2021

Bat Assessment – Hayden's Lane, Lucan, Co. Dublin

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Bat Eco Services

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NPWS licence C13/2020 (Licence to handle bats, expires 31st December 2022);
NPWS licence 08/2020 (Licence to photograph/film bats, expires 31st December 2022) ;
NPWS licence DER/BAT 2019-138 (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: Oppermann Associates

Project Name & Location: Hayden's Lane, Lucan, Co. Dublin.

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
21st April 2021	Draft 1	Oppermann Associates (by email)

Purpose

This document has been prepared as a Report for Oppermann Associates. 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: Hayden's Lane, Lucan, Co. Dublin.

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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Contents

1. Introduction

Bat Eco Services was commissioned by Oppermann Associates to undertake a bat survey of Hayden's Lane, Lucan, Co. Dublin. A survey was undertaken in 2015 but due to the fact that this data is six years old, a new survey was undertaken to update the information previously recorded.

1.1 Relevant Legislation & Bat Species Status in Ireland

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

1.1.1 Irish Legislation

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

The codes used for national legislation are as follows:

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

1.1.2 EU Legislation

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

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

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

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

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

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

1.1.3 IUCN Red Lists

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

1.1.4 Irish Red List - Mammals

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

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

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

1.1.5 Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the 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 a notifiable action and a derogation licence has to be obtained from the *National Parks and Wildlife Service* before works can commence. Any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997 and Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law). The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

This circular states that:

"Under Regulation 23 of the Habitats Regulations 1997, any person who, in regard to the animal species listed in Annex IV of the Habitats Directive –

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 the eggs from the wild, or
d) Damages or destroys a breeding site or resting place of such an animal.

shall be guilty of an offence."

In summary the circular requires that an appropriate assessment is undertaken to identify where a risk of damage or disturbance to an Annex IV species may exist and where a risk is identified, alternative or modifications will be required to avoid risk. Where is it not possible to avoid risk, a derogation licence from the Minister under Regulation 23 of the Habitats Regulation should be considered. The Minister is empowered, within strict parameters, to grant a licence for derogation from complying with the requirements of the provisions of section 21 of the Wildlife Act 1976 and Regulations 23 and 24 of the Habitats Regulations as follows:

"Where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range, the Minister may, in respect of those species, grant a licence to one or more persons permitting a derogation from complying with the requirements of the provision of section 21 of the Principal Act and Regulations 23 and 24".

There are eleven recorded bat species in Ireland, nine of which are considered resident. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species. A total of 41 SACs

have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

Irish bat species list 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.
- Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

- Bat Conservation Trust (2018) Bats and artificial lighting in the UK: bats and the built environment series. Guidance Note 08/2019. BCT, London.

Collins (2016) is the principal document used to provide guidance in relation to survey effort require 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.

Kelleher & Marnell (2006) is referred to for guidance in relation to survey guidance, derogation licences, mitigation measures.

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

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

Ecological Value	Geographical Scale of Importance
International	International or European scale
National	The Republic of Ireland or the island of Ireland scale (depending on the bat species)
Regional	Province scale: Leinster
County	County scale: County Dublin
Local	Proposed development and immediate surroundings
Negligible	None, the feature is common and widespread

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

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

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

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

1.2.1 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

In the context of terrestrial ecosystems, the impact of street lights may appear to be positive for some bats but over the long term impacts may be negative even for those species that seem to gain from exploiting insect swarms. As Rydell (2006) points out, there has been no research into whether or how bat predation at lights affects the size of moth populations. Moths that normally exhibit evasive responses to bats have been shown to be unable to avoid capture by bats under bright street lights (Svensson and Rydell 1998) and some bats that feed at street lights increase their consumption of moths compared with their normal catch in other habitats (Rydell 1992). By disorientating insects that would normally be feeding or engaging in reproductive behaviours, as well as increasing predation by bats, overall reproductive rates may well decrease for insects that are within range of light pollution sources. Therefore resulting in long-term overall decreased availability or diversity of prey species.

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.

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

- Attracting Prey Items;
- Reducing Foraging Habitat;
- Fragmenting The Landscape;
- Reducing Drinking Sites.

1.2.2 Assessment Criteria

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

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

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

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

Table 4a: Criteria for assessing impact quality based on EPA, 2017,

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

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

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

- Overall Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 4b (based on EPA, 2017).

Table 4b: Criteria for assessing significance of effects based on EPA, 2017,

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

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

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

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

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

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

1.3 Project Description

1.3.1 Site Location

The proposed development is located on Hayden's Lane, Lucan, Co. Dublin. The proposed development site consists of a vacant industrial site surrounded by treelines/hedgerows. It is located adjacent to the Griffeen Valley Park. The proposed development site is located in a largely urban setting.

Figure 1a: Aerial photograph of proposed development site: Hayden's Lane, Lucan, Co. Dublin.

1.3.2 Proposed Project

The proposed residential development will consist of:

- Demolition (site clearance) of what remains of the former industrial building. The building itself was demolished some years ago and all that remains is the concrete floor slab.
- Construction of 54 residential units in 3 No. blocks as follows:
    a) North Block: 4 two bedroomed units and 4 three-bedroom units.
    b) East Block: 9 two bedroomed units and 9 three-bedroom units.
    c) West Block: 14 two bedroomed units and 14 three-bedroom units.
- 54 car parking spaces and 120 No. cycle parking spaces.
- New boundary treatment along Hayden's Lane including entrance to the proposed development in the former entrance to the new demolished industrial unit.
- All associated development works, bin stores and landscaping.

Figure 1b: Layout of proposed development site: Hayden's Lane, Lucan, Co. Dublin.

1.3.3 Bat Survey Aims

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

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

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

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

2. Bat Survey Methodology

2.1 Daytime Inspections

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

Table 3: Bat Roost Types (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

There are no buildings within the proposed development site.

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

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

Dusk Emergence Surveys were completed from 10 minutes before sunset to at least 110 minutes post sunset and the surveyor position himself within the proposed development site to determine if bats were roosting in the mature trees along the boundary of the proposed development site.

The following equipment was used:

Surveyor 2: Bat Logger M2 Full Spectrum Bat Detector and Pettersson D200 Heterodyne Bat Detector.

A walking transects was completed post Dusk Emergence Surveys and involved the surveyor walking the park adjacent to the proposed development site (Griffeen Valley Park). Mapping of bat encounters was undertaken using Google My Map facility (Longitude & Latitude co-ordinates, Excel CSV file). Validation of bat records was completed by the principal bat surveyor prior to mapping.

2.2.2 Passive Static Bat Detector Survey

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

The microphone of the unit was position horizontally to reduce potential damage from rain. Bat Logger A+ units and Wildlife Acoustics Song Meter SM2, SM2 BAT+ SM4 Bat FS and SM3 BAT Platform Units use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis. These results are depicted on a graph showing the number of bat passes per species per hour/night. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats

The recordings are analysed using 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 5: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM Mini Bat Units 1 - 3	Wildlife Acoustics SongMeter 2 Bat+	Passive Full Spectrum	SMM-U2

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 O0345433028.

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.

2.4 Photographic Record

A photographic record is completed for the survey and is presented within the text.

2.5 Previous Bat Survey Report

A previous bat survey report was completed by Bat Eco Services in 2015. A daytime inspection and dusk survey was completed on 18th July 2015 and a dawn survey was completed on 19th July 2015. Two static recording units were deployed for one night's surveillance.

Dusk surveying was also completed using a bat detector (Wildlife Acoustics EM3 and Pettersson D200 Heterodyne Bat Detector) from 21:30 hrs to 00:00 hours and 03:30 hrs to 05:00 hrs. Two units of Wildlife Acoustic SongMeter 2 Platform Unit were also deployed and located as follows:

SM1 located to the rear of factory along boundary hedge
SM2 located to gable side of factory, adjacent to halting site

The results of the 2015 bat survey are as follows: there was no evidence of bats roosting in any of the buildings located on site. The survey area has a low potential of providing foraging areas for bats due to its location within a highly built up area with extensive street lighting.

Dusk Survey Results

- four common pipistrelles were recorded commuting from the direction of halting site towards green fields.

Dawn Survey Results

- No bats were recorded during the dawn survey, re-confirming that there are no roosting bats.

SongMeters Results

- Two species of bat was recorded on the SongMeter unit located to the rear of the factory.
- Common pipistrelles (10 passes) were recorded in the 22:00-23:00 hr reflecting commuting bats, similar to the Dusk Survey results.
- Between the hours of 01:00 hrs and 04:00 hrs occasional passes from soprano pipistrelle and common pipistrelle were recorded and indicative of foraging individuals. But the number of passes were low.

Report Citation: Aughney, T. (2015) Bat Survey: Hayden's Lane, Lucan, Co. Dublin. Unpublished report prepared for JNP, Dublin. Bat Eco Services.

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Tree Potential Bat Roost (PBRs) Inspection

The trees located along the boundary of the proposed development site were inspected and the following trees were deemed to have a Potential Bat Roost value (PBR):

Table 6: Tree PBR inspection results.

Tree No.	Tree Species	Grid Reference	PRFs	Bat Usage	Value
T013	Salix alba	00349233008	Split limbs, damage to trunk	None recorded	Category 2
T023	Eucalyptus	00347332973	Tree holes, spilt limbs	None recorded	Category 2

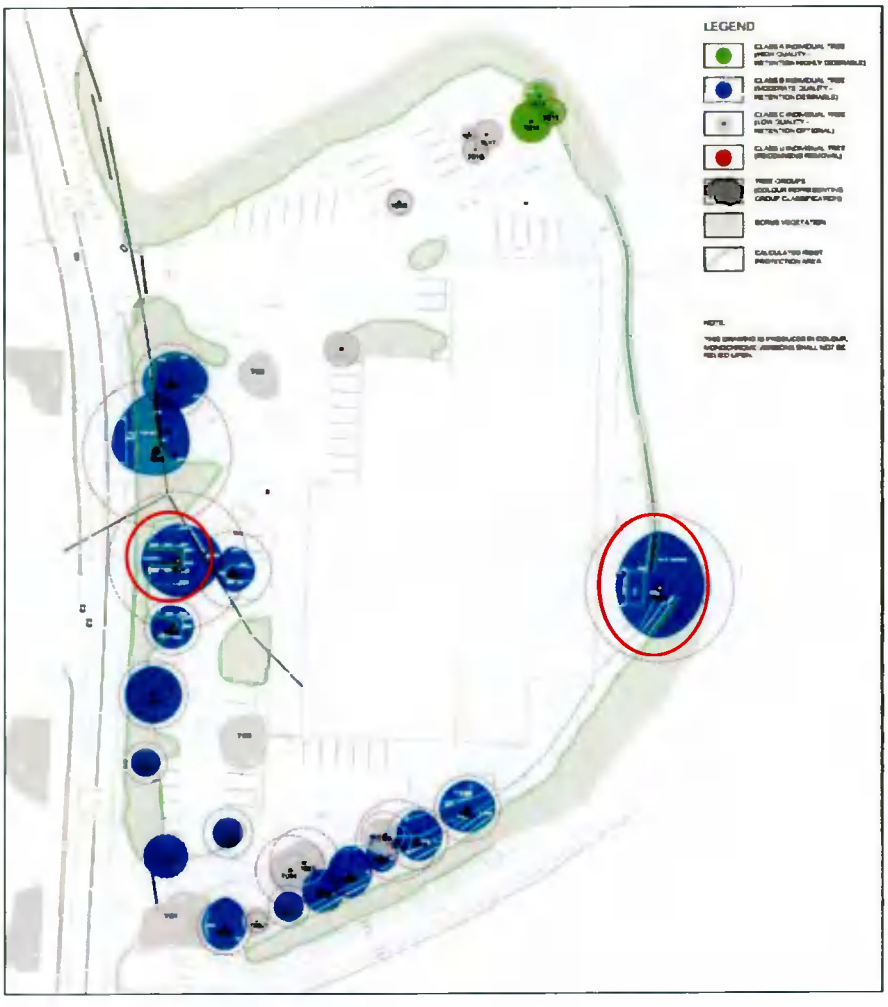

Figure 2: Tree Survey Report - Hayden's Lane, Lucan, Co. Dublin with PBRs enclosed in Red Circles (Source: Cunnane, Stratton & Reynolds).

The two trees identified as PBRs are recommended to be retained in the tree survey report.

3.1.2 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 7a: Habitat types present within survey area.

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

Table 7b: 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	Yes	Brackish waters		Caves		Grasslands	Yes
Coastal structures		Springs		Freshwater marsh		Scrub	
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	Yes
Sea cliffs/islets		Disturbed ground		Heath		Conifer plantation	
Sand dunes		Watercourse	Yes	Bog		Woodland	

3.2 Night-time Bat Detector Surveys

3.2.1 Dusk Bat Survey & Walking Transects

The following figures summarises the results of the bat detector survey completed on 15/4/2021 (Weather conditions: 7oC, partial cloud cover, light breeze and dry). Three species of bat were recorded: common pipistrelle, soprano pipistrelle and Leisler's bat during the survey period (20:06 hrs to 23:06 hrs).

A total of 29 common pipistrelle bat encounters were recorded during the survey. The first common pipistrelle was recorded at 20:27 hrs. Individuals were recorded commuting through the proposed development site towards the adjacent park (Figure 2a, Red arrow). Individuals were recorded foraging around the perimeter of the proposed development site.

A total of 41 soprano pipistrelle bat encounters were recorded during the survey. The first soprano pipistrelle was recorded at 20:39 hrs. Individuals were recorded commuting through the proposed development site towards the adjacent park (Figure b, Yellow arrow). Individuals were recorded foraging around the perimeter of the proposed development site.

A total of 4 Leisler's bat encounters were recorded during the survey. The first Leisler's bat was recorded at 21:03 hrs. Individuals were recorded commuting through the proposed development site towards the adjacent park, but no individuals of this species was recorded foraging within the park during the walking transect.

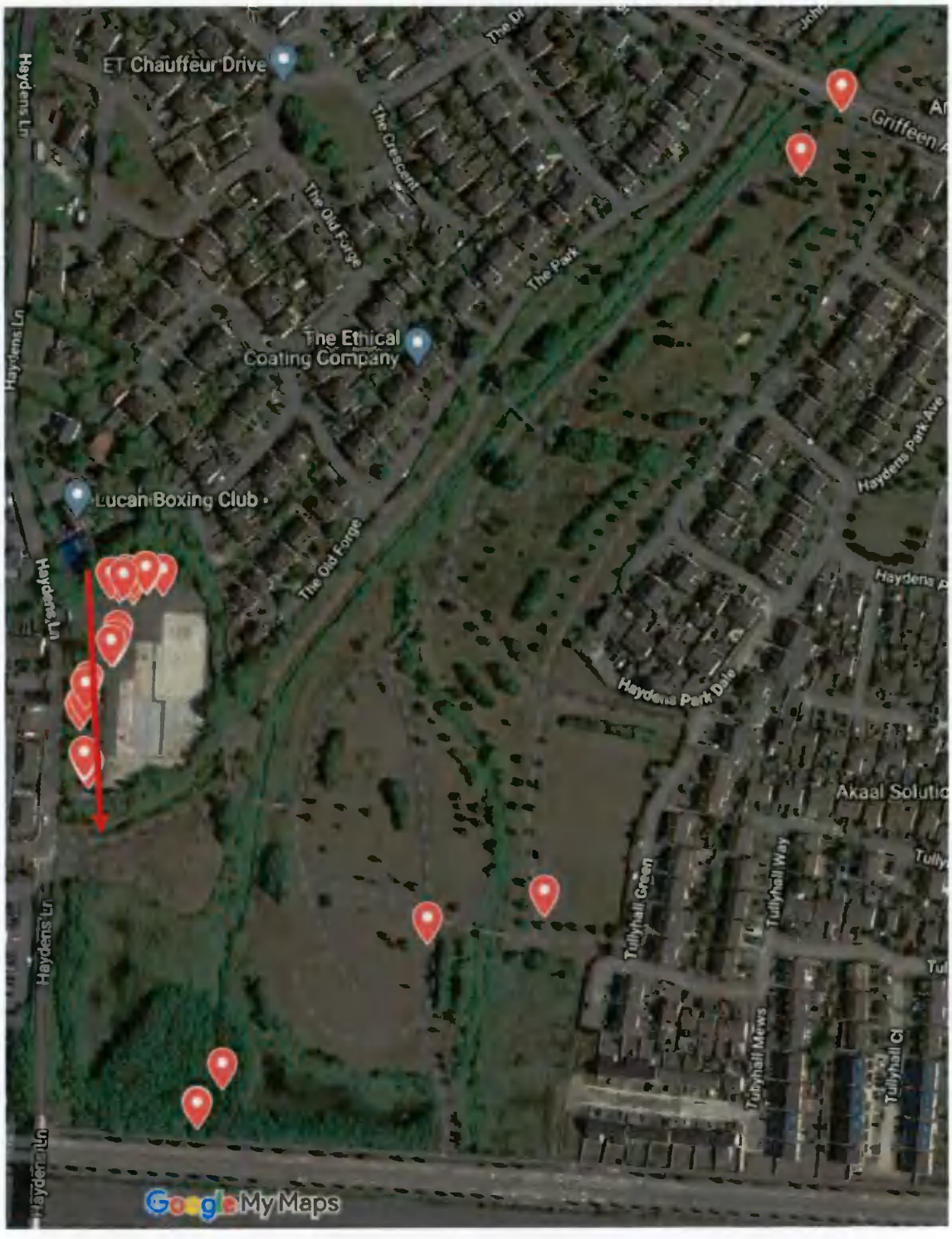

Figure 3a: Common pipistrelle bat encounters during dusk bat survey and walking transect.

Figure 3b: Soprano pipistrelle bat encounters during dusk bat survey and walking transect.

Figure 3c: Leisler's bat encounters during dusk bat survey and walking transect.

3.2.2 Passive Static Bat Detector Survey

The following tables summarises the results recorded on the static units deployed (Please see Figure 3). Three static units were deployed for 15 nights of surveillance. This is a long static surveillance period but this was completed in order to compensate for the cold nights recorded in April 2021 and for the early static surveillance (i.e. bat activity surveys are recommend to be undertaken from May to September). A total of five species of bat was recorded during the static surveillance: common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat and brown long-eared bat.

Figure 4: Location of static units during passive surveillance.

Table 8a: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Location Description	Grid Reference	Survey Period
Mini Bat 1	On tree along northern boundary of proposed development site.	O0347733072	31/3/2021 to 15/4/2021
Mini Bat 2	On tree along northern boundary of proposed development site.	O0344232958	31/3/2021 to 15/4/2021
Mini Bat 3	On tree within park woodland.	O0351032808	31/3/2021 to 15/4/2021

The highest bat activity level was recorded on the static unit deployed in the adjacent park compared to the two static units located within the proposed development site while a higher bat species diversity was recorded on the static units within the proposed development site (total of five bat species, Figure 5a). While bat activity was recorded on the static units located within the proposed development site, as observed during the dusk survey, thee are individual bats commuting through and travelling towards the adjacent park.

Table 8b: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Daubenton's bat	Brown long-eared bat
Mini Bat 1	169	131	19	1	0
Mini Bat 2	185	122	25	0	4
Mini Bat 3	465	489	17	1	0

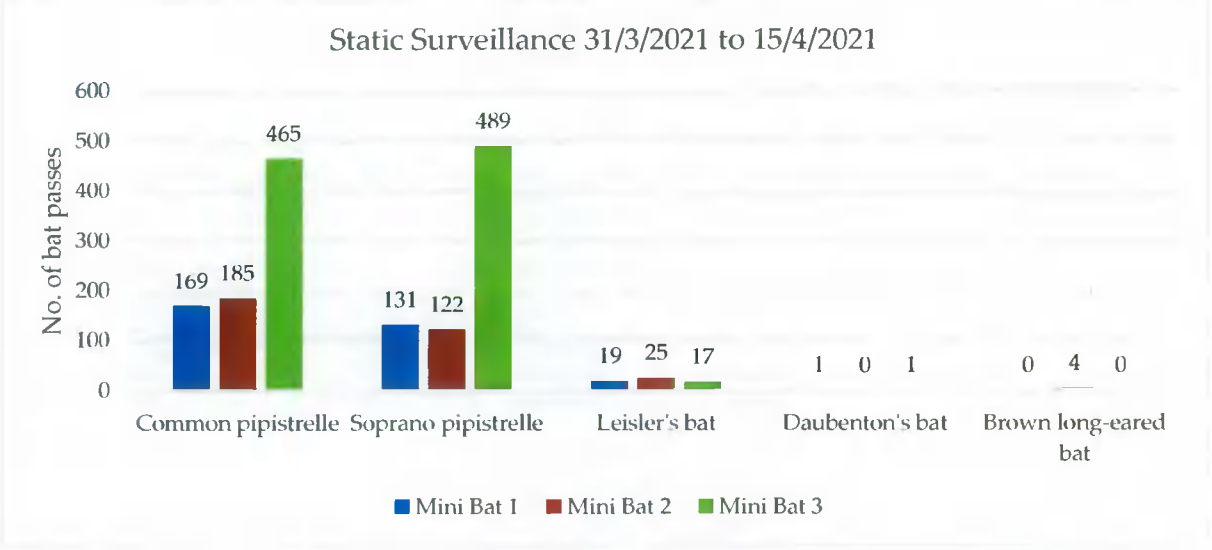

Figure 5a: Total bat passes for each of the bat species recorded during the static surveillance.

In relation to the nightly activity on the static units, the majority of the bat passes were recorded from 20:00 hrs to 23:00 hrs and this reflects the temperatures of the surveillance nights. Insects tend to fly in mild weather conditions and, therefore, bats are active when their prey items are active. As a consequence, there is little bat activity once the air temperature drop below 6°C. indeed, on nights where air temperatures were low, no bat activity was recorded (Figure 5b). The brown long-eared bats recorded on mini Bat 1 (Table 8b) were four passes recorded on three separate nights and were

recorded between the hours of 00:00 hrs to 04:00 hrs and therefore are likely to be foraging individuals.

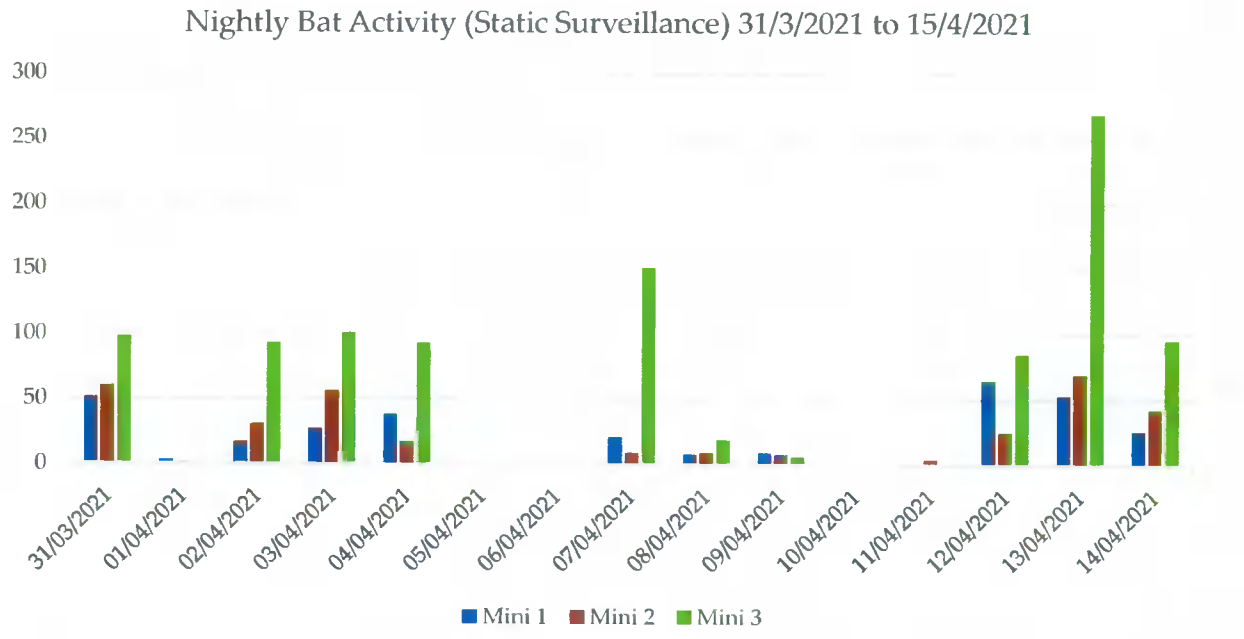

Figure 5b: Nightly total bat passes for each of the static units deployed during static surveillance.

As a general guide, activity level is determined by the author as follows: Low = <10 bat passes/hr; Medium = >10 - <50 bat passes/hr; High = >50 bat passes/hr). The static units recorded for approximately 8 hours per night. However, as the nightly temperature tended to drop too low for bat activity after midnight, just taking 4 hours as the nightly bat activity period the nightly data was examined (Please see tables in Appendices for nightly breakdown of activity). Therefore the activity levels for each bat species is presented in the Table 8b for the entire 15 days of surveillance indicates a Low level of bat activity for each bat species at each static unit locations within the proposed development site. In relation to the static located in the park, occasionally a Medium level of bat activity for common and soprano pipistrelles was recorded but a low level for all other bat species.

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

3.3 Lighting

Lighting was noted in Griffeen Valley Park (low level along walking tracks) and extensively street lighting was note along Hayden's Lane.

3.4 Desktop Review

3.4.1 Bat Conservation Ireland Database

The bat records within a 1km radius of the proposed development on the BCIreland database. The returned records are as follows:

Roost – 1 record (brown long-eared roost)
Transect – 1 record (Daubenton's bat on Grand Canal at 12th Lock)
Ad Hoc – 4 records (Daubenton's bats, common pipistrelle, soprano pipistrelle, Leisler's bat and brown long-eared bat).

The current bat survey recorded the same bat species list as already known for a 1km radius data search of the BCIreland database of the proposed development site.

3.4.2 Bat Conservation Landscape Favourability

Figure 6 depicts the BCIreland 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 located in the Red 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 only has a Medium to High favourability for the three species of bat recorded during the surveys: common pipistrelle, brown long-eared bat and Leisler's bat.

Table 12: 5km Square Landscape Favourability value for individual bat species.

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% (Low to Medium)
Whiskered bat	19% (Low to Medium)
Lesser horseshoe bat	0% (Not suitable)

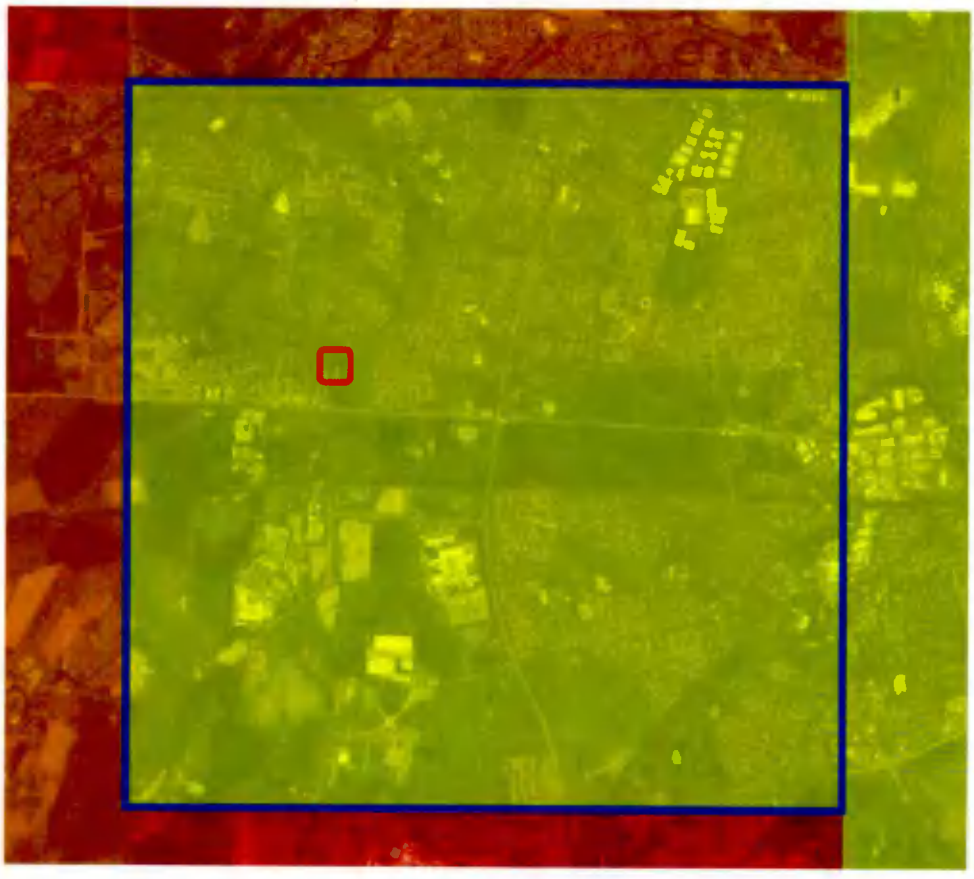

Figure 6: BCIreland Landscape Favourability Model 5km square – proposed development site location is marked with a Red Square (Source: www.biodiversityireland.ie).

3.5 Survey Effort, Constraints & Survey Assessment

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

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

Category	Discussion
Timing of surveys	April 2021 – these is outside the preferred survey months of May to September. However, to compensate for this early survey, a longer static surveillance was undertaken.
Survey Type	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 ○
Weather conditions	Cool weather conditions during static surveillance period.
Survey Constraints	Early survey period
Survey effort	Dusk Survey & Walking Transect = 3 hrs Static Surveillance – 3 units, 15 night = 360 hrs **TOTAL = 363 hrs**
Extent of survey area	Proposed development site and adjacent Griffeen Valley Park
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 complete the aims of the bat survey.

4. Bat Ecological Evaluation

4.1 Bat Species Recorded & Sensitivity

Five species of bat were recorded foraging and commuting within the proposed development area. No bats roosts were recorded. For a small survey area, this is a high level of bat biodiversity but this reflects that fact that the proposed development site is located adjacent to Griffeen Valley Park.

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 (Roche *et al.*, 2014). The remaining two bat species are considered to be less common but widespread. Overall a low level of bat activity was recorded within and adjacent to the proposed development area. A low-medium level of bat activity was recorded within the adjacent park and this reflects the wider array of bat habitats available for local bat populations.

Two trees were identified as have a Potential Bat Roosts (PBR) value but not bats were recorded roosting within.

4.2 Bat Foraging Habitat & Commuting Routes

As the proposed development site is a small area, the bat activity recorded is more associated with commuting individuals with some foraging recorded. Bats commuted through the proposed development site to such areas as the Griffeen Valley Park.

The proposed development area is located in a primarily urban area with some green parklands and vegetation associated with local Griffeen Valley Park which provide bat foraging and commuting habitat in the immediate area.

4.3 Zone of Influence – Bat Landscape Connectivity

The proposed development area is located in a primarily urban area with some green parklands and vegetation associated with local Griffeen Valley Park which provide bat foraging and commuting habitat in the immediate area. Other potential bat habitats located in the local area include Finnstown Castle to the west and Vesey Park to the north.

5. Impact Assessment & Mitigation

The level of bat activity within the proposed development site is considered to be Low for all bat species recorded.

The proposed development would result in the following:

- Removal of treelines (Construction Impacts)
- Increase in human activity (noise and light levels) (Operational Impacts)

As there are no confirmed bat roosts within the proposed development site, there is no assessment made in relation to potential Scale of Impact according to Table 6.1 of Kelleher & Marnell, 2006. In addition, there is no assessment value in relation to Appendix 1 of NRA, 2006 due to the fact that there are no roosts within the proposed development area.

The Tree Survey Report recommends the retention of trees including the two identified as PBRs.

There is a Low level of bat activity within the proposed development area. The potential impact of the proposed development is, overall, considered to have a scale of impact of Minor-Moderate Negative on named bat species. This has been considered in relation to the trees identified to have Potential Bat Roost (PBR) value and due to increased lighting for the proposed development.

Table 13a: Potential Negative scale of impact of the proposed development on the different bat species recorded during survey work.

Works	SP	CP	Leis	BLE	Daub
Lighting of development area	Minor	Minor	Minor	Minor-Moderate	Minor-Moderate
Removal of trees	Minor	Minor	Minor	Minor-Moderate	Minor-Moderate
Operation of the development site	Minor	Minor	Minor	Minor-Moderate	Minor-Moderate
Infrastructure	Minor	Minor	Minor	Minor	Minor
Landscape Plan – Planting	Neutral	Neutral	Neutral	Neutral	Neutral

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

Overall in consideration of the level of bat activity and presence of suitable bat habitats in the immediate area, the potential impact quality and significance of the proposed development is considered to be Negative but Slight (according to criteria set out in Tables 2a,b, Section 1.2.1), if no bat mitigation measures are implemented. The operational impacts of the proposed development will likely be long-term (as per the duration of the operation of the proposed development).

5.1 Bat Mitigation Measures

In order to reduce the potential negative impact of the proposed development on local bat populations, the following mitigation measures are recommended to be fully implemented.

5.1.1 Phase 2 Tree Survey & Tree Felling

Minimise the removal of mature trees, where possible. Retain the two trees identified as PBRs and incorporate into landscape plans.

If the two trees identified as PBRs are required to be felled, then a 2nd assessment will be undertaken prior to tree removal. This will be undertaken in consultation with the tree surgeons.

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

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

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

  For every three Category 2 trees (i.e. Moderate) to be felled – one bat box is required

5.1.2 Bat Box Scheme

The total number of bat boxes required to mitigate for the tree felling (n=19 PBRs) and for general conservation of local bat populations:

- 4 summer bat boxes (Schwegler Woodcrete 1FF bat box) to be erected within Griffeen Valley Park under consultation with the park's management team and local authority.

Bat boxes scheme be sited carefully and this will be undertaken by a bat specialist. Bat boxes will be erected prior to construction works. The bat specialist will erect the bat boxes with assistance from the contractor. Some general points that will be follow include:

- Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 1 metre above and below position of bat box.
- Diameter of tree should be wide and strong enough to hold the required number of boxes.
- Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations should be sheltered from prevailing winds.
- Bat boxes should be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of resident bats.
- Locations for bat boxes should be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes.

5.1.3 Lighting Plan

This element of the proposed planning application is important aspect in relation to local bat populations. All European bat species, including Irish bat species, are nocturnal. They usually hide in roosts during the daytime, while fly to feeding areas or drinking sites using commuting routes during the night. Annually bats will hibernate in the winter, swarm in the autumn and give birth in the summer months. In all aspects of the bat lifestyle, Artificial Light at Night (ALAN) may significantly change their natural behaviour in relation to roosting, commuting and feeding. While bats are naturally exposed only to very low lighting levels produced by moonlight, starlight and low intensity twilight, light levels greater than natural light levels can impact on the lifestyle of bats.

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 bat species 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 recorded within the survey area. 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. 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 the four remaining bat species recorded within the survey area. 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 22: 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

Bats are light sensitive bats species, hence their nocturnal activities. Of the three bat species recorded foraging and commuting within the survey area, two species are Semi-tolerant and the third species if Tolerant. However as artificial lighting is a barrier to nocturnal wildlife, strict lighting guidelines are required to reduce the potential impact of the proposed development on local bat populations.

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

- All luminaires used will lack UV/IR elements to reduce impact.
- LED luminaires will be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability.
- A warm white spectrum (<2700 Kelvins will be used to reduce the blue light component of the LED spectrum).
- Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible.
- Only luminaires with an upward light ratio of 0% and with good optical control will be used.
- Luminaires will be mounted on the horizontal, i.e. no upward tilt.
- Any external security lighting will be set on motion-sensors and short (1min) timers.
- As a last resort, accessories such as baffles, hoods or louvres will be used to reduce light spill and direct it only to where it is needed.

The lighting plan for the proposed development should strictly follow the above guidelines and these should be strictly implement during construction and operation phase of the proposed development.

5.1.4 Landscaping plan

It is important to ensure that there is boundary landscape planting to provide suitable bat commuting and foraging habitat. It is also recommended that the trees identified as PBRs are retained as part of the proposed landscape master plan.

Any planting should include native deciduous trees and shrubs.

In general, the following should also be followed:

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

5.1.5 Monitoring

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

- Inspection of bat boxes within one year of erection of bat box scheme/rocket box. Register bat box scheme with Bat Conservation Ireland. This should be undertaken for a minimum of 2 years.
- Monitoring of any bat mitigation measures. All mitigation measures should be checked to determine that they were successful. A full summer bat survey is recommended post-works.

6. Survey Conclusions

Five species of bat were recorded foraging and commuting within the proposed development area. No bats roosts were recorded. For a small survey area, this is a high level of bat biodiversity but this reflects that fact that the proposed development site is located adjacent to Griffeen Valley Park.

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 (Roche *et al.,* 2014). The remaining two bat species are considered to be less common but widespread. Overall a low level of bat activity was recorded within and adjacent to the proposed development area. A low-medium level of bat activity was recorded within the adjacent park and this reflects the wider array of bat habitats available for local bat populations.

Two trees were identified as have a Potential Bat Roosts (PBR) value but not bats were recorded roosting within.

Overall in consideration of the level of bat activity and presence of suitable bat habitats in the immediate area, the potential impact quality and significance of the proposed development is considered to be Negative but Slight, if no bat mitigation measures are implemented. The operational impacts of the proposed development will likely be long-term (as per the duration of the operation of the proposed development).

Mitigation measures are provided to reduce this potential negative impact.

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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. 

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 Static Surveillance Results

Mini 1					
Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Daubenton's bat	TOTAL
31/03/2021	21	25	5	0	**51**
01/04/2021	3	0	0	0	**3**
02/04/2021	8	9	0	0	**17**
03/04/2021	12	12	3	0	**27**
04/04/2021	27	11	0	0	**38**
05/04/2021	0	0	0	0	**0**
06/04/2021	0	0	0	0	**0**
07/04/2021	13	8	0	0	**21**
08/04/2021	4	4	0	0	**8**
09/04/2021	9	0	0	0	**9**
10/04/2021	0	0	0	0	**0**
11/04/2021	0	0	0	0	**0**
12/04/2021	35	29	1	0	**65**
13/04/2021	18	27	8	0	**53**
14/04/2021	18	6	1	1	**26**
Mini 2					
Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	TOTAL
31/03/2021	25	29	5	1	**60**
01/04/2021	1	0	0	0	**1**
02/04/2021	22	7	1	1	**31**
03/04/2021	29	21	6	0	**56**
04/04/2021	10	8	0	0	**18**
05/04/2021	0	0	0	0	**0**
06/04/2021	0	0	0	0	**0**
07/04/2021	8	1	0	0	**9**
08/04/2021	6	3	0	0	**9**
09/04/2021	4	3	1	0	**8**
10/04/2021	0	0	0	0	**0**
11/04/2021	1	3	0	0	**4**
12/04/2021	18	5	2	0	**25**
13/04/2021	33	25	9	2	**69**
14/04/2021	27	15	1	0	**43**
Mini 3					
Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Daubenton's bat	TOTAL
31/03/2021	82	14	2	0	**98**
01/04/2021	0	0	0	0	**0**
02/04/2021	74	18	1	0	**93**
03/04/2021	71	26	4	0	**101**
04/04/2021	48	45	0	0	**93**
05/04/2021	0	0	0	0	**0**
06/04/2021	0	0	0	0	**0**
07/04/2021	10	141	0	0	**151**
08/04/2021	12	7	0	0	**19**
09/04/2021	1	5	0	0	**6**
10/04/2021	0	0	0	0	**0**
11/04/2021	1	0	0	0	**1**

12/04/2021	33	49	2	1	**85**
13/04/2021	98	164	7	0	**269**
14/04/2021	35	60	1	0	**96**

9. Photograph Catalogue

Plate 1: Example of PBR located within the proposed development site.

10. Bat Species Profile

10.1 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.

10.2 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)

10.3 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).

10.4 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.

10.5 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.

10.6 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