

2019

Bat Assessment



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NPWS licence C30/2017 (Licence to handle bats, expires 31st December 2019)

NPWS licence 33/2017 (Licence to photograph/film bats, expires 31st December 2019)

NPWS licence DER/BAT 2017-09 (Licence to disturb a roost, expires 29th March 2020)

Client: Cairn Homes Properties Ltd.

Project Name & Location: Newcastle, Co. Dublin

Report Revision History

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1/7/2019	Draft 1	James Donlon, Cairn Homes Properties Ltd.
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22/7/2019	Final	James Donlon, Cairn Homes Properties Ltd.
10/8/2019	Amendment to reflect NPWS Derogation Licence received.	James Donlon, Cairn Homes Properties Ltd.
20/8/2019	Correction to Project description	Declan Brassil & Co.

Purpose

This document has been prepared as a Draft Report for Cairn Homes Properties Ltd. 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: Newcastle, Co. Dublin

Proposed work: Residential development

Bat Survey Results - Summary

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

Bat Survey Duties Completed

Tree PBR Survey	<input checked="" type="checkbox"/>	Daytime Building Inspection	<input checked="" type="checkbox"/>
Static Detector Survey	<input checked="" type="checkbox"/>	Daytime Bridge Inspection	<input type="checkbox"/>
Dusk Bat Survey	<input checked="" type="checkbox"/>	Dawn Bat Survey	<input checked="" type="checkbox"/>
Walking Transect	<input checked="" type="checkbox"/>	Driving Transect	<input type="checkbox"/>
Trapping / Mist Netting	<input type="checkbox"/>	IR Camcorder filming	<input checked="" type="checkbox"/>
Endoscope Inspection	<input type="checkbox"/>	Other	<input type="checkbox"/>

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1. Introduction

Bat Eco Services was commissioned Cairn Homes Properties Ltd. to survey lands proposed to be developed in Newcastle, Co. Dublin.

1.1 Relevant Legislation & Bat Species Status in Ireland

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), issued by NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

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

Irish bat species list (please see Appendices for more information in individual bat species) is presented in Table 1. The current status of the known bat species occurring in Ireland is given in the Table 1 below.

Table 1: Status of the Irish bat fauna (Marnell *et al.*, 2009).

Species: Common Name			Irish Status	European Status	Global Status
Resident Bat Species ^					
Daubenton's bat <i>Myotis daubentonii</i>			Least Concern	Least Concern	Least Concern
Whiskered bat <i>Myotis mystacinus</i>			Least Concern	Least Concern	Least Concern
Natterer's bat <i>Myotis nattereri</i>			Least Concern	Least Concern	Least Concern
Leisler's bat <i>Nyctalus leisleri</i>			Near threatened	Least Concern	Least Concern
Nathusius'	pipistrelle	<i>Pipistrellus nathusii</i>	Least Concern	Least Concern	Least Concern
Common	pipistrelle	<i>Pipistrellus pipistrellus</i>	Least Concern	Least Concern	Least Concern
Soprano	pipistrelle	<i>Pipistrellus pygmaeus</i>	Least Concern	Least Concern	Least Concern
Brown long-eared bat <i>Plecotus auritus</i>			Least Concern	Least Concern	Least Concern
Lesser horseshoe bat		<i>Rhinolophus hipposideros</i>	Least Concern	Near threatened	Least Concern
Possible Vagrants ^					
Brandt's bat <i>Myotis brandtii</i>			Data deficient	Least Concern	Least Concern
Greater horseshoe bat		<i>Rhinolophus ferrumequinum</i>	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.

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

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

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

Impacts, in general, 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 road improvement scheme.

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 conflict along each of the proposed route options.

1.3 Project Description

1.3.1 Site Location

Lands marked for proposed residential development at Newcastle, Co. Dublin consists of land associated with a farmland and construction land along with sections that were previously developed with residential units. There are extensive hedgerows and treelines present on sections where no construction has taken place and these have been noted in the local development plan.

The survey area included the lands within the Blue Lines of the following map while the actual proposed development site is within the Red Lines of the map below.

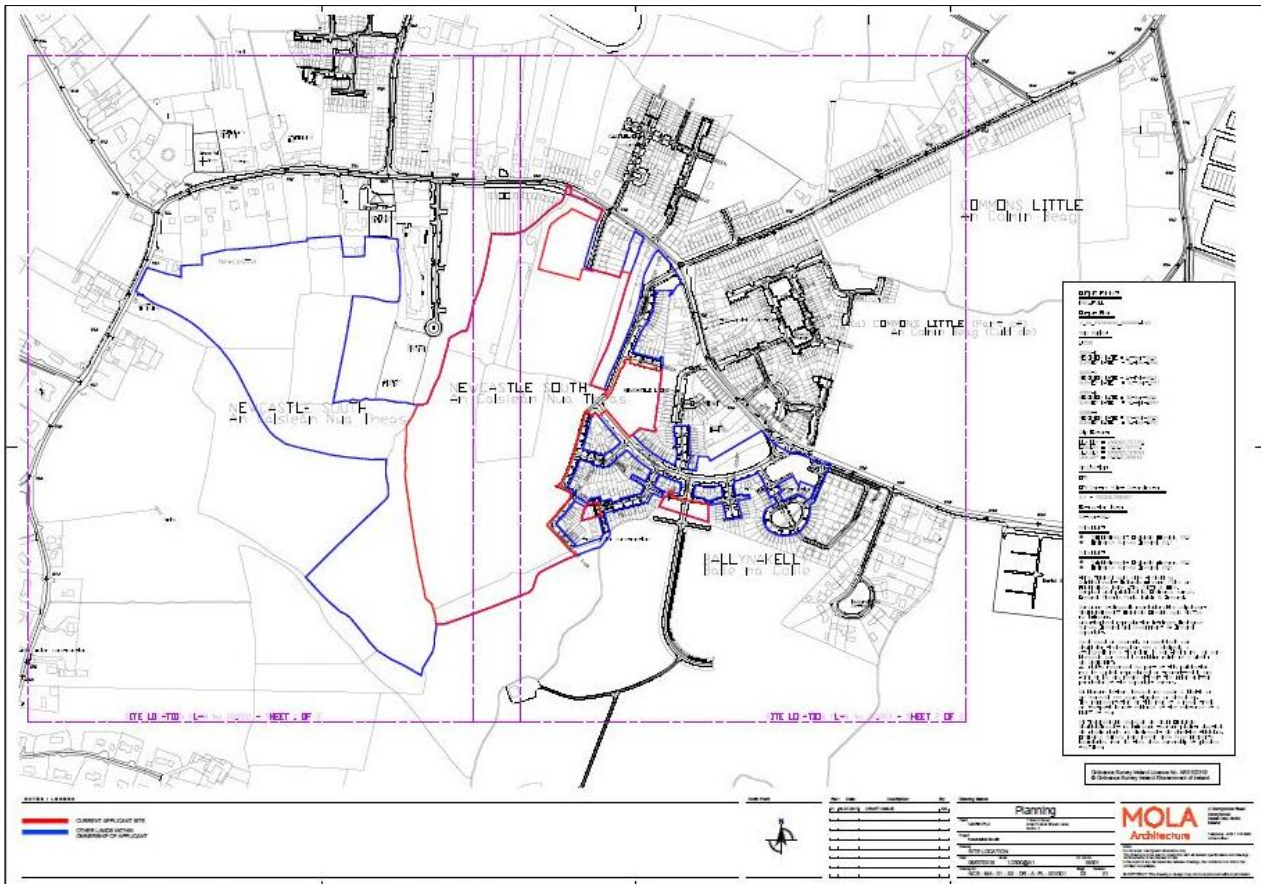


Figure 1: Bat Survey Area (Blue Lines) and proposed development site (Red Lines) (Map provided by Cairn Home Properties Ltd.)

1.3.2 Proposed Project

The application site comprises of a main development site of approximately 16 hectares, to the south of Main Street, together with three infill sites which comprise of a 0.80ha site at Ballynakelly; a 0.18ha site at Ballynakelly Rise and a 0.05ha site at Ballynakelly Edge.

The proposed development comprises of 406 no. dwellings comprising 8 no. one-bed apartments; 20 no. two-bed apartments; 1 no. three-bed apartments; 48 no. two-bed apartments with 48 no. three bed duplex units above; 21 no. two-bed houses; 208 no. three-bed houses; and 52 no. four-bed houses.

In addition, the proposed development provides a childcare facility (518sqm) with capacity for in the order of 110 no. children to serve the needs of the proposed development and the wider community. The proposals also include 1 no. retail units (total gross floor area 67.7sqm) at ground floor level within the Ballynakelly apartment block.

The proposed development also provides for the first phase of a new east-west link street and greenway, a continuation of Newcastle Boulevard, and a new north-south greenway linking the Main Street to the new public park. The proposed development facilitates a number of future potential pedestrian, cycle and vehicular links to existing and proposed adjoining developments. Access to the proposed development is via a new north-south link street, with a new entrance onto Main Street, and via the existing road network from Newcastle Boulevard to the east.

A primary school site (approximately 1.5ha) has been reserved at the south-east of the application site in accordance with the Newcastle LAP 2012. A new public park is proposed (approximately 2ha) together with a range of pocket parks and greenways to serve the proposed development and the wider Newcastle community.

The proposed development provides all associated and ancillary infrastructure, landscaping, boundary treatments and development works on a total site of approximately 16 hectares. The proposed development also provides for a temporary, single storey marketing suite and associated signage (including hoarding) during the construction phase of development only.

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;
- 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 clear 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 completed.

- 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).

1.3.4 Bat Surveys - Historical

A bat survey was undertaken in May 2018 (various dates) and re-surveying was completed in June 2019 (various dates). Therefore this report presents the survey results from both survey years. Please note, that there may be differences in the bat survey methodologies between the two surveys as the 2019 surveys generally follows the recommendations from Collins, 2016. This report template was designed in 2019 to capture the detail of surveys completed in 2019 and going forward.

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 types of bat roosts. Where possible, one of the objectives of the surveys is to be able to identify the types of roosts present, if any. However, the determination of the type of roost present depends on the timing of the survey and the number of bat surveys completed. Consequently, the definition of roost types, in this report, will be based on the following:

Table 3: Bat Roost Types (Collins 2016).

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

2.1.1 Building & Structure Inspection

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

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

2.1.2 Tree Potential Bat Roost (PBRs) Inspection

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

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

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

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

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

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

2.1.3 Bat Habitat & Commuting Routes Mapping

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

2.2 Night-time Bat Detector Surveys

2.2.1 Dusk & Dawn Bat Surveys

Dusk surveys are generally completed from 10 minutes before sunset to at least 120 minutes post sunset (extended survey period times occur if walking transects and driving transects are included). Dawn surveys are generally completed from 90 minutes before sunrise to 10 minutes after sunrise. Surveys are completed during mild and dry weather conditions with air temperature 8°C or greater, where possible. All bat encounters are noted during surveys.

The following equipment is used:

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

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

Surveyor 3: Wildlife Acoustics Echo Meter Touch (Generation 1, Apple IOS) connected to iPad 2 (32 GB storage) and Petersson D100 Heterodyne Bat Detector.

If the focus of this survey is to determine whether a structure is a bat roost (i.e. An Emergence Survey is deemed necessary), the surveyors then position themselves adjacent to the building / structure to be surveyed to determine if bats are roosting within, location of roost, number of bats, bat species etc. Surveying is generally completed for 100 mins, starting 10 mins before sunset.

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

2.2.2 Passive Static Bat Detector Survey

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

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

the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats

The recordings are analysed using various software. Recordings made by SongMeter SM2 (Unit 2) is analysed using SongScope, SongMeter SM2Bat+ (Unit 4, 5), Song Meter Bat FS (Units 1-5) and SongMeter 3 recordings are analysed using BatClassifyIreland and Wildlife Acoustics Kaleidoscope Pro. Elekon BatLogger A+ units are analysed using BatExplorer. Each sequence of bat pulses are noted as a bat pass to indicate level of bat activity for each species recorded. This is either expressed as the number of bat passes per hour or per survey night.

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

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

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM2 Unit 2 – 2019 & 2018	Wildlife Acoustics SongMeter 2 Bat+	Passive Full Spectrum	SMX-US (connected directly to unit)
SM2 Unit 4 - 2018			SMX-U1 (connected directly to unit)
SM2 Unit 5 – 2019			
SM4 Unit 1 - 2019	Wildlife Acoustics	Passive Full Spectrum	SMM-U2, 4m cable
SM4 Unit 2 - 2019	SongMeter 4 Bat FS		
BL Unit A - 2018	Elekon BatLogger A+ bat detector	Passive Full Spectrum	FG Black microphone, 2m cable
BL Unit B - 2018			

2.3 Desktop Review

2.3.1 Bat Conservation Ireland Database

A 1km and 10km search is undertaken for the central Irish grid reference of the survey site.

2.4 Photographic Record

A photographic record was completed for the survey. Photographs are presented throughout the report, where relevant.

2.5 Survey Constraints

It is important to note that bat surveys are comprised of a number of surveys designed to provide as much information on the bat usage of a survey area. Each survey method has its pros and cons. Therefore, a combination of surveys is recommended to determine the importance of a survey area for local bat populations. Bat surveys are also a snap shot of the bat activity at the time of surveying. Bat activity varies greatly from season to season and in relation to weather conditions. A list of bat survey methods are ticked at the start of the report to provide an overview for the reader. Weather data is presented to provide context to the suitability of survey dates to recorded bat activity.

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

Table 6: Survey Constraint Assessment Results.

Category	Discussion
Timing of surveys	June 2019 supplemented with data from May 2018. This is during the recommended survey period to record bat activity and to record summer roosts.
Weather conditions	July / June 2019 – good weather conditions May 2018 – good weather conditions
Survey effort	July 2019 – emergence surveys (3 surveyors), 1 walking transect June 2019 – 4 nights statics; 1 emergence survey (3 surveyors), 1 dawn survey (1 surveyor), 2 walking transects (3 surveyors). May 2018 – 2 nights statics, 2 emergence surveys (1 surveyor), 2 walking transects (1 surveyor)
Equipment	All in good working order.

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

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Building & Structure Inspection

The following buildings / structures were inspected on 26/6/2019. Previous inspections were completed on the 3/5/2018 in relation to the agricultural building and 19/5/2018 in relation to the cottage on the main street. In relation to the dwellings and sheds located on Fitzgibbon lands and the community building, these were surveyed on the 20/7/19.

Table 7: Buildings / Structures inspection results.

Building Code	Description	Grid Reference	Roost Type / Suitability	Bat Species
Cottage, main street	Derelict cottage, no roof, concrete block walls, dense vegetation	00033128664 Red circle	Low	Internal inspection of walls completed during the daytime. Examination of externa walls. No evidence recorded.
Agricultural shed	Concrete cavity block walls, corrugated iron roof	00008528472 Yellow circle	Medium	Internal inspection of walls completed during the daytime. Examination of externa walls. Bat droppings – small scatter
Stone ruins	Derelict stone building	N9955628608 Blue circle	Medium	Internal inspection of walls completed during the daytime. No evidence recorded. However, suitable crevices within stone work for individual bats.
Vacant Community building	Unfished building	00024828207	Low	Internal inspection of walls completed during the daytime. Examination of externa walls. No evidence recorded. No attic space.
Fitzgibbons dwelling 1	Bungalow, tiled roof, insulated and roof felt.	00014728663	Medium	Internal inspection of attic space – no bat evidence record. Examination of external walls – no bat evidence recorded.
Fitzgibbons dwelling 2	Single storey residence, flat roof.	00024828207	Low to Medium	No attic space. Examination of external walls – no bat evidence recorded.
Fitzgibbons	Single storey sheds Shed 1 – concrete block	00024828207	Low	No attic space. Examination of external

Sheds / caravan	shed with corrugated roof. Shed 2 – modern corrugate shed. Caravan		walls – no bat evidence recorded.
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Figure 1: Location of buildings / structures surveyed.



Plate 1: Agricultural shed recorded as a satellite roost for common pipistrelles (Yellow Circle).



Plate 2: Derelict cottage surveyed (Red Circle).



Plate 3: Fitzgibbon's dwelling 1.



Plate 4: Fitzgibbon's land - additional structures surveyed.



Plate 5: Vacant community building.

3.1.2 Tree Potential Bat Roost (PBRs) Inspection

Sixteen trees located along treeline / hedgerows were recorded as Potential Bat Roosts (PBRs) (Figure 2 – Blue circles) from daytime ground inspection of the trees on-site. This is a first phase assessment of trees to document Potential Bat Roosts as a result of features potentially suitable for roosting bats. An additional two trees were identified on the Fitzgibbons lands (entrance drive way) as PBRs.

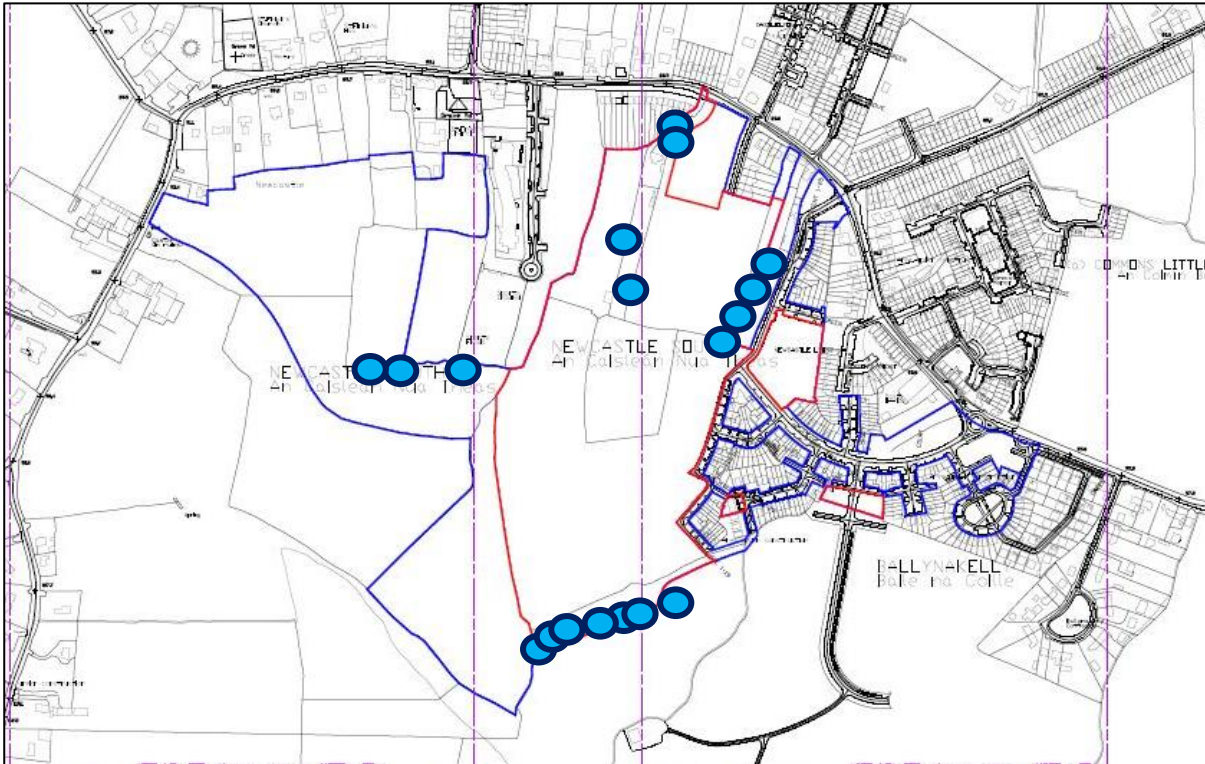


Figure 2: Map of daytime survey results of trees (Within Red Line, supplied by Cairn Home Properties Ltd.). Circles indicate the location of PBRs.

The Tree Survey report (dated: May 2018) was consulted in relation to trees marked for potential removal. Within the U category (trees recommended for removal) two mature trees have been identified as potential bat trees: 14E (mature ash – Hedge 19) and 68 (mature ash). Tree number 36 (mature ash) is within Hedgerow 26 and is marked for removal. This is considered to be a PBR. Hedge 29 is marked for removal and within this there are four mature ash trees: 37, 38, 41 and 48 considered to be PBRs. The two trees located along the driveway of Fitzgibbons land will also be removed. The remaining trees deemed as PBRs are not marked for removal. However, this should be assessed prior to any works and final tree/vegetation removal plans.

3.1.3 Bat Habitat & Commuting Routes Mapping

The survey area is characterised by extensive hedgerows (primarily Sparse Treeline hedgerow) with some sections of Mature Treelines. The survey area, as a consequence, offer good commuting linear habitat features for bats species such as common pipistrelles and soprano pipistrelles. There are a number of mature trees which also offer foraging habitat for Leisler's bats as well as open grassland with cattle grazing, which are also good foraging habitat for this bat species.

3.2 Night-time Bat Detector Surveys

3.2.1 Dusk & Dawn Bat Survey

An emergence survey was undertaken on 26/6/2019 of the cottage and agricultural shed while a static recording unit was placed within the stone ruins for 3 hours of recording (weather conditions: clear sky, light breeze, dry and 14°C). One surveyor was located on the main street in front of the cottage. The remaining two surveyors was located in vicinity of the agricultural shed – one to the rear of the shed noting bat activity along the principal hedgerows adjacent to the agricultural shed, while the third surveyor was located to the front of the shed operating a Sony Camcorder (night shot) with Infra-red lamps in order to film bat activity within the agricultural shed. This confirmed that the bats were roosting within the shed and emerged from the internal space rear of the shed. Two bats were recorded roosting in the shed and emerged during the dusk emergence survey. A number of common pipistrelles were also recorded commuting along the hedgerow towards the shed and further afield into the proposed development site. Leisler's bats were also recorded commuting from the north to south direction throughout the survey period. In relation to the cottage, no bats were recorded emerging from the building. Post emergence surveys, a walking transect were completed (results are detailed below).

A dawn survey was completed in relation to the cottage and general environs of the main street of the Newcastle town on 28/6/2019 (weather conditions: clear sky, light breeze, dry and 15°C). A previous emergence survey of the cottage was completed on the 19/5/2018 from 21:00 hrs to 22:30 hrs (weather conditions: cloudy, dry, calm and 17°C). No bats were detected roosting in the building during the dawn survey.

An emergence survey was completed on 20/7/2019 of buildings on Fitzgibbon lands and the community building (weather conditions: overcast, dry, calm and 14°C). One surveyor was located at the community building while two surveyors were located on Fitzgibbon's land. A dawn survey was also completed on the 21/7/2019 of the buildings on Fitzgibbon lands (weather conditions: clear sky, dry, light and 11°C). During the emergence dusk surveys, no bats were detected roosting in any of the buildings surveyed. In relation to the Fitzgibbons lands, the first bat was detected at 21:56 hrs and this was a Leisler's bat commuting from north to south through the survey area. Common pipistrelles were then recorded from 22:10 hrs with much of the foraging activity recorded around the mature trees at the entrance driveway and/or along the hedgerow commuting towards the survey area. Three species of bat was recorded commuting through the general environs of the community building: Leisler's bat, common pipistrelles and soprano pipistrelles. No bats were recorded exiting the buildings and overall the bat activity was at a low level. During the dawn survey at Fitzgibbons lands, not bats were recorded swarming and therefore roosting in any of the buildings. Only common pipistrelles were recorded from 04:07 hrs and these were individuals commuting in a south to north direction through the survey area.

The following figure summarises the results of the bat detector surveys completed in relation to buildings/structures:

Table 8: Buildings / Structures survey results.

Building Code	Roost Type & Location	Bat Species (No. of bats)	Access Points	Vegetation / Lighting arrangement
Cottage, main street	None 19/5/2018 - no	N/A	N/A	Yes - street lighting and dense vegetation growth within and

	bats emerging			adjacent to the cottage
	26/6/2019 - no bats emerging			
	28/6/2019 - no bats swarming / returning			
Agricultural shed	Satellite roost	2 common pipistrelles emerging on 26/6/2019 3+ common pipistrelles emerging on 3/5/2018	Open gable ends of building	No lighting Dense ivy growth on one gable end. Adjacent to hedgerow
Stone ruins	None	N/A	N/A	No lighting
Vacant Community building	None	N/A	N/A	Street lighting
Fitzgibbons dwelling	None	N/A	N/A	Associated residential lighting
Fitzgibbon dwelling 2, sheds and caravan	None	N/A	N/A	Associated residential lighting

A number of walking transect bat surveys were completed in both 2018 and 2019.

Previous bat survey work from 2018 within the survey area was undertaken on the following dates:

Weather Conditions	Cloudy, dry, light breeze, 12 ^o C.	2 nd May 2018
Dusk Survey	20:30 to 00:00 hrs	2 nd May 2018
Weather Conditions	Cloudy, dry, calm and 13 ^o C.	3 rd May 2018
Dusk Survey	20:30 to 00:00 hrs	3 rd May 2018

Dusk Survey Results 2nd May 2018

- The surveyor walked each of the treelines / hedgerows throughout the proposed development site from 20:30 hrs. The bat encounters are presented on Figure 3.
- The first bat encounter was at 21:38 hours and this was a common pipistrelle. This was the most common bat species encountered on-site during this survey.
- The first Leisler's bat was encountered at 21:44 hours. This species was only encountered on two occasions during this night of the bat survey.
- The first soprano pipistrelle was encountered at 22:52 hrs and this was the only location at which this species was recorded. However, the individual was foraging along this hedgerow.
- It was noted that there was a medium level of common pipistrelle bat activity at the location of the shed (Triangle, Figure 3).



Figure 3: Map of survey results – Dusk Survey 2nd May 2018 (Google Maps - aerial). Circles indicate the location of bat encounters and colours correspond to bat species: Blue = common pipistrelle; Green = soprano pipistrelle and Orange = Leisler's bat.

Dusk Survey Results 3rd May 2018

- An emergence survey was undertaken at the shed (Triangle, Figure 4). This was recorded as a common pipistrelle bat roost with 3+ individuals recorded emerging (deemed as a satellite bat roost). Individuals from this building commuted west along the hedgerow (blue arrow, Figure 4). Individuals from this roost was record continuously foraging in the area and along hedgerows to the east of the building.
- The first bat encounter was at 21:37 hours and this was a Leisler's bat. This was the 2nd most common bat species encountered on-site and was recorded at four locations.
- The first common pipistrelle was encountered at 21:39 hours. This species was the most encountered bat species during this night of the bat survey.
- The first soprano pipistrelle was encountered at 22:56 hrs and this species was only recorded at two locations.



Figure 4: Map of survey results – Dusk Survey 3rd May 2018 (Google Maps - aerial). Circles indicate the location of bat encounters and colours correspond to bat species: Blue = common pipistrelle; Green = soprano pipistrelle and Orange = Leisler’s bat.

The first walking transects for 2019 completed on the 26/6/2019 starting from 00:00hrs and was undertaken by one surveyor only and data is represented on the Google Earth map below. Four species of bat was encountered: common pipistrelle, soprano pipistrelle, Leisler’s bat and Daubenton’s bat. Common pipistrelles were the most encountered bat species. The most frequently recorded species was common pipistrelles followed by Leisler’s bats.

The walking transect was completed on the 27/6/2019 by 3 surveyors from 00:00 hrs. One surveyor walked the fields to the west of the agricultural shed while the 2 remaining surveyors walked the fields to the east of the agricultural shed. The Google Earth maps produced represent the bat encounters of surveyor walking the fields to the west with the bat encounters for the remaining surveyors marked on these maps post survey. Five species of bat was recorded during this survey: common pipistrelle, soprano pipistrelle, Leisler’s bat, brown long-eared bat and Daubenton’s bat. Again the most frequently recorded species was common pipistrelles followed by Leisler’s bats.

During the emergence survey of the agricultural shed, common pipistrelles (>20 individuals) were recorded commuting along the treelines / hedgerows from the town of Newcastle and past the agricultural shed. The first common pipistrelle was noted at 22:29 hrs with continuous activity thereafter noted during the emergence survey. Leisler’s bats were also recorded commuting from the town of Newcastle onto the survey site before continuing to commute in a south-west and south-east direction. The first Leisler’s bat was recorded at 22:33 hrs and activity was noted frequently thereafter. The surveyor at the cottage emergence survey also noted a high level of Leisler’s bat activity with commuting bats traveling from Newcastle town environs onto the survey site passing over the cottage. Common pipistrelles were also noted commuting over the cottage

and along the treeline / hedgerow within the survey area. These commuting routes are presented on the figures below.

Figure 5a-e: Walking transect results for 26/6/2019. The pink line represents the walking route.

a) All bat passes



b) Common pipistrelle encounters



c) Daubenton's bat encounters



d) Leisler's bat encounters

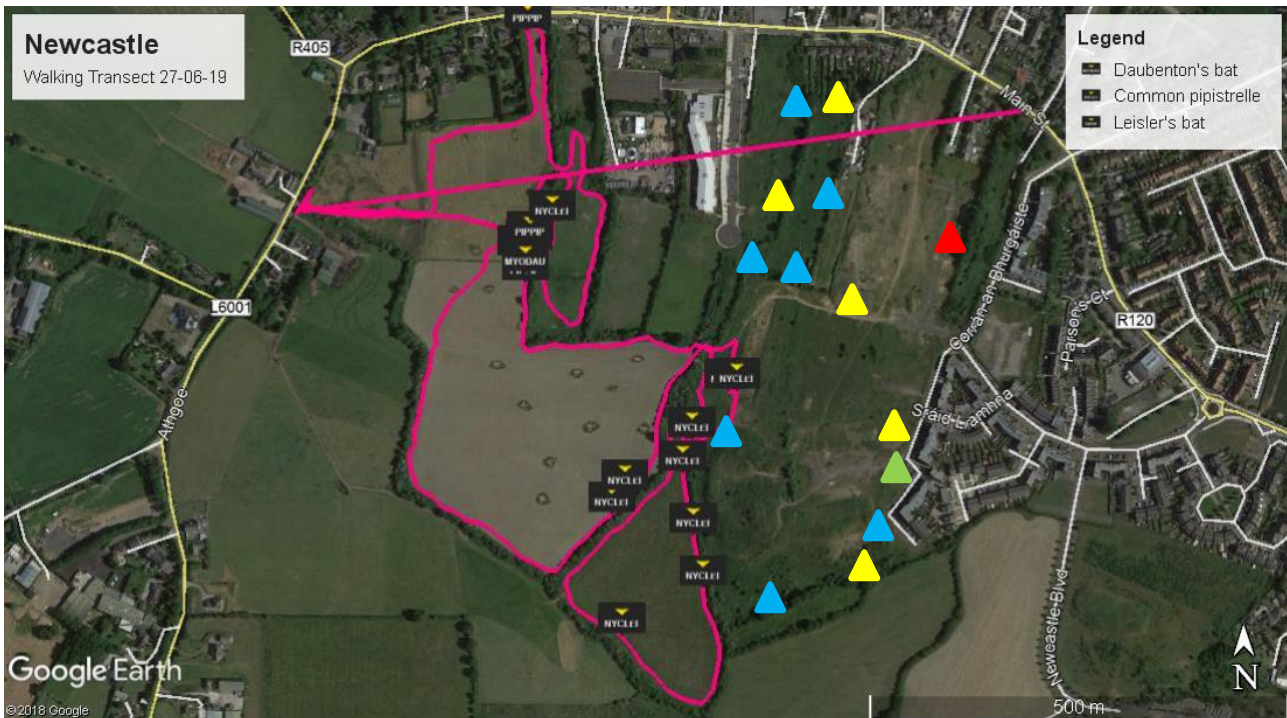


e) Soprano pipistrelle encounters



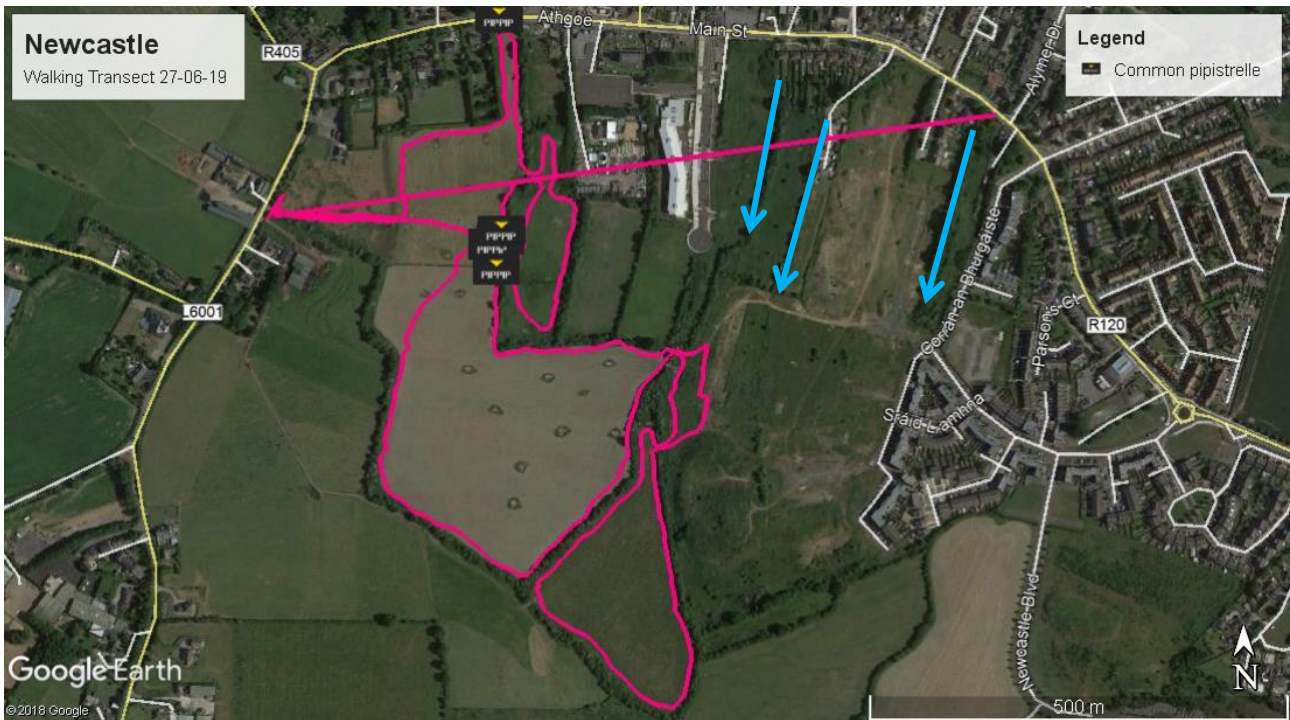
Figure 6a-d: Walking transect results for 27/6/2019. The pink line represents the walking route. Additional bat encounters are marked on the map: Yellow triangle = Leisler's bat; Blue triangle = common pipistrelle; Green triangle = brown long-eared bat and red triangle = soprano pipistrelle.

a) All bat passes



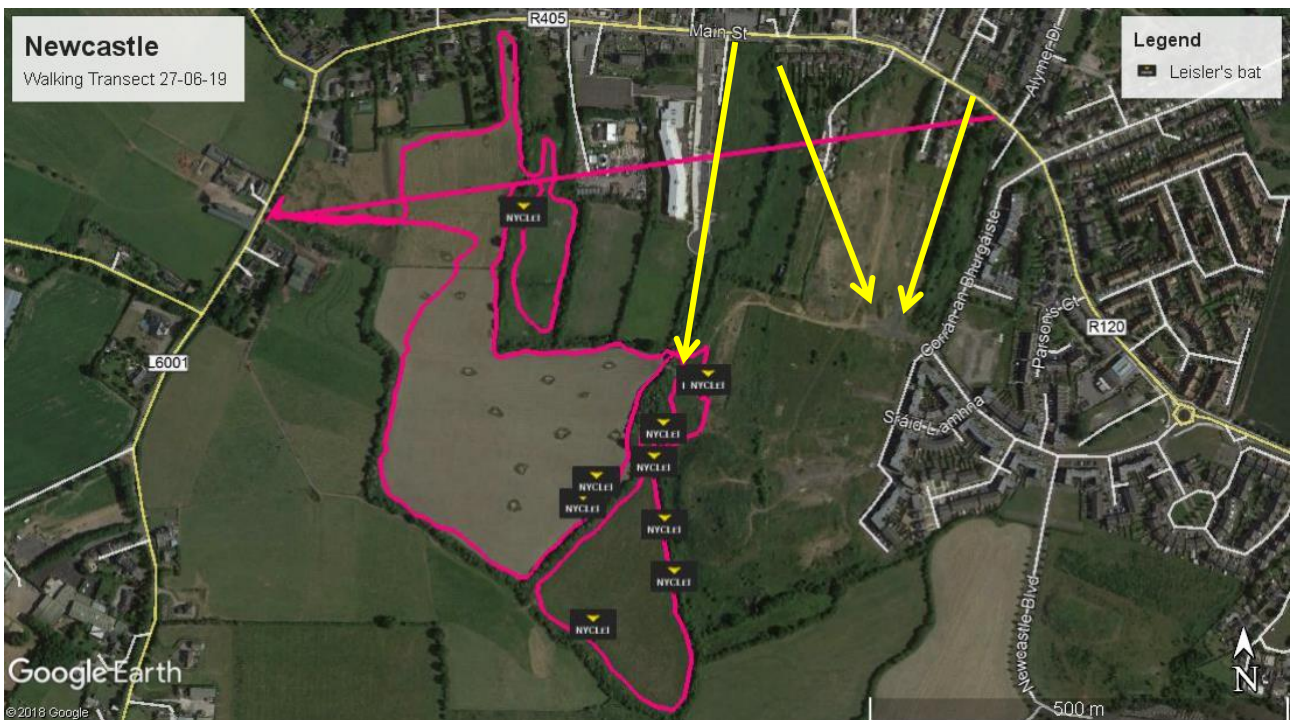
- b) Common pipistrelle encounters (please see All bat passes for the additional common pipistrelles encounters)

Commuting routes shown in blue arrows.



- c) Leisler's bat encounters (please see All bat passes for the additional common pipistrelles encounters)

Commuting routes shown in yellow arrows.



d) Daubenton's bat encounters



Plate 6: Landscape of proposed development site.

Additional walking transects were undertaken for the following locations on 20th July 2019 (Figure 7). Two species of bat were recorded commuting and foraging in the Red area (Fitzgibbon Lands): common pipistrelle and Leisler's bat. Common pipistrelle bat activity was primarily confined to the two mature trees at the front entrance of the driveway. Leisler's bats (2 passes) were commuting individuals through the survey area in a north to south direction.

Three species of bat was recorded in the general vicinity of the Blue areas: soprano pipistrelles, common pipistrelles and Leisler's bats. However only a small number of bat passes were recorded and these were of commuting bats through the areas. No foraging activity was recorded.

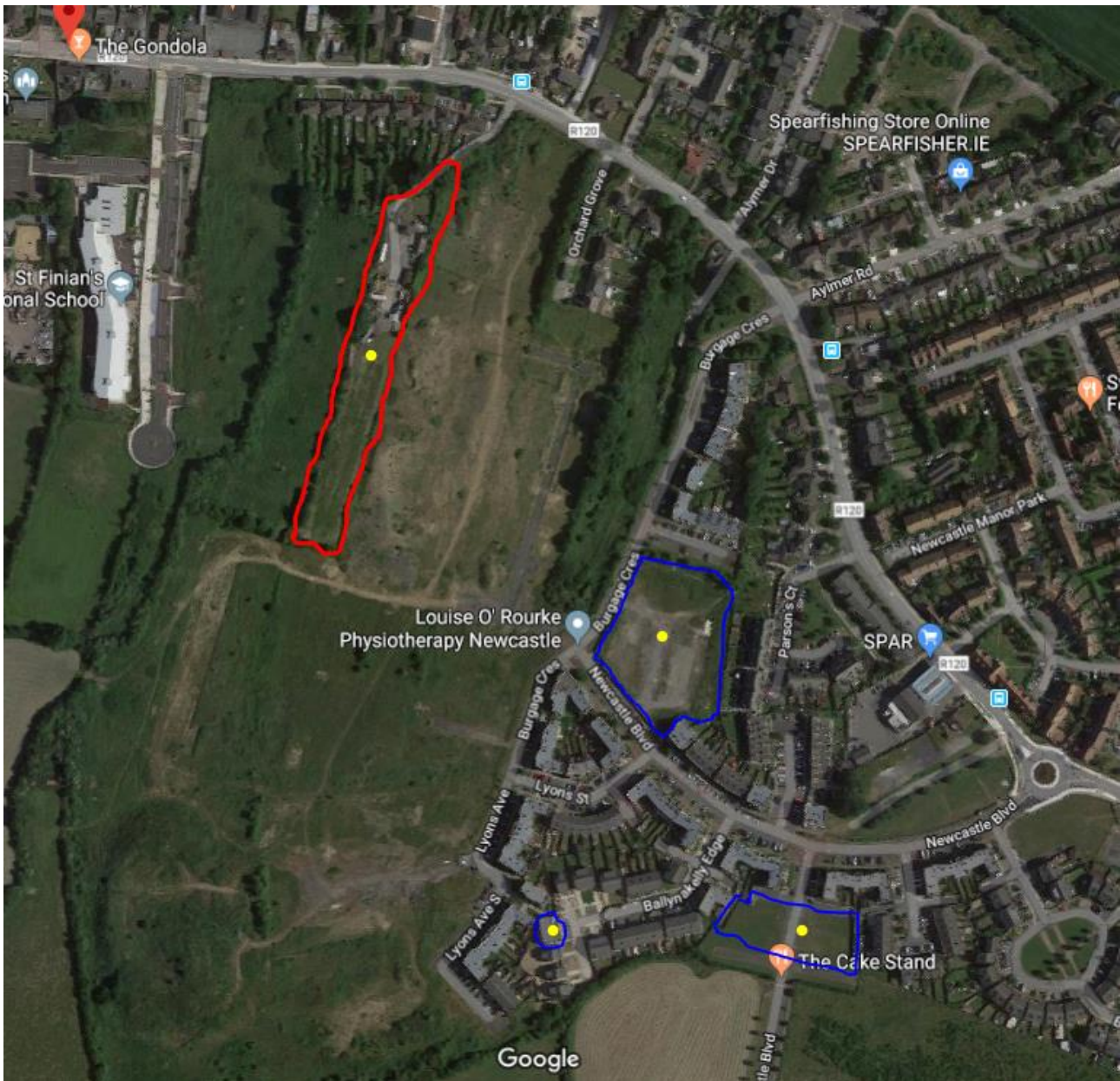


Figure 7: Additional lands surveyed on 20/7/2019.

3.2.2 Passive Static Bat Detector Survey

The following table summarises the results recorded on the static units deployed in both 2019 and 2018. The total number of bat passes recorded per night and divided by the number of hours of recording provides a figure for analysis. 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). Please see Appendices for more details.

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.

Table 9: Result of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Details	Leis	CP	SP	BLE	Myotis
2019 SM4 Unit 1	Location: treeline (red triangle) Survey Period - 24/6/2019 to 28/6/2019	Night 1 – Low Night 2 – Low Night 3 – Low Night 4 – Low	Night 1 – Low Night 2 – Med Night 3 – Med Night 4 – Low	Night 1 – Low Night 2 – Med Night 3 – Low Night 4 – Med	None	Night 1 – Low Night 2 – Low
2019 SM4 Unit 2	Location; adjacent to agricultural shed (orange triangle) Survey Period - 24/6/2019 to 28/6/2019	Night 1 – Med Night 2 – Med Night 3 – Low Night 4 – Low	Night 1 – Med Night 2 – High Night 3 – High Night 4 – High	Night 1 – Med Night 2 – Med Night 3 – Med Night 4 – Med	Night 1 – Low	None
2019 SM2	Location: treeline (blue triangle) Survey Period - 24/6/2019 to 28/6/2019	Night 1 – Low Night 2 – High Night 3 – High Night 4 – High	Night 1 – Low Night 2 – High Night 3 – High Night 4 – High	Night 1 – Low Night 2 – Med Night 3 – High Night 4 – Med	Night 2 – Low Night 4 – Low	Night 1 – Low Night 2 – Low
2019 SM5	Location: mature tree in ditch (green triangle) Survey Period - 24/6/2019 to 28/6/2019	Night 1 – Med Night 2 – Low Night 3 – Low Night 4 – Low	Night 1 – Low Night 2 – Low Night 3 – Low Night 4 – Low	Night 1 – Low Night 2 – Low Night 3 – Low Night 4 – Med	None	Night 4 – Low
2018 SM2 Unit 2	Location: Treeline / hedgerow (blue circle) Survey Period – 2/5/2018 to 4/5/2018	Night 1 – Low Night 2 – Low	Night 1 – Low Night 2 – High	Night 1 – Low Night 2 – Low	None	Night 1 – Low Night 2 – Low

2018 SM2 Unit 4	Location: Treeline / hedgerow (orange circle) Survey Period – 2/5/2018 to 4/5/2018	Night 1 – Low Night 2 – Low	Night 1 – Med Night 2 – Med	Night 1 – Low Night 2 – Med	None	None
2018 Unit A	Location: Treeline / hedgerow (purple circle) Survey Period – 2/5/2018 to 4/5/2018	Night 1 – Low Night 2 – Low	Night 1 – Med Night 2 – Med	Night 1 – Low Night 2 – Med	None	None
2018 Unit B	Location: Treeline / hedgerow (green circle) Survey Period – 2/5/2018 to 4/5/2018	Night 1 – Low Night 2 – Low	Night 1 – Med Night 2 – Low	Night 1 – Low Night 2 – Med	None	None



Figure 8: Aerial map of static unit locations in 2018 and 2019 surveys. Circles indicate the location of the static units in 2018 and triangles indicate the location of the static units in 2019.

3.3 Desktop Review

3.3.1 Bat Conservation Ireland Database

A 1km and 10km search was undertaken for the central Irish grid reference of the survey site: O0026328391.

1 km level: 2 Roosts (*Pipistrellus* spp. and soprano pipistrelle), 1 Transect (Leisler's bat and common pipistrelle) and 4 Ad Hoc record (Leisler's bat, soprano pipistrelle and common pipistrelle).

10km level: 35 Roosts (Natterer's bat, soprano pipistrelle, brown long-eared bat, common pipistrelle and Leisler's bats); 46 Transects (Daubenton's bat, Leisler's bat, common pipistrelle, Nathusius' pipistrelle and soprano pipistrelle) and 93 Ad Hoc records (whiskered bat, soprano pipistrelle, brown long-eared bat, common pipistrelle, Natterer's bat and Leisler's bats).

4. Bat Ecological Evaluation

4.1 Bat Species Recorded & Sensitivity

Three bat species were frequently recorded during these bat surveys: common pipistrelle, Leisler's bat and soprano pipistrelle. These three species are the three most common bat species recorded in Ireland. The additional two bat species recorded were Daubenton's bat and brown long-eared bat within the survey area, one of which was only recorded in the proposed development area (brown long-eared bat).

The medium-high level of bat activity of common pipistrelles and Leisler's bats was recorded, especially at the start of the night, commuting into the survey area and this may indicate that there are roosts, likely to be maternity roosts, located within the town of Newcastle. A low-medium level of soprano pipistrelle bat activity was recorded while a low level of bat activity was recorded for Daubenton's bat and brown long-eared bat. The Daubenton's bat encounter was recorded outside the proposed development area.

A medium-high level of bat activity was recorded in sections of the survey area and these are discussed further in the next section. Overall, the level of bat activity could be considered as Medium level.

A satellite roost of common pipistrelles was recorded both in 2018 and 2019 in an agricultural shed within the proposed development area.

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

Leisler's bat

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

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

Taken from Roche *et al.*, 2014

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

- Tree felling
- Increasing urbanisation

Brown long-eared bat

This species was only encountered once during the walking transects (south-east of the survey area). This species is generally considered to be widespread across the island. The modelled Core Area for brown long-eared bats is a relatively large area that covers much of the island of Ireland (52,820 km²) with preference suitable areas in the southern half of the island. The Bat Conservation Ireland Irish Landscape Model indicated that the brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5 km emphasising the importance of local landscape features for this species (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Estimated Irish Population Size	64,000 to 115,000 (2007-2012)
Irish Population Trend	2008-2013 Stable
Estimate Core Area (km²) (Lundy <i>et al.</i> 2011)	49,929

Taken from Roche *et al.*, 2014

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

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

Daubenton's bat

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

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

Taken from Roche *et al.*, 2014

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

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

Common pipistrelle

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

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

Taken from Roche *et al.*, 2014

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

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

Soprano pipistrelle

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

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

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

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

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

4.2 Bat Foraging Habitat & Commuting Routes

A number of locations within the survey area have been identified as important foraging habitats and commuting routes for bats. These are represented on the aerial below. Yellow circled locations represent MEDIUM-HIGH importance (due to medium to high level of bat activity recorded within this area) and blue represent MEDIUM importance (due to medium level of bat activity recorded within this area).

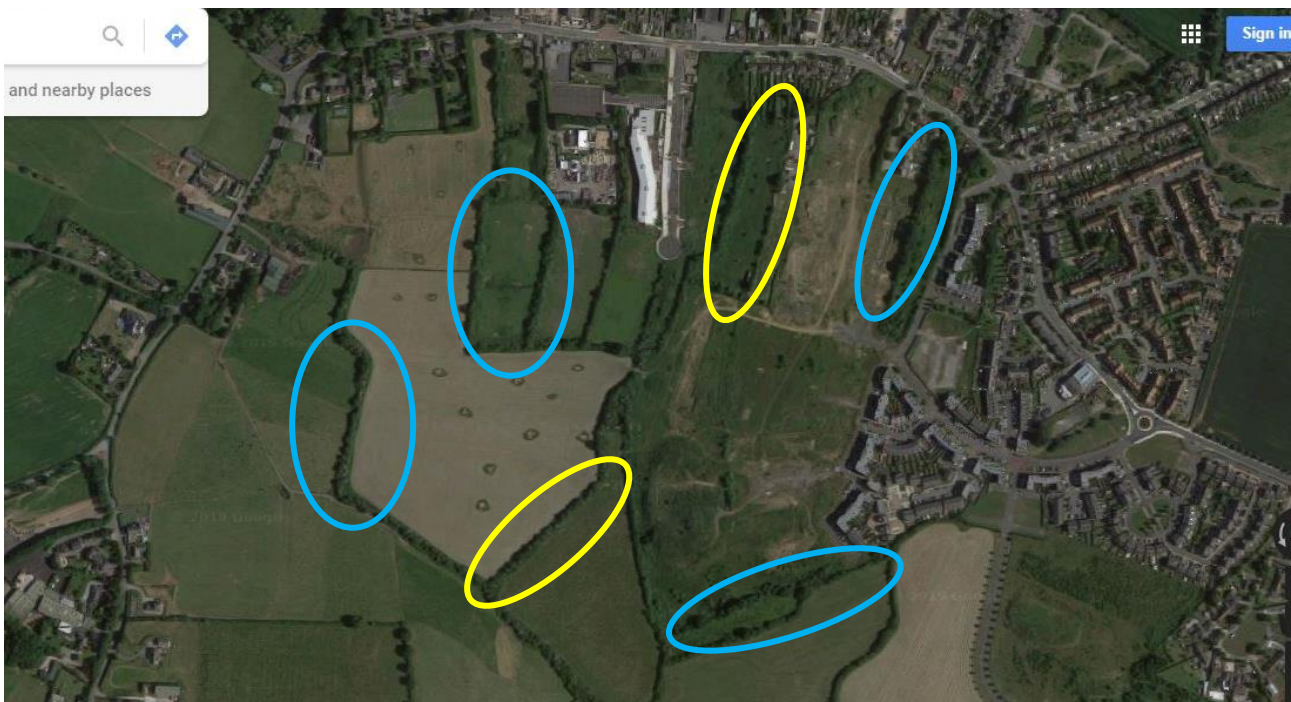


Figure 9: Aerial map of survey area indicating High and Medium important areas for local bat populations.

4.3 Zone of Influence – Bat Landscape Connectivity

The survey area is located south of the town of Newcastle, Co. Dublin. It is primarily an agricultural landscape and offers a well-connected landscape for local bat populations. There is an industrial zone located to the east of the town towards Dublin city. As a consequence, it is important to retain the connectivity within the survey area to allow local bat populations to continue to commuting and foraging post-construction of the proposed development.

4.4 Landscape & Lighting Plan

The landscape plan (Draft Version 19.7.2019 shown below) has marked linear habitat features proposed to be removed to make way for the proposed development. It also shows those to be retained post-development of the survey area.

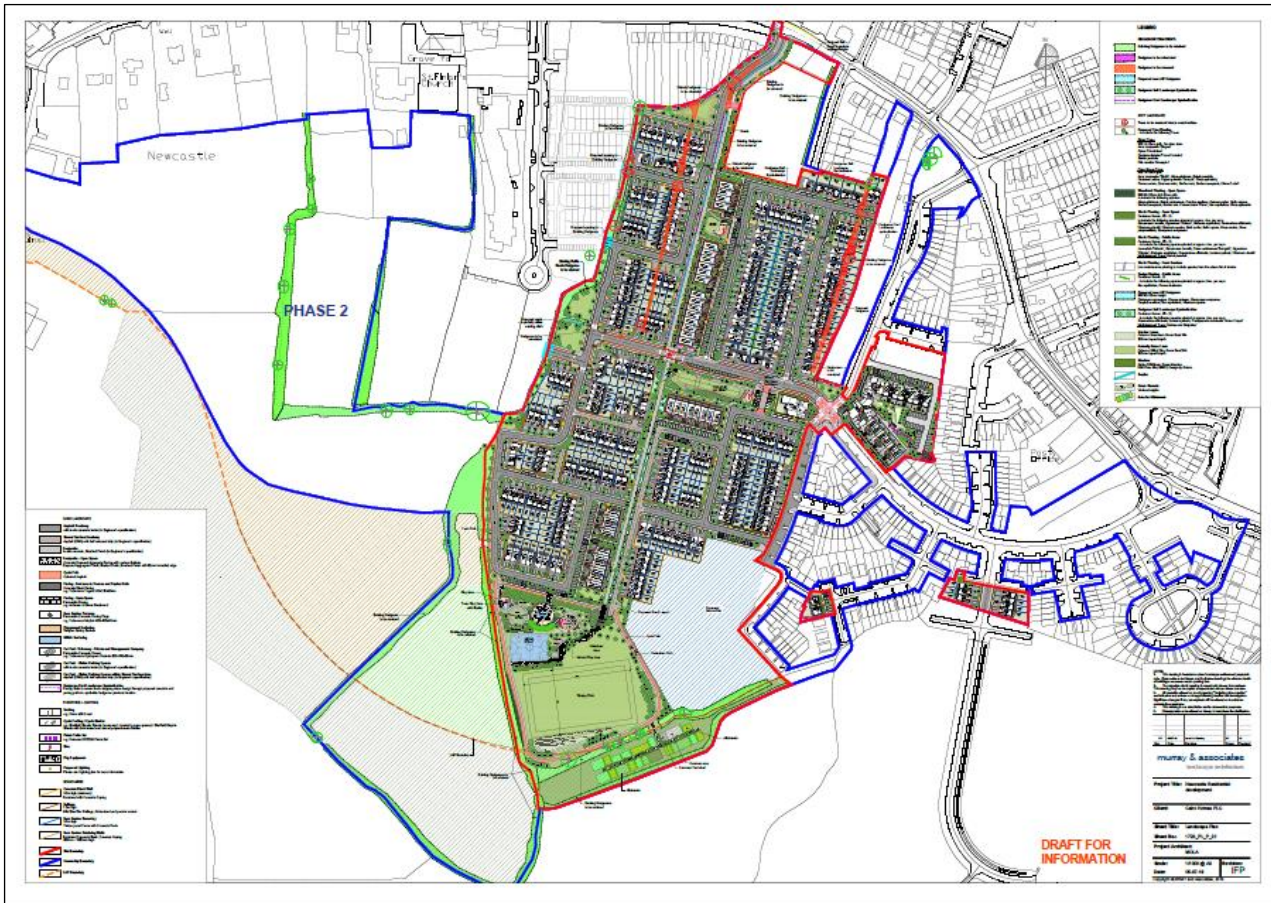


Figure 10: Draft Landscape Plan.

The linear habitat features to be removed are shown on the aerial below with a colour indication in relation to their importance as commuting and foraging habitats for local bat populations.

Linear feature 1 – to be removed. This will also result in one tree, identified as a Potential Bat Roost (PBR), located along this hedgerow to be removed.

Linear feature 2 – to be removed, but replanted post development. The proposed site layout plan and the landscape plan facilitate landscape connectivity to maintain this linear habitat.

All other linear habitats marked as important for bats are marked to be retained. The retention of the majority of the linear habitats will reduce the potential impact of the proposed development on local bat populations.

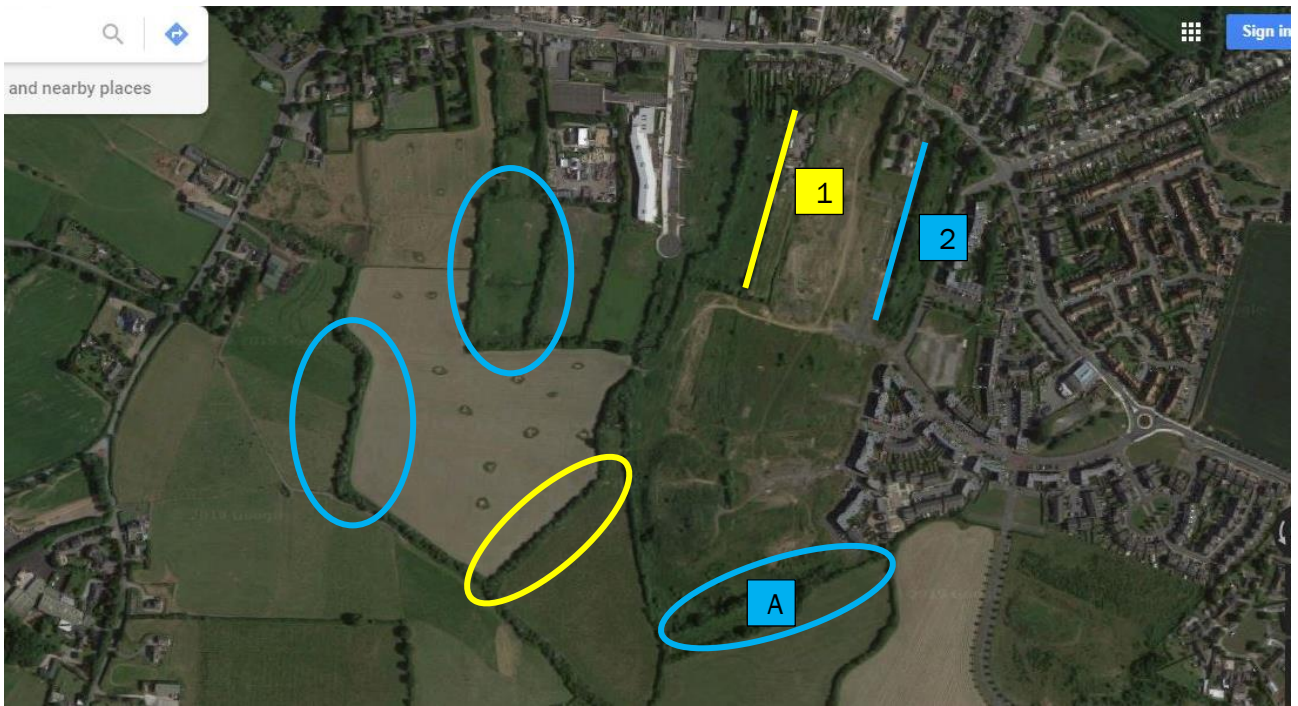


Figure 11: Aerial map of survey area indicating linear habitats to be removed to facilitate the proposed development. Linear habitat features coloured according to their High (Yellow) and Medium (Blue) importance for local bat populations.

The area marked A in the figure above is to be retained and used for allotments. As a consequence, this area is recommended to be the location of the rocket bat boxes. The remaining areas highlighted are outside the current proposed development.

5. Impact Assessment & Mitigation

The following bat species have been recorded during this bat survey: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat and Daubenton's bats. This represents the five of the nine residence bat species known to Ireland. Four of this species were recorded within the proposed development area: common pipistrelle, soprano pipistrelle, Leisler's bat and brown long-eared bat, with the later only encountered once during all of the surveys completed.

All bat species recorded during this Bat Survey are Annex IV species under the EU Habitats Directive and all have a Favourable Status in Ireland.

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

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

- Bats may use trees with heavy ivy growth as occasional roosts. Bats may use mature trees with tree holes etc., as roosting sites all year around. A tree assessment in relation to Potential Bat Roosts was undertaken and 18 trees were deemed to be PBRs, the majority of which are classed as Category 2 PBRs.
- Foraging and commuting areas were primarily recorded along hedgerows and treelines located within the proposed development site, particularly for common and soprano pipistrelles. The exception to this is Leisler's bats, which is a bat species that fly high over the landscape. They are not a reliant on linear habitats to traverse through the landscape.
- An extensive array of buildings are located adjacent to the survey area while a number of buildings are located within the survey area. All of buildings within the proposed development area have been surveyed as part of this bat survey, one of which have been recorded as a bat roost.

1 *agricultural grasslands.*

This habitat is present within the survey area as agricultural blocks surrounded by linear habitats. These agricultural blocks and associated hedgerows/treeline boundaries provides foraging habitat for common bat species especially common pipistrelle and Leisler's bat. May be considered as Medium ecological value.

2 *hedgerow and treeline boundaries, access tracks.*

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

3 *areas of scrub.*

The survey area includes some small areas of scrub, much of which are associated with construction spoil areas. This provides a mosaic of habitat which is essential for foraging

and commuting bat species. Variable in species composition, any areas of scrub can provide foraging areas for bats with some commuting potential. May be considered as of Medium Local value for bats.

4 buildings.

There are a small number of buildings located within the survey area. One of these buildings provides roosting for common pipistrelles. Its ecological value increased when associated with hedgerows and treelines, which many of them are. May be considered as of Medium ecological value for bats.

Bat fauna within the survey area will be affected by both the construction phase and operational phase of the proposed development. The impact assessment and mitigation will be undertaken in relation to the four bat species recorded within the proposed development area: common pipistrelle, soprano pipistrelle, Leisler's bat and brown long-eared bat.

Principal impacts of the proposed development, in general, on bat fauna may be summarised as follows:

1. A variety of habitats occur within the proposed development area, which vary in their importance for bats. The loss of areas of agricultural grassland within the proposed development area will have a negligible or minor impact on bats. The main impact on bats arises through the loss of hedgerows and treelines within the proposed development area which are widely used by pipistrelles. Loss of bat habitats such as treelines, hedgerows as a result of construction will impact on commuting bats. This is considered as a Moderate Negative impact and maybe reduced to Minor-Moderate Negative impact if such linear features remain in the landscape and mitigation measures are strictly followed.
2. Loss or fragmentation of foraging habitats may diminish the available insect prey species and reduce feeding area for bats in some locations. This is considered as a Moderate Negative impact and maybe reduced to Minor Negative if such linear features remain in the landscape.
3. Bats are often faithful to a particular roost site from year to year. A single satellite roost for common pipistrelles were recorded within the proposed development site. The removal of the agricultural shed will result in the loss of a satellite roost for common pipistrelles. This is considered as a Moderate Negative impact and maybe reduced to Minor-Moderate Negative impact if alternative roosting sites are provided.
4. Bats will often use trees as roosting sites. Potential Bat Roosts in trees is also an important area to address and the proposed road route will be assessed for PBRs. There are 18 trees deemed to have roosting potential, however, many of these are located within treelines / hedgerows to be retained. Two linear habitats are proposed to be removed which will results in five trees identified as a PBR to be removed. An additional two trees are also recommended to be removed. One of these linear habitats will be replanted post-development. All other linear habitats deemed important for local bat populations are marked to be retained on the landscape map.

The loss of trees in the landscape as a result of proposed development is likely to be Minor-Moderate Negative impact.

In addition the operation of the proposed development is likely to entail the following:

a) Lighting of the general area (street lighting, residential lighting etc.).

Proposed lighting of the proposed development will potentially impact on all bat species in relation to commuting, roosting and foraging potential. But the degree of impact is dependent on how sensitive the particular bat species is to lighting as some bats are tolerant of lighting. It is also dependent on the type of lighting installed and the location of such lighting.

Leisler's bats are tolerant of street lighting. Common pipistrelles and soprano pipistrelles will tolerate low levels of lighting while brown long-eared bats are a lighting sensitive bat species. The latter species was only recorded in one area of the proposed development site and this area is located adjacent to linear habitat features that are proposed to be retained and developed as an allotment area. This will benefit this bat species, as well as the other bat species recorded.

Therefore the lighting of the proposed development is likely to have a Moderate Negative impact.

a) Infrastructure

There is some road infrastructure already in place within the Newcastle development (east of the survey site). Further preparation of infrastructure to support the current development site is proposed. This will result in the loss of some treelines/hedgerows and as a consequence commuting and foraging habitats. However, as stated above, minimal removal of hedgerows is planned with some replacement planting post-works.

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

Therefore the infrastructure of the proposed development is likely to have a Moderate Negative impact.

b) Operational post-development

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

This proposed development is considered to have an overall potential Moderate Negative impact on local bat populations if no mitigation measures were implement.

Table 10: Potential impact of the proposed development on the different bat species recorded during survey work prior to the implementation of mitigation measures.

Works	SP	CP	Leis	BLE
Removal of agricultural building	None	Moderate	None	None
Lighting of development area	Moderate	Moderate	Minor	Moderate
<ul style="list-style-type: none"> - Reduced foraging - Reduced commuting 				
Removal of linear habitats	Minor-Moderate	Moderate	Minor	Moderate
Operation of the development site	Moderate	Moderate	Minor	Moderate
Infrastructure	Moderate	Moderate	Minor	Moderate

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

5.1 Mitigation Measures

The following mitigation measures are recommended to reduce the potential impact of the proposed development on local bat populations from Moderate to Minor-Moderate Negative impact:

5.1.1 Removal of Agricultural shed

This building is a satellite roost for common pipistrelles. Therefore the removal of such will require an NPWS Derogation Licence* and mitigation measures to provide an alternative roosting site for bats. The following procedure will be as follows (subject to Derogation Licence and terms and conditions attached):

*** NPWS Derogation Licence received on 8th August 2019 (DER-BAT-2019-69)**

- i) Erection of an alternative roosting site prior to removal of the agricultural shed. This will be erected in the winter/spring months before planned demolition to allow local bat populations to become aware of it prior to removal of the agricultural shed.
 - a. Rocket Bat Box (x2) – free-standing chamber on free standing pole (See appendices).
 - b. Location of rocket boxes will be in the area of allotments as shown in a section of the Draft Landscape Plan (19.7.19) below. This site is chosen as there is well connected hedgerows/ treelines and located in an area where not lighting is planned.



Figure 10: Potential location of Rocket bat boxes (Orange & Black Circles).

- ii) The agricultural shed will be removed in the following autumn or springs months after the erection of the alternative roosts:
 - a. Check / survey building to ensure that no bats are present.
 - b. Remove corrugated roof in the presence of a bat specialists.
 - c. The bat specialist is to check cavity blocks for bats. Once cleared, removed blocks on the same day of inspection.

To ensure that bats use the rocket bat boxes, these will be carefully sited by a bat specialist. Some general points to follow include:

- Located adjacent to hedgerows / treelines.
- Rocket box is erected on 5m mild steel box poles set in 1m x 1m concrete (45 newton) ensuring that there is 4m of pole above ground. Rocket bat box is secured on top of this steel pole.
- Locations for bat boxes are selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes.

5.1.2 Removal of other buildings

While other buildings located within the proposed development area were not recorded as bats roosts, the following buildings will require a re-survey prior to removal to ensure that no bats are roosting within:

- Fitzgibbon Dwelling 1 & 2.

5.1.3 Lighting plan

Nocturnal mammals are impacted by lighting. Therefore it is important that lighting installed within the proposed development site is completed with sensitivity for local wildlife while still providing the necessary lighting for human usage. The following principals are to be followed:

- Artificial lights shining on bat roosts, their access points and the flight paths away from the roost **must always be avoided**. This includes alternative roosting sites such as bat boxes.
- Lighting design will be flexible and be able to fully take into account the presence of protected species. Therefore, appropriate lighting will be used within a proposed development and adjacent areas with more sensitive lighting regimes deployed in wildlife sensitive areas.
- Dark buffer zones will be used as a good way to separate habitats or features from lighting by forming a dark perimeter around them. This will be used for habitat features noted as foraging areas for bats.
- Buffer zones will be used to protect Dark buffer zones and rely on ensuring light levels (levels of illuminance measured in lux) within a certain distance of a feature do not exceed certain defined limits. The buffer zone can be further subdivided in to zones of increasing illuminance limit radiating away from the feature or habitat that requires to be protected.
- Luminaire design is extremely important to achieve an appropriate lighting regime. Luminaires come in a myriad of different styles, applications and specifications which a lighting professional can help to select. The following will 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 is achieved 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.
- The use of specialist bollard or low-level downward directional luminaires should be considered in bat sensitive areas to retain darkness above.
- Column heights will 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 always 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.

In particular, lighting should not shine onto important commuting and foraging areas identified for local bat populations.

The Outdoor Lighting Report was consulted in relation to Lux levels within the proposed development site. The horizontal luminance provides information in relation to the projected Lux levels. In relation to hedgerows being retained (external boundary of proposed development site), a Lux level of 1 is projected along this area. For the common bat species (i.e. common pipistrelle, soprano pipistrelle and Leisler's bats) recorded foraging and commuting within the proposed development site, this Lux level is tolerable. However a higher Lux level is recorded along internal hedgerows and this may discourage *Pipistrellus* species from commuting along. This will be addressed to reduce the Lux level to allow continued use by *Pipistrellus* species.

Rocket bat boxes will be located in the allotment area as this area will have no street lighting and therefore is a suitable area for these alternative roosts.

5.1.4 Landscaping plan

It is important to ensure that Linear Habitat No. 2 is replanted with native Irish tree and shrub species and to plan landscaping that will reconnect this linear habitat to other linear habitats on the boundaries of the proposed development post development. If possible, additional planting should be undertaken to replace the loss of Linear habitat No. 1. The landscaping will incorporate:

- Native hedgerow tree species
- Individual deciduous trees to allow mature trees to develop over time
- Where possible, pockets (field corners) of small groups of deciduous trees to provide shelter belts for foraging.
- Planting incorporate retained hedgerows / treelines.
- Any semi-natural habitats will be protected from potential damage construction phase and post-construction.
- Minimise the use of chemicals (weed killers, etc.) within the development zone.
- Any gaps will be planted along the new boundary of the proposed development. The shrub / tree mixture will be native plant species replication what already exists in the landscape: hawthorn, ash and oak.

5.1.5 Removal of trees

- a) As many of the PBRs will be retained, where possible. A buffer zone will be in place of at least 10 m on either side of the treeline to ensure that there is a dark zone for commuting bats.
- b) If the trees are to be removed, planting will be undertaken to mitigate for tree removal and landscaping plans will be planted using “like for like” in relation to tree and shrub species removed. Consideration will be given towards hawthorn, blackthorn mix with individual ash, alder and birch to form a native tree hedge) and deciduous trees (native tree species include ash, oak, alder, birch) will be planted to buffer the new development area.

Trees, which are to be removed, will be felled during the autumn months of September, October or November (felling during the spring or autumn months avoids the periods when the bats are most active). Prior to tree removal, a resurvey of the trees proposed to be felled will be undertaken in consultation with the tree surgeon. This will allow a plan to be formulated in relation to tree felling. Surveying of trees, including a Phase II survey (closer examination of the trees) and dusk/dawn surveys of trees to determine their bat usage is recommended prior to felling and to inform the felling plan.

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

- Any ivy covered trees (Category 2) which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape.
- Category 1 trees will be felled by dismantling of the limbs prior to felling of the main trunk. This will be undertaken in the presence of a bat specialist.
- A bat box scheme will to be erected prior to any tree felling. The number of bat boxes will be calculated according to the number of trees felled and the category of trees felled. The bat boxes will be erected prior to felling at locations chosen by the bat specialist.

5.1.6 Monitoring

Monitoring is will be completed post-construction works. This monitoring will involve the following aspects:

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

Table 11: Potential impact of the proposed development on the different bat species recorded during survey work if bat mitigation measures are fully implemented.

Works	SP	CP	Leis	BLE
Removal of agricultural building under derogation licence conditions (e.g. erection of rocket bat boxes etc.)	None	Minor	None	None
Lighting of development area	Minor	Minor	Minor	Moderate
<ul style="list-style-type: none"> - No lighting in allotment area - Lighting plan using LED lighting, directional luminaires etc. 				
Linear habitats – retention of external boundary habitats, replanting of additional linear features	Minor	Minor to Moderate	Minor	Minor to Moderate
Operation of the development site	Minor	Minor to Moderate	Minor	Moderate
Infrastructure	Minor	Minor to Moderate	Minor	Moderate

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

6. Survey Conclusions

This report provides information on the bat usage of the proposed development site. Three bat species were frequently recorded during these bat surveys: common pipistrelle, Leisler's bat and soprano pipistrelle. The additional two bat species recorded were Daubenton's bat and brown long-eared bat within the survey area, one of which was only recorded in the proposed development area (brown long-eared bat).

The medium-high level of bat activity of common pipistrelles and Leisler's bats was recorded, while a low-medium level of soprano pipistrelle bat activity was recorded and a low level of bat activity was recorded for Daubenton's bat and brown long-eared bat. Overall, the level of bat activity could be considered as Medium level. A satellite roost of common pipistrelles was recorded both in 2018 and 2019 in an agricultural shed within the proposed development area. In relation to the bat evidence collected by this report, it is deemed that the bat populations recorded within the survey area are of Local Importance.

The proposed development will likely have a Moderate Negative impact on local bat populations.

A number of mitigation measures have been provided and incorporated into the design of the proposed development, and strict adherence to these will reduce the overall impact level to Minor-Moderate Negative impact.

The proposed development area will result in the loss of a number of commuting hedgerows/treelines, some of which will be replanted as part of the Landscape Plan.

The proposed development will increase the degree of lighting. However, the lighting plan is designed to reduce lighting spillage onto external hedgerows/treelines which will allow their continued usage by commuting and foraging bats.

The proposed development will result in the loss of a satellite roost for common pipistrelles but alternative roosting will be erected south of the proposed development (allotment area).

The proposed development will result in the felling of a small number of mature trees but this will be undertaken in a manner to ensure that no bats are harmed and alternative roosting will be provided in the form of bat boxes.

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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 individual 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

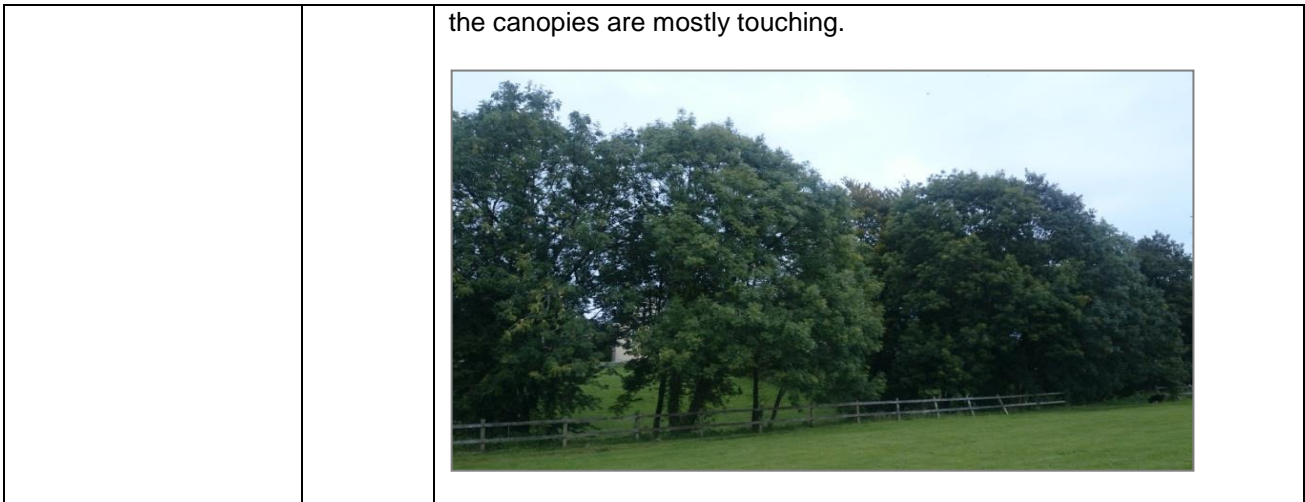
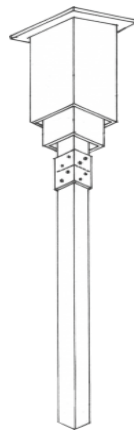


Table 1.B: Habitat Classification (Bat Conservation Ireland, 2015, based on Fossit, 2000)

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 Alternative Bat Roosting

Habibat Double Chambered Rocket Box
Pole-mountable bat box to provide extensive roosting space



(please view on www.nhbs.com)

9. Static Unit Results

As a general guide, the average number of bat passes per hour and summarised for each survey night is assigned as follows - Activity level: Low = <10 bat passes/hr; Medium = >10 - <50 bat passes/hr; High = >50 bat passes/hr). This is an arbitrary guide designed by the author. Static unit recording in 2018 was for 8 hours per night and recording in 2019 was for 7 hours per night.

Static Unit Results - 2018

Table 1: Songmeter SM2 BAT+ Unit 4 located along treeline/hedgerow (Orange circle)

Time (hrs)	Leis	SP	CP
2nd to 3rd May 2018			
21:00-22:00	0 passes	6 passes	0 passes
22:00-23:00	0 passes	0 passes	0 passes
23:00-00:00	0 passes	1 pass	57 passes
00:00-01:00	0 passes	0 passes	50 passes
01:00-02:00	0 passes	0 passes	22 passes
02:00-03:00	0 passes	0 passes	16 passes
03:00-04:00	0 passes	1 pass	4 passes
04:00-05:00	0 passes	0 passes	3 passes
3rd to 4th May 2018			
21:00-22:00	6 passes	8 passes	5 passes
22:00-23:00	0 passes	5 passes	18 passes
23:00-00:00	0 passes	2 passes	48 passes
00:00-01:00	1 pass	8 passes	138 passes
01:00-02:00	2 passes	147 passes	130 pass
02:00-03:00	0 passes	0 passes	0 passes
03:00-04:00	0 passes	0 passes	0 passes
04:00-05:00	0 passes	0 passes	0 passes

Table 2: Songmeter SM2 BAT+ Unit 2 located along treeline/hedgerow (Blue circle)

Time (hrs)	Leis	SP	CP	Myotis
2nd to 3rd May 2018				
21:00-22:00	0 passes	1 pass	11 passes	0 passes
22:00-23:00	0 passes	1 passes	3 passes	0 passes
23:00-00:00	0 passes	2 passes	0 passes	0 passes
00:00-01:00	0 passes	2 passes	11 passes	1 pass
01:00-02:00	0 passes	0 passes	0 passes	0 passes
02:00-03:00	0 passes	0 passes	0 passes	0 passes
03:00-04:00	0 passes	0 passes	0 passes	0 passes
04:00-05:00	0 passes	0 passes	2 passes	0 passes
3rd to 4th May 2018				
21:00-22:00	10 passes	3 passes	10 passes	1 pass
22:00-23:00	1 pass	14 passes	165 passes	1 pass
23:00-00:00	2 passes	0 passes	189 passes	0 passes
00:00-01:00	0 passes	27 passes	56 passes	1 pass
01:00-02:00	0 passes	1 pass	38 passes	0 passes
02:00-03:00	0 passes	8 passes	64 passes	0 passes
03:00-04:00	0 passes	0 passes	61 pass	0 passes
04:00-05:00	0 passes	0 passes	102 passes	0 passes

Table 3: BatLogger A+ Unit A located adjacent to treeline (Purple Circle)

Time (hrs)	Leis	SP	CP
2nd to 3rd May 2018			
21:00–05:00	4 passes	26 passes	137 passes
3rd to 4th May 2018			
21:00–05:00	35 passes	32 passes	128 passes

Table 4: BatLogger A+ Unit B located along treeline/hedgerow in the southern area of the proposed development area (Green Circle)

Time (hrs)	Leis	SP	CP
2nd to 3rd May 2018			
21:00–05:00	25 passes	18 passes	171 passes
3rd to 4th May 2018			
21:00–05:00	23 passes	25 passes	38 passes

Table 5: Static units results from 2019 (Triangles)

Static Unit	Date	Leis	passes/hr	SP	passes/hr	CP	passes/hr	BLE	passes/hr	Myotis	passes/hr
SM4 Unit 1	24/06/2019	36	5.1428571	105	15	89	12.714286	0	0	1	0.1428571
	25/06/2019	44	6.2857143	88	12.571429	95	13.571429	0	0	1	0.1428571
	26/06/2019	32	4.5714286	57	8.1428571	77	11	0	0	0	0
	27/06/2019	18	2.5714286	86	12.285714	66	9.4285714	0	0	0	0
SM4 Unit 2	24/06/2019	121	17.285714	137	19.571429	324	46.285714	1	0.1428571	0	0
	25/06/2019	146	20.857143	132	18.857143	403	57.571429	0	0	0	0
	26/06/2019	69	9.8571429	98	14	370	52.857143	0	0	0	0
	27/06/2019	68	9.7142857	117	16.714286	365	52.142857	0	0	0	0
SM2 Unit 2	24/06/2019	51	7.2857143	18	2.5714286	52	7.4285714	0	0	1	0.1428571
	25/06/2019	1740	248.57143	242	34.571429	1428	204	1	0.1428571	1	0.1428571
	26/06/2019	382	54.571429	398	56.857143	2588	369.71429	0	0	0	0
	27/06/2019	357	51	402	57.428571	2214	316.28571	0	0	1	0.1428571
SM2 Unit 5	24/06/2019	97	13.857143	11	1.5714286	44	6.2857143	0	0	0	0
	25/06/2019	40	5.7142857	11	1.5714286	20	2.8571429	0	0	0	0
	26/06/2019	14	2	6	0.8571429	21	3	0	0	0	0
	27/06/2019	6	0.8571429	3	0.4285714	10	1.4285714	0	0	1	0.1428571