bat pass for each bat species recorded within the audio file. Each bat pass does not equate to the number of individuals of bats flying in vicinity of the recording device 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 (i.e. separate audio files within a small 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 of echolocation calls or bat pass is more likely to be indicative of individual bats.

The recordings are analysed using Wildlife Acoustics Kaleidoscope Pro. 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 6a: Static Bat Detectors deployed during Static Bat Detector Surveys.

| Static Unit Code | Bat Detector Type | Recording Function | Microphone |
|---|---|---|---|
| **SM4 Units 1 – 8** | Wildlife Acoustics SongMeter 4 Bat FS | Passive Full Spectrum | SMM-U2, 4m cable |
| **SM Mini Bat Units 1-12** | Wildlife Acoustics SongMeter Mini Bat | Passive Full Spectrum | SMM-U2 |
| **SM2 Unit 2**<br>**SM2 Unit 4**<br>**SM2 Unit 5** | Wildlife Acoustics SongMeter 2 Bat+ | Passive Full Spectrum | SMX-US (connected directly to unit)<br><br>SMX-U1 (connected directly to unit) |
| **AudioMoths** | Silicon Labs AudioMoth | Passive Full Spectrum | MEMS microphone which is surface mounted |

Bats produce different types of echolocation calls and each bat species family have a characteristic bat echolocation call depending largely on their morphology and preferred habitat type. The different types of echolocation calls (i.e. CF or Constant Frequency call verses a FM or Frequency Modulated call) provides different types of information and therefore are used to detect prey items or for orientation in different habitat types. These can be broadly defined as in the table below.

Table 6a: Bat Habitat Types definitions for Passive Static Bat Detector Surveys.

| Bat Habitat | Definition | Example |
|---|---|---|
| **Open** | Large open space require bat to produce calls that are loud and therefore will travel far in order to detect prey items in the open sky. This is typically where Leisler's bats will forage. | Grassland field |
| **Edge** | Linear habitat features where bats produce echolocation calls that allow them to detect the linear habitat and the adjacent open space of a field for example. This is typically where *Pipistrellus* species will forage. | Hedgerows and treelines |
| **Closed** | To fly within a closed habitat of a woodland (i.e. the clutter of branches and leaves), bats produce a quite calls that provides very detailed information. This is typically where brown long-eared bats will forage. | Woodland interior |
| **Water** | This is a specific Bat Habitat Type for Daubenton's bats which produced bat echolocation calls in the same manner as a bats would produce bat echolocation calls when flying within a Closed Bat Habitat Type. | Rivers |

| | | |
|---|---|---|
| | Daubenton's bats typically fly 30cm above water surface and as a consequence produce echolocation calls to detect the "Clutter" of the closeness of their flight to the water surface. | |

## 2.3 Desktop Review

### *2.3.1 Bat Conservation Ireland Database*

Bat Conservation Ireland acts as the central depository for bat records for the Republic of Ireland. Its' bat database is comprised of >60,000 bat records. The database primarily contains bat records from the following datasets:

- Irish Bat Monitoring Programme

The Irish Bat Monitoring Programme is comprised of four surveys (Car-based Bat Monitoring Scheme (2003-), All Ireland Daubenton's Bat Waterways Survey (2006-), Brow Long-eared Bat Roost Monitoring Scheme (2007-) and Lesser Horseshoe Bat Monitoring Scheme (1980s-). Apart from the latter survey, all monitoring data is stored on the BCIreland database.

- BATLAS 2020 & 2010

BCIreland has undertaken two all-Ireland species distribution surveys (2008-2009 for BATLAS 2010 and 2016-2019 for BATLAS 2020) of four target bat species (Common and soprano pipistrelle, Leisler's bats and Daubenton's bat).

- Ad Hoc Bat Records

Ad hoc bat records from national bat groups, ecological consultants and BCIreland members are also stored on the BCIreland database.

- Roost Records

These records are only report at a 1km level to protect the location of private dwellings and to protect such important bat records.

A 1km radius search was requested for the Irish Grid Reference O0528232384.

### *2.3.2 Bat Conservation Landscape Favourability*

Bat Conservation Ireland produced a landscape conservation guide for Irish bat species using their database of species records collated during the 2000 - 2009 survey seasons. An analysis of the habitat and landscape associations of all bat species deemed resident in Ireland was undertaken and reported in Lundy *et al.*, 2011. The geographical area suitable for individual species was used to identify the core favourable areas of each species. This was produced as a GIS layer for local authorities and planners in order to provide a guide to the consideration of bat conservation. The island is divided into 5km squares and the landscape favourability of each 5km square for each species of bat was modelled. A caveat is attached to the model and it is that the model is based on records held on the BCIreland database, while core areas have been identified, areas outside the core area should not be discounted as unimportant as bats are a landscape species and can travel many kilometres between roosts and foraging areas nightly and seasonally. This model was used as part of the desktop study for this report.

# 3. Bat Survey Results

## 3.1 Daytime Inspections

### *3.1.1 Building & Structure Inspection*

The following building was inspected: derelict building (Omer Lock House). Due to anti-social behaviour, this structure is fenced off and is not accessible. Therefore inspection was limited. The building is considered to be of Medium roosting value due to its location adjacent to the Grand Canal and due to the extensive ivy growth. This building is not located within the current planning application and due to its location along the canal tow path, it is not under Cairn Home ownership.

**Table 7: Buildings / Structures inspection results.**

| Building Code | Description | Location | Roost Type / Suitability | Bat Species |
|---|---|---|---|---|
| **Derelict building** | Natural stone walls (partial roof), heavy ivy growth | Located along the Grand Canal to path | Medium | None |

Plate 1: Derelict structure (Omer Lock House) located along tow path of Grand Canal.

### *3.1.2 Tree Potential Bat Roost (PBRs) Inspection*

Trees were inspected (with reference to the Tree Constraints Plan) within the proposed development site. The internal linear habitats of the proposed development site are proposed to be removed to facilitate the proposed development but there are no PBR trees within these linear habitats.

### *3.1.3 Bat Habitat & Commuting Routes Mapping*

The habitat types, with reference to Fossit (2000) were recorded both within the survey area and adjacent to the survey area.

**Table 9a: Habitat types present within survey area.**

| Habitat | Yes | Habitat | Yes | Habitat | Yes | Habitat | Yes |
|---|---|---|---|---|---|---|---|
| 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 | |

**Table 9b: Habitat types present adjacent to survey area.**

| Habitat | Yes | Habitat | Yes | Habitat | Yes | Habitat | Yes |
|---|---|---|---|---|---|---|---|
| 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 | |

There are nine broad habitat types are present within the greater bat survey area. Agricultural fields are predominantly dry meadows – GS2 and neutral grassland – GS1. Field boundaries are predominantly made up of hedgerows – WL1. Tree/shrub species include Grey Willow *Salix cinerea*, Blackthorn *Prunus spinosa*, Hawthorn *Crataegus monogyna*, Spindle *Euonymus europaeus*, Ash *Fraxinus excelsior*, Elm *Ulmus glabra*, Dog Rose *Rosa canina*, Elder *Sambucus nigra*, Hazel *Corylus avellana*, Guelder-rose *Viburnum opulus*. Alder *Alnus glutinosa*, Crack Willow *S. fragilis* and Sycamore *Acer pseudoplatanus*. Drainage ditches – FW4 accompany some linear woodland features. The southern boundary is mostly characterised by a treeline – WL2, with tree species including Oak Quercus sp., Ash and Sycamore along with Brambles *Rubus fruticosus* agg., Hazel, Blackthorn and Spindle.

Grand Canal pNHA (site codes: 2104): The Grand Canal was constructed in the 18th century and links Dublin to the River Shannon. It is a nationally valuable wildlife corridor and is home to a wide range of plants and animals, many of conservation value, including the Otter Lutra lutra.

## 3.2 Night-time Bat Detector Surveys

For ease of presentation of the survey results, separate maps have been prepared for each bat species recorded. Due to the large number of years of surveying for is site, data is presented together for 2018-2021 data while 2022 data is presented separately.

### *3.2.1 2022 Bat Surveys*

#### 3.2.1.1 Dusk Bat Survey 2022

A walking transect was undertaken on the 6/6/2022 and 7/6/2022 of a larger area than the proposed development section. Four species of bat was recorded: Leisler's bat, Daubenton's bat, soprano pipistrelle and common pipistrelle.

Leisler's bats was the most frequently recorded bat species with greater amount of encounters recorded along the treeline and canal along the southern boundary of the survey area. There was also a large volume of bat encounters along the eastern boundary where street lighting was present. This species of bat is known to take advantage of swarming insects around outdoor lighting.


Figure 4a: Leisler's bat encounters during 2022 bat surveys.

Soprano pipistrelles were recorded occasionally within the agricultural field network of the larger bat survey area but the majority of the bat encounters were associated with the southern treeline boundary and the canal.

Daubenton's bat was only encountered once and this individual was recorded foraging on the canal to the south of the proposed development area.


Figure 4b: Soprano pipistrelle bat encounters during 2022 bat surveys.


Figure 4c: Daubenton's bat encounters during 2022 bat surveys.

Common pipistrelle bat encounters was more associated with the internal linear habitat network of the agricultural land and the most frequently recorded bat species within the smaller section proposed to be development.


Figure 4d: Common pipistrelle bat encounters during 2022 bat surveys.

### 3.2.1.2 Passive Static Bat Detector Survey 2022

Eight static units were deployed in 2022 to cover a great survey area than previous survey years. A total of five bat species were recorded during three years of static surveillance: common pipistrelle, soprano pipistrelle, Leisler' bat, brown long-eared bat and Daubenton's bat.

Table 10a: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

| Static Code | Location Description / Bat Habitat Type | Grid Reference | Survey Period | Bat Species |
|---|---|---|---|---|
| **Static 13 (AM4)** | Adjacent to Grand Canal | 705121, 732256 | 6/6/62022 to 12/6/2022 | CP, SP, Leis, Daub |
| **Static 14 (Mini 2)** | Hedgerow (northern section) | 705155, 732894 | 6/6/62022 to 12/6/2022 | CP, SP, Leis |
| **Static 15 (AM1)** | Hedgerow | 705987, 732252 | 6/6/62022 to 12/6/2022 | CP, SP, Leis |
| **Static 16 (Mini 8)** | Along canal tow path | 704835, 732288 | 6/6/62022 to 12/6/2022 | CP, SP, Leis |

| | | | | |
|---|---|---|---|---|
| **Static 17 (Mini 1)** | Railway boundary | 704944, 732688 | 6/6/62022 to 12/6/2022 | CP, SP, Leis |
| **Static 18 (AM2)** | Hedgerow | 705462, 732537 | 6/6/62022 to 12/6/2022 | CP, SP, Leis |
| **Static 19 (Mini 5)** | Hedgerow (railway boundary) | 705805, 732634 | 6/6/62022 to 12/6/2022 | CP, SP, Leis |
| **Static 20 (Mini 11)** | Hedgerow (northern section) | 705955, 732861 | 6/6/62022 to 12/6/2022 | CP, SP, Leis |

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


Figure 4e: Location of static units deployed for static surveillance in 2022.

*3.2.2 2018-2021 Bat Survey Results*

### 3.2.2.1 Dusk Bat Survey 2018-2021

Walking transects were the principal means of collecting bat data for this survey area since 2018 and due to the large number of years of surveying, the survey results from 2018-2021 are presented together.

While there is one structure within the proposed development site, anti-social behaviour at this structure reduced the possibility of surveying it for the full duration of a dusk survey without drawing unwanted attention. However, the walking transects, coupled with static surveillance, ensure that this structure was surveyed adequately. Walking transects were completed along the canal and along the treeline / hedgerow network within the survey area (Pease note: the survey area is greater than the actual proposed development area of Clonburris T3) and these were completed in 2018, 2019, 2020 and 2021.

2018: 22nd September 2018 (Weather conditions: clear skies, dry, calm, 11oC)
2019: 31st August 2019 (Weather conditions: patchy cloud cover, dry, breezy, 17oC)
2020: 12th July 2020 (Weather conditions: full cloud cover, dry, breezy, 16oC)
2021: 2nd June 2021 (Weather conditions: partial cloud cover, dry, light wind, 18oC)

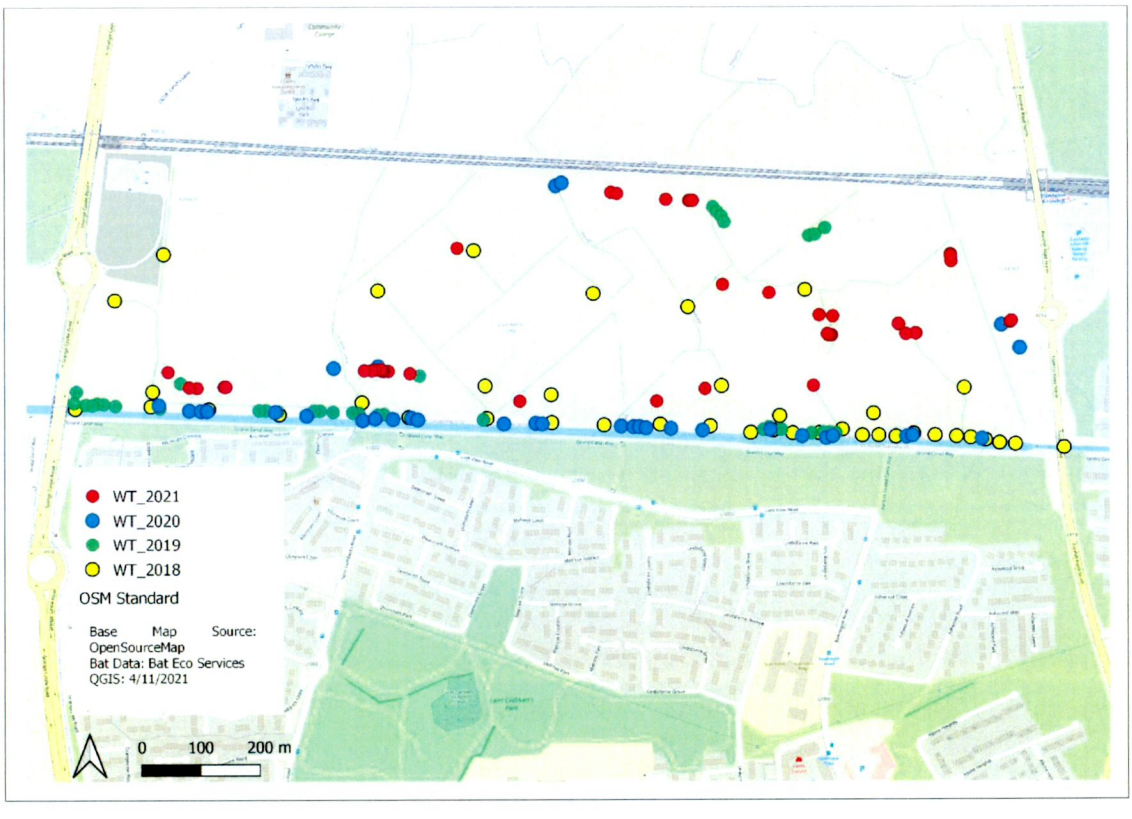


Figure 5a: All bat data recorded during the walking transects 2018-2021.

Three species of bat were recorded in all survey years: common pipistrelle, Leisler's bat and soprano pipistrelle. Daubenton's bats were recorded in 2018 along the canal only. Due to the array of surveys completed, the data for each bat species is presented later in the report.

In 2018 and 2019 one survey was located adjacent to the derelict structure along the tow path and no bats were recorded emerging. It was not possible to undertake a survey of the derelict structure in 2020 and 2021 due to anti-social behaviour.

#### 3.2.2.2 Passive Static Bat Detector Survey 2018-2021

The following table summarises the results recorded on the static units deployed (Please see Figure 2b) over three years: 2018, 2019 and 2020. No static surveillance was completed in 2021 due to anti-social behaviour. Six different static locations were surveyed, with duplications of some of the grid referenced points during the three years of surveillance. A total of five bat species were recorded during three years of static surveillance: common pipistrelle, soprano pipistrelle, Leisler' bat, brown long-eared bat and Daubenton's bat.

In relation to Clonburrs T3, Statics 3, 7 and 11 were located along the main linear habitat feature of this proposed development site. All five species of bat recorded during static surveillance were detected at this location.

**Table 10a: Results of Static Bat Detectors deployed during Static Bat Detector Surveys (Colour coded where location is the same from year to year).**

| Static Code | Location Description / Bat Habitat Type | Grid Reference (Irish Grid) | Survey Period | Bat Species |
|---|---|---|---|---|
| **Static 1** | Hedgerow (western section) | O0509532405 | 19/9/2018 to 22/9/2018 | CP, SP, Leis |
| **Static 3** | Hedgerow (eastern section) | O0570732482 | 19/9/2018 to 22/9/2018 | CP, SP, Leis, Daub |
| **Static 4** | Northern boundary | O0534832640 | 19/9/2018 to 22/9/2018 | CP, SP, Leis |
| **Static 2** | Near canal (Adjacent to Omer Lock Hs) | O0581832233 | 19/9/2018 to 22/9/2018 | CP, SP, Leis |
| **Static 5** | Hedgerow (western section) | O0509532405 | 25/8/2019 to 29/8/2019 | CP, SP, Leis |
| **Static 7** | Hedgerow (eastern section) | O0570732482 | 25/8/2019 to 29/8/2019 | CP, SP, Leis |
| **Static 8** | Northern boundary | O0534832640 | 25/8/2019 to 29/8/2019 | CP, SP, Leis |
| **Static 6** | Near canal (Adjacent to Omer Lock Hs) | O0581832233 | 25/8/2019 to 29/8/2019 | CP, SP, Leis |
| **Static 9** | Hedgerow (western section) | O0509532405 | 12/7/2020 to 17/7/2020 | CP, SP, Leis, BLE |
| **Static 10** | Hedgerow (middle) | O0528232438 | 12/7/2020 to 17/7/2020 | CP, SP, Leis |
| **Static 11** | Hedgerow (eastern section) | O0570732482 | 12/7/2020 to 17/7/2020 | CP, SP, Leis, Daub, BLE |
| **Static 12** | Eastern boundary | O0614832304 | 12/7/2020 to 17/7/2020 | CP, SP, Leis |

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


Figure 5b: Location of static units deployed for static surveillance in 2018-2020.

In order to compare the level of bat passes from year to year, the total number of bat passes for each common bat species was divided by the total number of surveillance nights. This indicates that there was a similar level of bat passes recorded for soprano pipistrelles over the three years of static surveillance. However, a significant higher level of bat activity was recorded for both Leisler's bats and common pipistrelles in 2020 compared to 2019 and 2018. This may possibility be due to the fact that static surveillance was undertaken in July compared to September and August for the other surveillance periods, July being an important foraging month when both adult and juvenile bats are commuting and foraging and the weather is generally mor favourable.

Table 10b: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

| Bat Species | 2018 | 2019 | 2020 |
|---|---|---|---|
| | Total number of bat passes | | |
| **Common pipistrelle** | 613 | 799 | 1704 |
| **Soprano pipistrelle** | 468 | 482 | 669 |
| **Leisler's bat** | 86 | 107 | 536 |
| | | | |
| | 2018 | 2019 | 2020 |
| | Total no. of bat passes/no. of surveillance nights | | |
| **Common pipistrelle** | 51 | 67 | 85 |
| **Soprano pipistrelle** | 39 | 40 | 33 |
| **Leisler's bat** | 7 | 9 | 27 |
| | 12 nights | 12 nights | 20 nights |

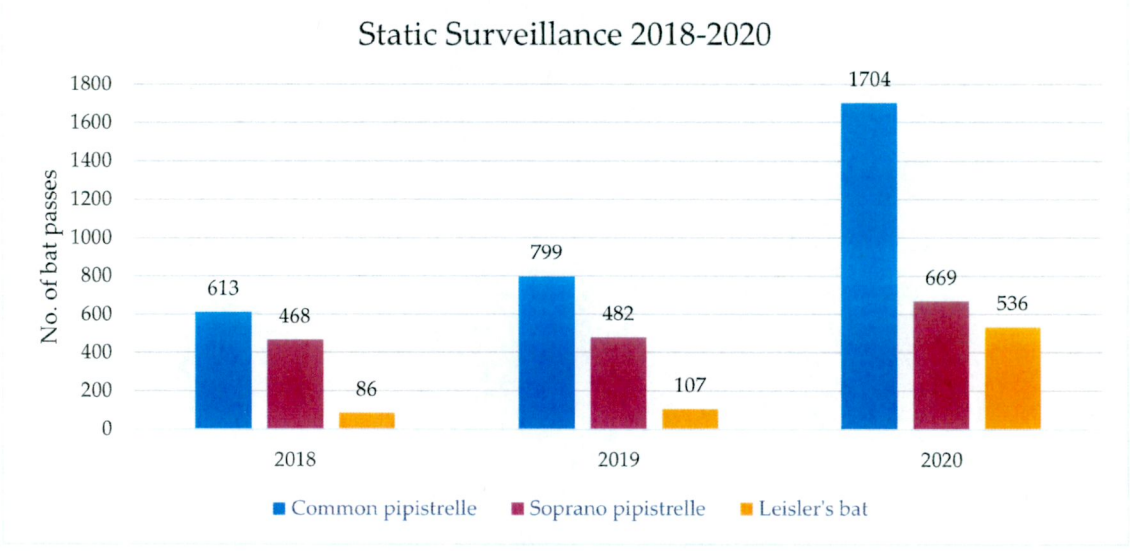


Figure 5c: Number of bat passes recorded during static surveillance for the three most frequently encountered bat species.

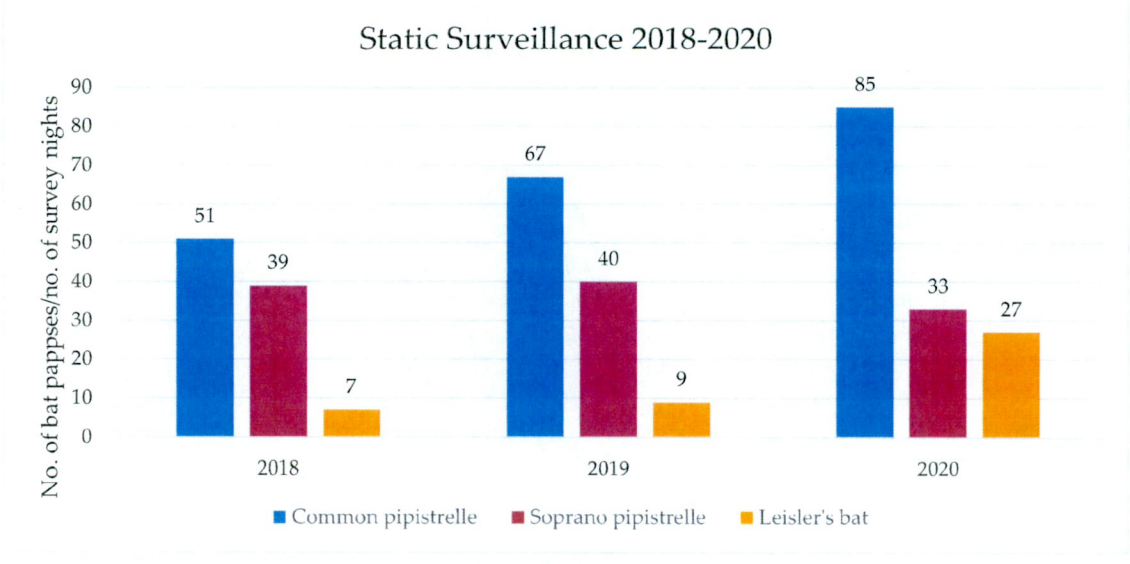


Figure 5d: Average number of bat passes recorded during static surveillance for the three most frequently encountered bat species.

However, overall the level of the level of bat activity (total number of bat passes divided by total number of hours of surveillance (2018: 108 hrs; 2019: 96 hrs and 2020: 140 hrs), apart from common pipistrelle in 2020 (1704 bat passes / 140 hrs = 12 bat passes/hr = Medium level of bat activity), there was less than 10 bat passes recorded per hour which is considered by the author as a Low level of bat activity.

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 7-9 hours per night depending on the month of surveillance.

### 3.3 Bat Species Records Summary 2018-2022

#### *3.3.1 Common pipistrelle*

Common pipistrelles were recorded during all walking transects and static surveillance surveys. This species was recorded foraging throughout the survey area with records distributed along the hedgerows, treelines and located along the treeline adjacent to the canal.

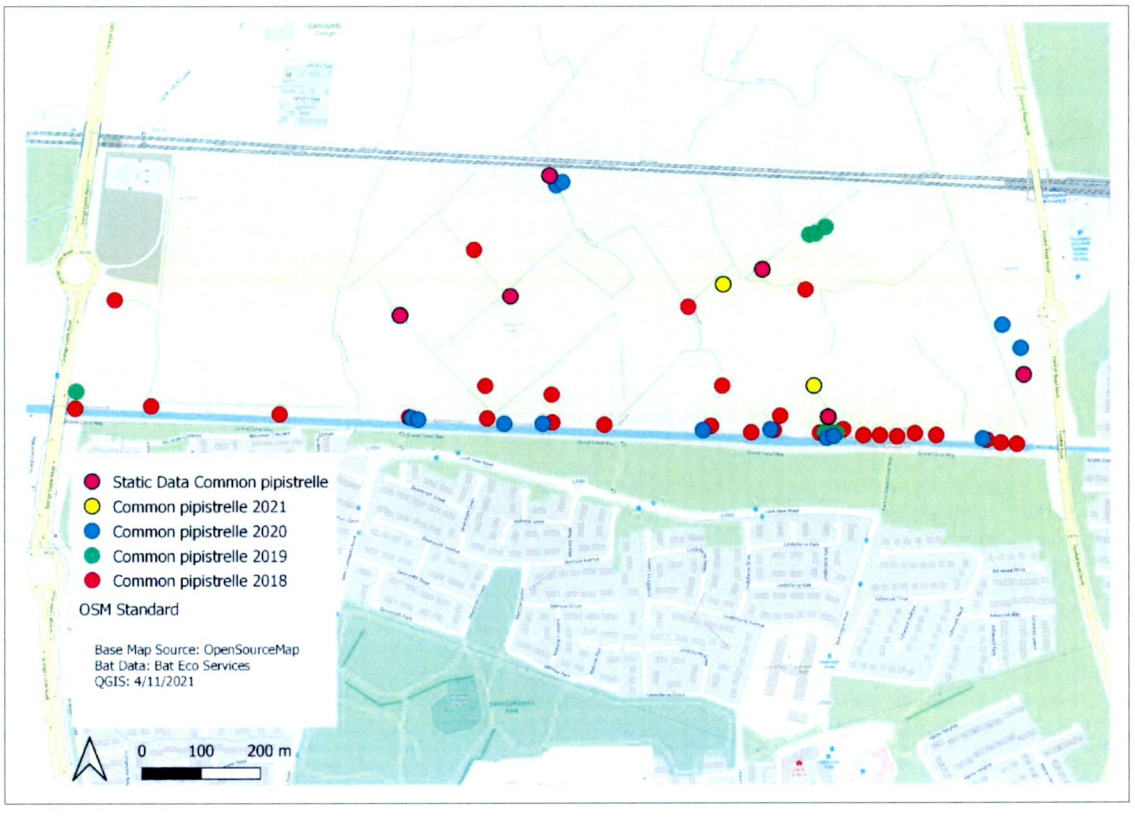


Figure 6a: Location of common pipistrelle bat encounters within the survey area during 2018-2021 surveys.

#### *3.3.2 Soprano pipistrelle*

Soprano pipistrelles were recorded during all walking transects and static surveillance surveys. This species was recorded foraging throughout the survey area with the majority of the records located along the treeline adjacent to the canal.

#### *3.3.3 Leisler's bat*

Leisler's bats were recorded during all walking transects and static surveillance surveys. This species was recorded foraging throughout the survey area with the majority of the records located along the mature treelines within the internal linear habitat network and along treelines adjacent to the canal.

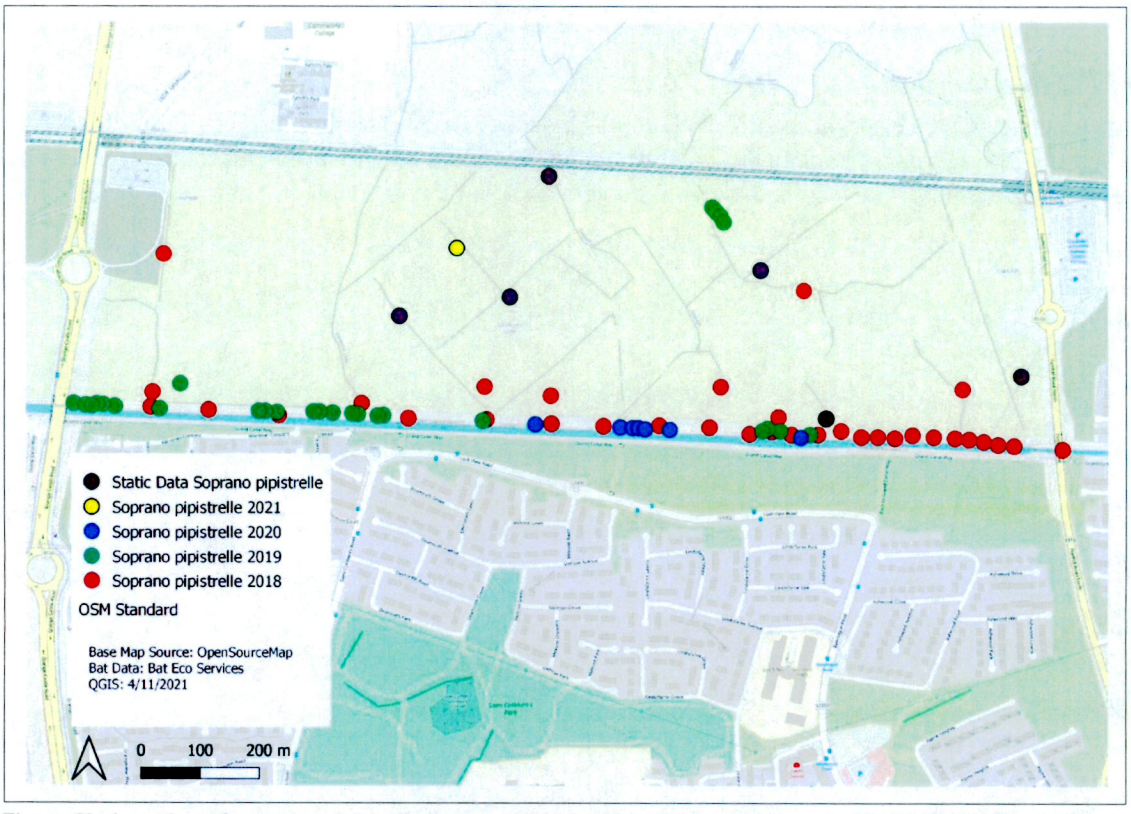


Figure 6b: Location of soprano pipistrelle bat encounters within the survey area during 2018-2021 surveys.

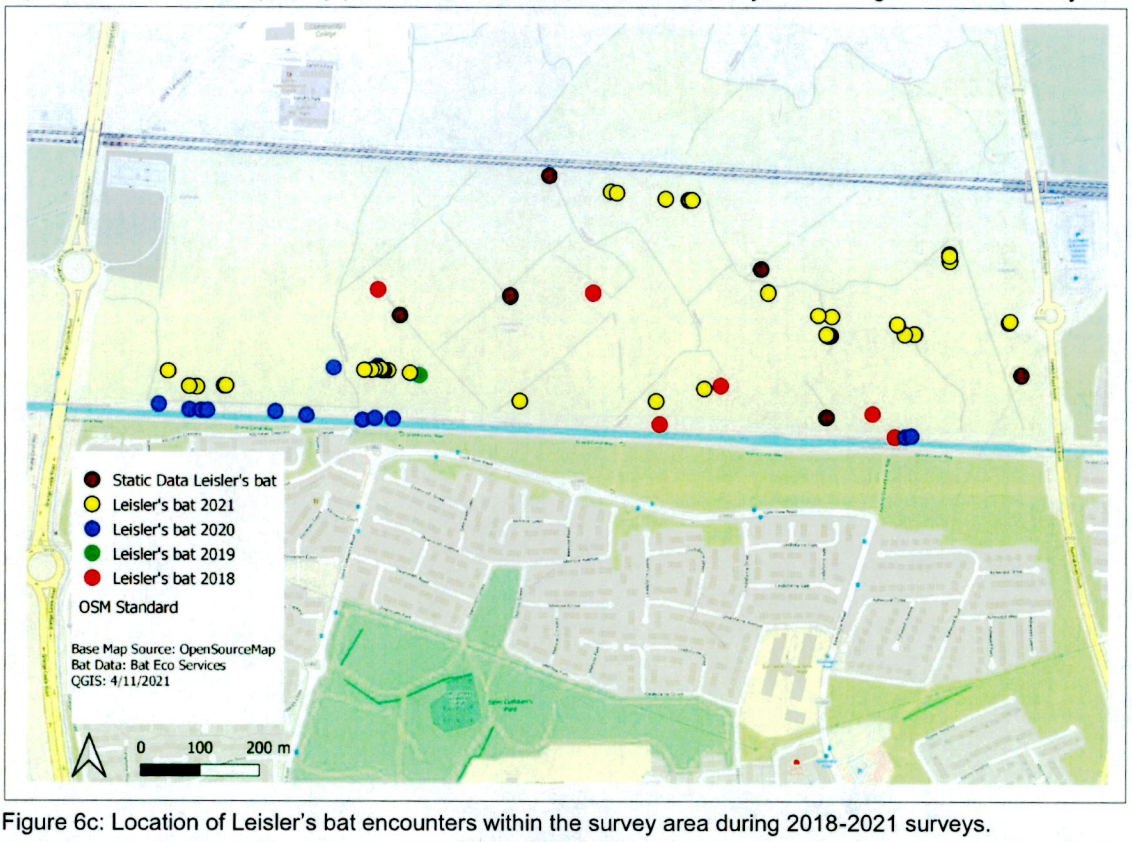


Figure 6c: Location of Leisler's bat encounters within the survey area during 2018-2021 surveys.

### *3.3.4 Brown long-eared bat*

Brown long-eared bats were only recorded during static surveillance during 2020 and on static units located along hedgerows within the internal linear habitat network of the survey area. A single bat pass of this bat species was recorded on the static units on the same night (16/7/2020) and therefore it is likely that is was one individual bat commuting and foraging through the survey area.

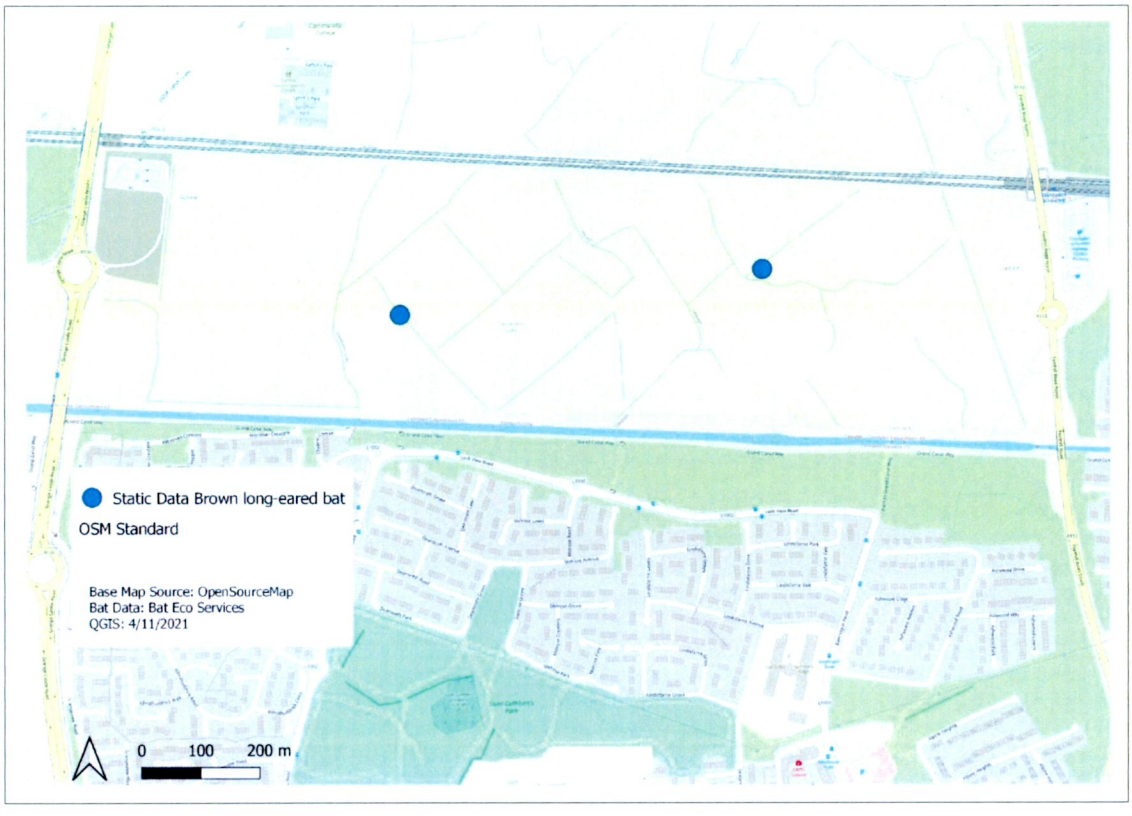


Figure 6d: Location of brown long-eared bat encounters within the survey area during 2018-2021 surveys.

### *3.3.5 Daubenton's bat*

Daubenton's bats were recorded during the 2018 walking transects and during static surveillance surveys completed in 2018 (one static unit, 3 bat passes) and 2020 (one static unit, 3 bat passes). The location of the static units was in the same grid refence point: hedgerow along the eastern section of the survey area. This species was only recorded during the 2018 walking transects and this was on the water surface of the canal.

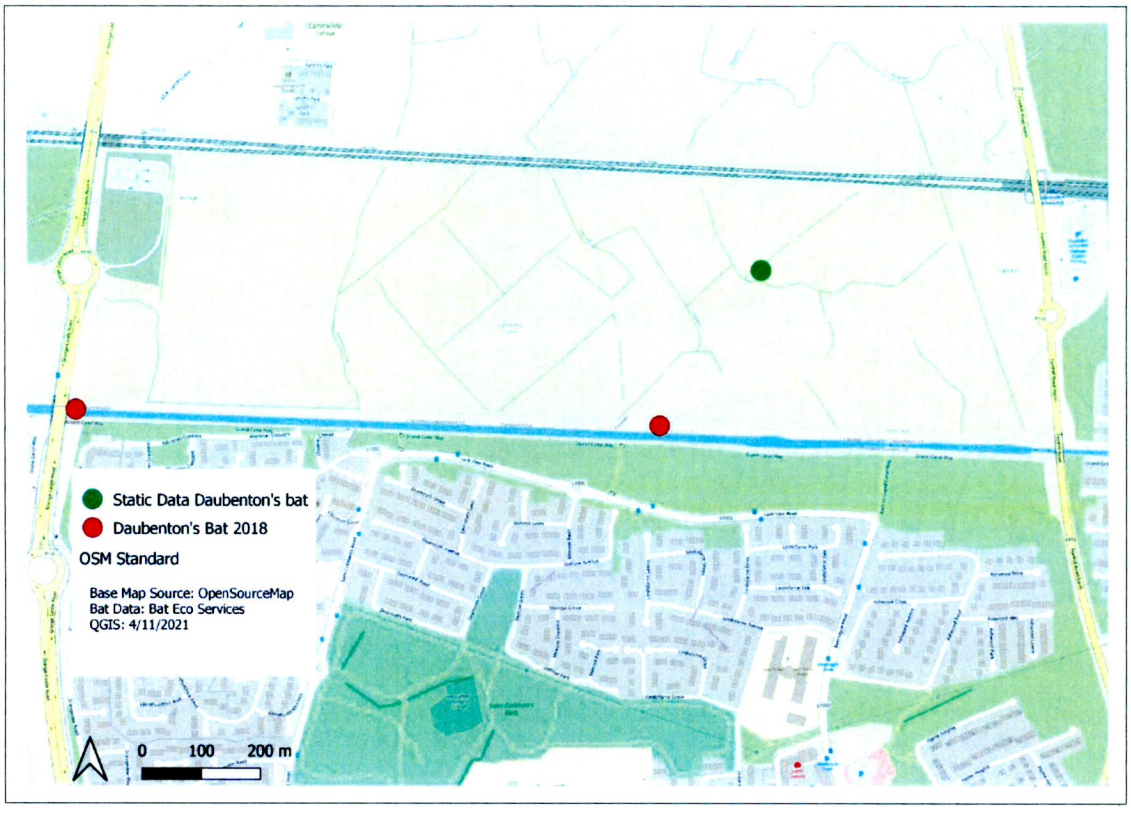


Figure 6d: Location of Daubenton's bat encounters within the survey area during 2018-2021 surveys.

### 3.4 Bat Species in Clonburris T3

The proposed development site is a much smaller area that what was surveyed for bats. Extracting the data for this proposed development indicates that five species of bat were recorded during the array of surveys completed: common pipistrelle, soprano pipistrelle, Leisler' bat, brown long-eared bat and Daubenton's bat.

## 3.5 Desktop Review

### *3.5.1 Bat Conservation Ireland Database*

The bat records within a 1km radius of the proposed development on the BCIreland database. This dataset consists of 5 bat records. The number of records for each species is as follows:

| | |
|---|---|
| Lesser horseshoe bat | 0 records; |
| Common pipistrelle | 5 records; |
| Soprano pipistrelle | 5 records; |
| *Pipistrellus* species | 0 records; |
| Leisler's bat | 5 records; |
| *Myotis* species | 0 records; |
| Daubenton's bat | 2 records; |
| Natterer's bat | 0 record; |
| Brown long-eared bat | 1 records; and, |
| Nathusius' pipistrelle | 0 record. |

This is consistent with the bat survey results reported.

### *3.5.2 Bat Conservation Ireland Landscape Favourability*

Figure 7 depicts the Bat Conservation Ireland Landscape Favourability Model (Lundy *et al.*, 2011). The county is divided into 5km squares and the different colouring of the square, indicates the favourability of the 5km square for bats. This GIS layer is hosted on the NBDC website www.biodiversityireland.ie. The proposed development site is approximately location in the Blue Box. This 5km square has an overall Medium favourability for bats, in general. The percentage favourability for each bat species is presented in the table below. The 5km square has Medium to High favourability for the three of the five species of bat recorded during the surveys: common pipistrelle, brown long-eared bat, and Leisler's bat and a Medium favourability for soprano pipistrelle and Low to Medium favourability for Daubenton's bat.

**Table 11: 5km Square Bat Landscape Favourability value for individual bat species (Source: www.biodiversityireland.ie).**

| Bat species | 5km Square |
|---|---|
| **Common pipistrelle** | 41% (Medium to High) |
| **Soprano pipistrelle** | 35% (Medium) |
| **Nathusius' pipistrelle** | 19% (Low to Medium) |
| **Leisler's bat** | 41% (Medium to High) |
| **Brown long-eared bat** | 40% (Medium to High) |
| **Daubenton's bat** | 19% (Low to Medium) |
| **Natterer's bat** | 26% (Medium) |
| **Whiskered bat** | 19% (Low to Medium) |
| **Lesser horseshoe bat** | 0% (Not suitable) |

Figure 7: Bat Landscape Favourability Model (All Bats) (Source: NBDC). Blue square – approximate location of proposed development and extent of survey area.

### 3.6 Survey Effort, Constraints & Survey Assessment

The following table details any Survey Constraints encountered and a summary of Scientific Assessment completed.

Table 12: Survey Effort, Constraints & Survey Assessment Results.

| Category | Discussion |
|---|---|
| **Timing of surveys** | Varied during the course of the four years – all in favourable weather conditions. |
| **Survey Type** | Bat Survey Duties Completed (Indicated by red shading)<br>Tree PBR Survey ● — Daytime Building Inspection ●<br>Static Detector Survey ● — Daytime Bridge Inspection ○<br>Dusk Bat Survey ● — Dawn Bat Survey ○<br>Walking Transect ● — Driving Transect ○<br>Trapping/Mist Netting ○ — IR Camcorder filming ○<br>Endoscope Inspection ○ — Other ○ |
| **Weather conditions** | Favourable for bat activity. |
| **Survey Constraints** | Limitation to complete surveys due to anti-social behaviour. Security required in 2021 and 2022. |
| **Survey effort**<br>**TOTAL = 651 hrs** | Walking Transects: x6 (1-2 surveyors) – 18 hrs<br>Dusk surveys: x2 (2 surveyors) – 3 hrs<br>Static surveillance: 4 years – 624 hrs<br>Daytime inspection: x2 - 6 hrs |
| **Extent of survey area** | Larger area than the proposed development area of Clonburris T3 |
| **Equipment** | All in good working order. |

The extent of the surveys undertaken has achieved to determine:

- Presence / absence of bat within the survey area;
- A bat species list for the survey area;
- Extent and pattern of usage by bats within the survey area.

It is therefore deemed that the Scientific Assessment completed is Appropriate in order to completed the aims of the bat survey.

# 4. Bat Ecological Evaluation

## 4.1 Bat Species Recorded & Sensitivity

Five bat species were recorded in total by the array of bat surveys completed for the greater survey site. The proposed development site is a much smaller area that what was surveyed for bats. Extracting the data for this proposed development indicates that five species of bat were recorded during the array of surveys completed: common pipistrelle, soprano pipistrelle, Leisler' bat, brown long-eared bat and Daubenton's bat.

Three of the bat species recorded were common pipistrelle, Leisler's bat and soprano pipistrelle and these are the three most common bat species in Ireland.

Soprano pipistrelles were recorded during all walking transects and static surveillance surveys. While this species was recorded foraging and commuting throughout the survey area, the majority of the bat encounters were in vicinity of the treeline along the Grand Canal. In relation to static surveillance a Low level of bat activity was recorded for this species of bat.

Common pipistrelles were recorded during all walking transects and static surveillance surveys. This species was recorded foraging throughout the survey area with records distributed along the hedgerows, treelines and located along the treeline adjacent to the canal. In relation to static surveillance a Low to Medium level of bat activity was recorded for this species of bat.

Leisler's bats were recorded during all walking transects and static surveillance surveys. This species was recorded foraging throughout the survey area with the majority of the records located along the mature treelines within the internal linear habitat network and along treelines adjacent to the canal. In relation to static surveillance a Low level of bat activity was recorded for this species of bat.

The remaining two bat species are considered to be less common in Ireland.

Brown long-eared bats were only recorded during static surveillance during 2020 and on static units located along hedgerows within the internal linear habitat network of the survey area. A single bat pass of this bat species was recorded on the static units on the same night (16/7/2020) and therefore it is likely that is was one individual bat commuting and foraging through the survey area.

Daubenton's bats were recorded during the 2018 walking transects and during static surveillance surveys completed in 2018 (one static unit, 3 bat passes), 2020 (one static unit, 3 bat passes) and 2022. The location of the static units relating to the 2018 and 2020 static surveillance was at the same grid refence point: hedgerow along the eastern section of the survey area while the static unit that recorded Daubenton's bats in 2022 was position adjacent to the canal. This species was only recorded during the 2018 and 2022 walking transects and this was on the water surface of the canal.

**Leisler's bat**

- Leisler's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Leisler's bat population is considered to be significantly increasing (Aughney *et al.*, 2021).
- The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km$^2$). 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.

**Common pipistrelle**

- Common pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national common pipistrelle population is considered to be significantly increasing (Aughney *et al.,* 2021).
- The modelled Core Area for common pipistrelle is a relatively large area that covers much of the island of Ireland (56,485km$^2$). 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).

**Soprano pipistrelle**

- Soprano pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national soprano pipistrelle population is considered to be significantly increasing (Aughney *et al.,* 2021).
- The modelled Core Area for soprano pipistrelle is a relatively large area that covers much of the island of Ireland (62,020km$^2$). 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).

**Brown long-eared bat**

- Brown long-eared bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national brown long-eared bat population is considered to be stable (Aughney *et al.,* 2021).
- The modelled Core Area for brown long-eared bat is a relatively large area that covers much of the island of Ireland (49,929 km$^2$). 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 0.5km emphasising the importance of local landscape features for this species (Roche *et al.,* 2014).

**Daubenton's Bat**

- Daubenton's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Daubenton's bat population is considered to be stable (Aughney *et al.,* 2021).
- The modelled Core Area for Daubenton's bat is (41,285 km$^2$) 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).

- No Annex II bat species are known to occur in County Dublin (i.e. lesser horseshoe bat) and were not recorded within the survey.

### 4.2 Bat Foraging Habitat & Commuting Routes

The Clonburris South-West Development Area of the Clonburris Strategic Development Zone (SDZ) is comprised of treelines and hedgerows in a well-connected immediate landscape with the Grand Canal as the southern boundary of the proposed development site. An inspection of aerial photographs of the Clondalkin area, the Clonburris site and an area of equivalent size north of the railway line and to the west are the remaining green areas in an urban setting. There are a number of small parks north of the proposed development site: Griffeen Valley Park, Ballyowen Park and Collins Park.

The Clonburris South-West Development Area of the Clonburris Strategic Development Zone (SDZ) is principally used a commuting route and foraging area for bats. The location of the Grand Canal along the southern boundary is an important conduit for nocturnal wildlife. Currently there is outdoor lighting along the two path on the southern bank of the Grand Canal. However there is no outdoor lighting on the northern bank of the Grand Canal within the proposed development site. Therefore it is essential that one side of the Grand Canal remains in darkness to allow nocturnal wildlife to move at night time.

### 4.3 Zone of Influence – Bat Landscape Connectivity

The Clonburris South-West Development Area of the Clonburris Strategic Development Zone (SDZ) is comprised of treelines and hedgerows in a well-connected immediate landscape with the Grand Canal as the southern boundary of the proposed development site. There are a number of small parks north of the proposed development site: Griffeen Valley Park, Ballyowen Park and Collins Park. The River Liffey Valley is located further north of the proposed development site but due to the extent of urbanisation in between, there is little dark corridors to connect this wooded river valley to the green areas within the Clondalkin area.

The proposed development site of Clonburris T3 is principally used a commuting route and foraging area for bats. The location of the Grand Canal along the southern boundary is an important conduit for nocturnal wildlife. Currently there is outdoor lighting along the two path on the southern bank of the Grand Canal. However there is no outdoor lighting on the northern bank of the Grand Canal within the proposed development site. Therefore it is essential that one side of the Grand Canal remains in darkness to allow nocturnal wildlife to move at night time. Therefore, the Grand Canal is the principal commuting corridor that connects the landscape in the south of Clondalkin and retaining this in darkness is essential for nocturnal wildlife.

## 5. Impact Assessment & Mitigation

The following bat species were recorded during this bat survey: common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat and brown long-eared bat. This represents five of the nine resident bat species known to Ireland and five of the eight species known to County Dublin.

### 5.1 Impact Assessment - Loss of bat roosts

While one building (Omer Lock house), located on the tow path of the Grand Canal was surveyed, this is not within the proposed development area or under ownership of Cairn Homes. This building was not recorded as a bat roost but due to its proximity to the Grand Canal it has a Medium roost suitability.

No trees of PBR value are located in the smaller area of ClonburrisT3. Therefore, no bat roosts will be directly impacted by the proposed development.

### 5.2 Impact Assessment – Foraging & Commuting Habitats

The proposed development site is an agricultural site with hedgerow and treelines. In order to facilitate the proposed development, this internal network of linear habitats will be removed. Therefore the foraging and commuting habitats for local bat populations will be impacted on.

### 5.3 Impact Assessment – Construction and Operation of residential development

The construction and operation of the proposed residential development will potentially increase the degree of light (both street and residential lighting) spilling onto the treeline and wooded habitats within the survey area. As the current planning application is a small area within the overall survey area, it is important that there is an overall appreciation of the entire survey site for bats.

### 5.4 Clonburris Greater Area

The Clonburris development includes a much larger area than T3. As bats travel greatly through the landscape, it is important that the overall management of the Clonburris Greater Area takes into consideration its potential impact on local bat populations.

#### *5.4.1 Landscape Plan & Tree Strategy*

The Tree Strategy Plan provides details of the trees to be retained. The trees identified as Potential Bat Roosts (PBRs) are proposed to be retained in the overall area surveyed. The Landscape Master Plan also indicates that there is a pedestrian/cycle greenway zig zagging along the treeline of the southern section of the proposed development site adjacent to the Grand Canal. This will be part of the proposed Grand Canal Park which will provide a tall vegetation buffer zone from proposed residential buildings within the proposed development site and the Grand Canal. To ensure that this buffer is effective for nocturnal wildlife, there should be no lighting be located along the canal tow path and within 30m of the canal's northern bank. There is also plans to provide additional tree planting throughout the proposed development site.

#### *5.4.2 Lighting Plan*

The lighting plan took into consideration the importance of retaining an dark ecological corridor along the principal southern boundary of the greater survey area adjacent to the Grand Canal. Apart from an access point to the greenway off the public roadway (eastern boundary) there is no lighting proposed within 30m of the Grand Canal pNHA boundary. As a consequence, there is no light spillage on to the surface of Grand Canal. This is assisted by the retention of the mature treeline between the proposed development and the Grand Canal tow path.

### *5.4.3 Landscape Plan*

The principal component of the Landscape Master Plan that will benefit local bat populations is the creation of two parks, the Grand Canal Park (2.85 ha) and the Local Park (1.56 ha), both to the south of the Clonburris area. The Grand Canal Park will provide essential commuting and foraging areas for local bat populations but will also buffer the Grand Canal from noise and lighting during the operation of the proposed development. In addition, there is an extensive planting regime proposed by the plan, which will be predominantly native tree species.

The landscape strategy for Clonburris T3 is to retain the existing northern boundary which will retain connectivity for local bat populations in this area. New hedgerow planting is also designed along the western and north-western boundary which will provide foraging habitat for bats.

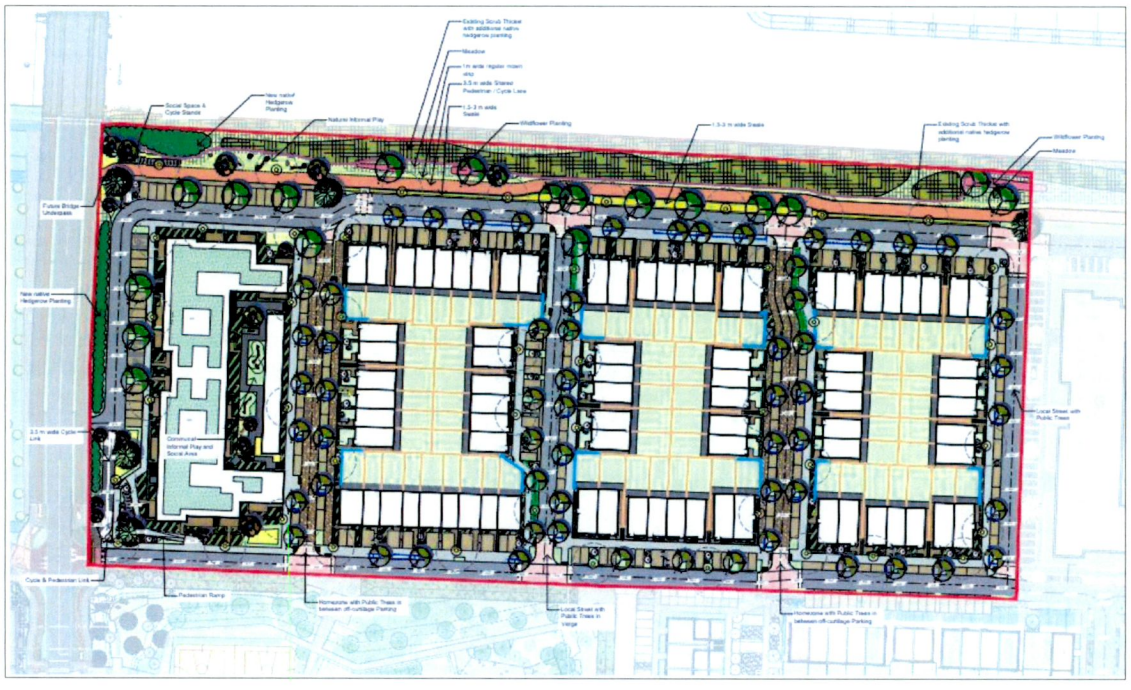

Figure 8: Landscape strategy for Clonburris T3.

## 5.5 Impact Assessment – Clonburris T3

There is a low to medium level of bat activity within the overall survey area while there is a low level of bat activity within the smaller proposed development area of Clonburris T3.

With just reference to the Clonburris T3 area proposed to be developed, without bat mitigation measures, the proposed development will have an overall Slight negative impact on local bat populations (Table 12). According to Tables 4a and 4b (Section 1.2.1) the following is the assessment:

- Habitat loss (potential roosting/foraging/ commuting habitat) effects on all bat species are assessed as **Permanent Slight Negative Effects**. This is relation to the proposed removal of internal linear habitat features.
- Disturbance and/or displacement effects on all bat species during the construction phase are assessed as **Short-term Slight Negative Effect.** This is in relation to the outdoor lighting for the proposed development.

However, the overall proposed Landscape Master Plan for the greater survey area will have a positive impact on local bat populations, particularly the large scale planting proposed, establishment of the Grand Canal Park and Local Park and the retention of the mature treeline along the southern boundary of the proposed development site. The retraction of lighting in the Grand Canal Park will reduce the impact of the proposed development on local bat populations utilising the Grand Canal. The retention of the mature treeline along the boundary of the proposed development and the tow path of the canal will also act as a buffer zone to reduce lighting spillage. With reference to T3, the landscape plan seeks the preservation and enhancement of the existing hedges along the railway and its connection to the south. Other important green links will be to connect the proposed development area to the local parks south of the area and along the canal.

## 5.6 Mitigation Measures

The following mitigation measures are recommended to reduce the potential impact of the proposed development on local bat populations, to protect local bat populations during proposed works and to conserve local bat populations post residential development.

### *5.6.1 Lighting Plan*

It is important that any proposed lighting for the proposed residential development is wildlife friendly and that there is a provision for continued dark zones to facilitate movement of light sensitive bat species such as brown long-eared bats and Natterer's bats. This is particularly important in relation to the extension of street lighting as the town of Maynooth extends eastwards.

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. It is also important that developments reduce their impact on the night sky and reduce sky glow. The "Dark Sky" principal should be followed – i.e. no upward lighting to reduce light pollution. The following principles should be followed:

- Luminaire design for any street lighting or lighting on buildings 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. The intensity of external lighting should be limited to ensure that skyglow does not occur in order to reduce light pollution.
- 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.

### *5.6.2 Landscape Plan – Greater Clonburris Area*

Due to the fact that Clonburris T3 is a small proposed development area, the bat mitigation measures relating to landscape relate in the greater development area of Clonburris.

In relation to the T3, it is recommended that proposed new hedgerow planting consists of native tree and shrub plants (Alder, Birch, Crab apple, Rowan etc.) along the northern and western boundary of the proposed development site and that these linear habitats connect to proposed parks along the canal and to the south of the overall Clonburris development area. It is recommended that any exiting tall vegetation along the northern boundary is retained and protected during construction works.

### *5.6.3 Supplementary Roosts – Greater Clonburris Area*

Due to the fact that T3 is a small proposed development area, It is recommended that a bat box scheme should be erected in the parks proposed to be located along the canal and to the south of the overall Clonburris development area. Positioning the bat box scheme here will ensure its greater benefit for local bat populations. This is in the form of three rocket bat boxes to be erected within the boundary habitats and parks.

Bat boxes scheme be sited carefully and this will be undertaken by a bat specialist. The rocket bat boxes are to be erected on a 5m pole fixed in $1m^3$ of 40 newton strength concrete (Please see appendices for details) and these should be located in parks proposed along the Grand Canal and Linear park.

### *5.6.4 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 and alternative roosts for Natterer's bat and brown long-eared bats. Register bat box scheme, rocker bat boxes and supplementary roosts with Bat Conservation Ireland. This should be undertaken for a minimum of 2 years in relation to bat boxes/rocket bat boxes.
- 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.

If the mitigation measures recommended in this report are strictly followed the potential impact of the proposed development on local bat populations will be reduced.

## 6. Survey Conclusions

Five bat species were recorded in total by the array of bat surveys completed for this survey site. Three of the bat species recorded were common pipistrelle, Leisler's bat and soprano pipistrelle and these are the three most common bat species in Ireland. The remaining two bat species (Daubenton's bats and brown long-eared bats) are considered to be less common in Ireland but were also recorded in lower activity levels within the proposed development area.

The proposed development site is an agricultural site with hedgerow and treelines. In order to facilitate the proposed development, this internal network of linear habitats will be removed. Therefore the foraging and commuting habitats for local bat populations will be impacted on.

Due to the fact that the proposed development site is part of a larger survey area, it is important that overall plans relating to lighting and landscape is considered to ensure that the local bat populations are conserved post development. The majority of bat mitigation measures are with reference to the greater Clonburris area.

The lighting plan will ensure that the guidelines recommended by BCT, 2018 will be implemented and therefore reducing the impact of the lighting plan on local bat populations.

The landscape plan for the greater Clonburris area aims to retain as much of the trees and treelines along the southern and eastern boundaries of the greater survey area. It will also undertake additional planting to provide foraging and commuting habitat for local bat populations. The development of the Grand Canal Park will provide a dark ecological corridor along the Grand Canal which will have a positive impact on local bat populations and other nocturnal wildlife. This is particularly important for commuting nocturnal wildlife.

As part of the Landscape Plan for the greater Clonburris area, additional bat mitigation measures have been recommended in relation to a new eastern boundary and the erection of a bat box scheme. This will increase the positive conservation of the sections of the proposed development for local bat populations.

Therefore the proposed development, if all mitigation measures including the Lighting Plan and Landscape Plan are strictly adhered to, will likely have a **Permanent Slight Negative Effects** on local bat populations within the smaller proposed development site and in the long-term for the greater survey area.

However due to extensive landscape mitigation measures proposed and the proposed dark corridor within the Grand Canal Park, the proposed development will likely have a **Not Significant Negative Effects** on local bat populations along the Grand Canal. This is an important factor in protecting this linear habitat that is the primary foraging area for local bat populations within the survey area.

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# 8. Appendices

Appendix 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.<br>  |

**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 | |

## Appendix 2 Light Treatments

Lighting, including street lights come in an array of different types. The Information Box provided below is taken from BCT, 2018 and provides an comprehensive summary of lighting types.

**INFORMATION BOX – Type of Lights used in exterior lighting applications, (Taken directly from BCT, 2018)**

**Low-pressure sodium lamps (SOX)** (orange lamps seen along roadsides). Light is emitted predominantly at one wavelength, contains no ultraviolet (UV) light, and has a low attraction to insects. The lamps tend to be large which makes it more difficult to focus the light from these lamps. These are in the gradual process of being removed or replaced, in part due to their poor colour rendition, and will not be available past 2019.

2. **High-pressure sodium lamps (SON)** (brighter pinkish-yellow lamps). Commonly used as road lighting. Light is emitted over a moderate band of long wavelengths giving little, if any, UV component, except for the version of the lamp used in horticulture. Insects are attracted to the brighter light. The lamp is of medium size and the light can be more easily directed than low pressure sodium. This lamp is still used for some main road lighting but this is being reduced; these lamps are expected to be phased out in the future.

3. **Mercury lamps (MBF)** (bluish-white lamps). These emit light over a moderate spectrum, including a larger component of UV light to which insects are particularly sensitive. Insects are attracted in large numbers along with high densities of certain tolerant bat species (Rydell & Racey 1993). They ceased to be available in the EU in 2015 and are rare now.

4. **White SON**. This is a reddish white light source. It is based on high pressure sodium technology and has the same UV component as SON. This source is no longer used and is not available now.

5. **Metal halide.** A small lamp and therefore more easy to focus light and make directional. Emits a small UV content. The light source is available in three forms a) quartz arc tube (HQI); b) ceramic arc tube (CDM-T) and c) CosmoPolis which is the newest of the ceramic forms. Still used by some for some exterior lighting applications.

6. **Light emitting diodes (LEDs)**. This is the light source of choice for most local authorities. The light emitted is more directional and normally controlled by lenses or sometimes reflectors. The light is produced in a narrow beam. It is an instant light source. LED is available in a number of colour temperatures. Older installations tend to use 'cool white' (blueish colour) at >5700° Kelvin. More recently, 4000°K has become more commonly used. 'Warm white' (more yellow/orange colour) at around 3000°K and as low as 2700°K can now be used with little reduction in lumen output. LED typically features no UV component and research indicates that while lower UV components attract fewer invertebrates, warmer colour temperatures with peak wavelengths greater than 550nm(~3000°K) cause less impacts on bats (Stone, 2012, 2015a, 2015b).

7. **Tungsten halogen**. Is not used in new lighting schemes but may be encountered as security light on a private household.

8. **Compact fluorescent.** Mostly in use in residential street lighting. It produces a white light; variants are available with minimal UV output. It can be used at a low wattage and therefore on a low output to achieve low levels of illuminance (measured in lux).

## Appendix 3 Rocket Bat Boxes

An Irish supplier of this type of bat box is:

Shop - Eire Ecology – Rocket Bat Box

# 9. Bat Species Profile

## 9.1 Leisler's bat

Ireland's population is deemed of international importance and the paucity of knowledge of roosting sites, makes this species vulnerable. However, 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 (52,820km$^2$). 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 |
| Irish Population Trend | 2003-2013 ↑ |
| Estimated Irish Population Size | 73,000 to 130,000 (2007-2013) Ireland is considered the world stronghold for this species |
| Estimate Core Area (Lundy *et al. 2011)* | 52,820 km$^2$ |

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

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

- Selection of maternity sites is limited to specific habitats;
- Relative to the population estimates, the number of roost sites is poorly recorded;
- Tree felling, especially during autumn and winter months; and
- Increasing urbanisation.

## 9.2 Common pipistrelle

This species is 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 (56,485km$^2$) 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 |
| Irish Population Trend | 2003-2013 ↑ |
| Estimated Irish Population Size | 1.2 to 2.8 million (2007-2012) |
| Estimate Core Area (km$^2$) (Lundy *et al. 2011)* | 56,485 |

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Common pipistrelles 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.
- Renovation or demolition of derelict buildings.
- Tree felling
- Increasing urbanisation (e.g. increase in lighting)

### 9.3 Soprano pipistrelle

This species is 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 (62,020km$^2$). 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 |
| Irish Population Trend | 2003-2013 ↑ |
| Estimated Irish Population Size | 0.54 to 1.2 million (2007-2012) |
| Estimate Core Area (km$^2$) (Lundy *et al. 2011)* | 62,020 |

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

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

- Lack of knowledge of roosts;
- Renovation or demolition of structures;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

### 9.4 Brown long-eared Bat

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 (52,820km$^2$) 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 0.5km 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 |
| Irish Population Trend | 2008-2013 Stable |
| Biographical Range | km$^2$ |
| Estimate Core Area (Lundy *et al. 2011)* | 49,929 km$^2$ |

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

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

- Selection of maternity sites is limited to specific habitats;
- Lack of knowledge of winter roosts;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

### 9.5 Daubenton's bat

The modelled Core Area for Daubenton's bats is a relatively large area that covers much of the island of Ireland (41,285km$^2$) 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 |
| Irish Population Trend | 2008-2013 Stable |
| Estimated Irish Population Size | 81,000 to 103,000 (2007-2012) |
| Estimate Core Area (km$^2$) (Lundy *et al. 2011)* | 41,285 |

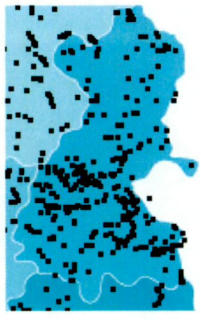
Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

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

- Potential roost loss due to bridge maintenance;
- Loss of woodland and forest clearance;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

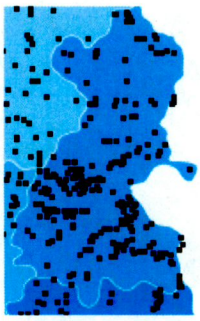
### 9.6 Bat Conservation Ireland Bat Species Maps

Bat records for County Dublin (Source: www.batconservationireland.org)

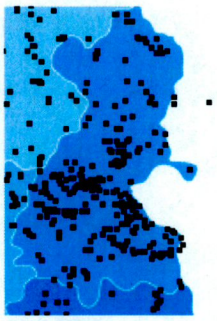


Common pipistrelle

Nathusius' pipistrelle



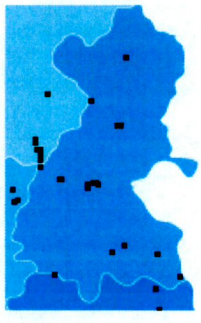
Soprano pipistrelle



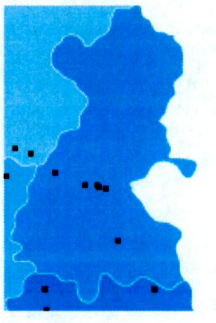
Leisler's bat

Brown long-eared bat

Daubenton's bat



Natterer's bat



Whiskered bat

Lesser horseshoe bat