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ECOLOGICAL IMPACT ASSESSMENT REPORT


FOR
PROPOSED DEVELOPMENT


AT
CLONBRONE, ESKER HILL,
LUCAN
CO. DUBLIN


ON BEHALF OF
NACUL DEVELOPMENTS LTD.

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1 INTRODUCTION

Enviroguide Consulting was commissioned by Nacul Developments Ltd. to undertake an Ecological Impact Assessment for a Proposed Development at Clonbrone, Esker Hill, Lucan, Co. Dublin. This report will form the basis of a full Environmental Impact Assessment Report (EIAR) Biodiversity Chapter for the final application submission.

This Ecological Impact Assessment (EclA) assesses the potential effects of the proposed development, hereafter referred to as the "Proposed Development", on habitats and species; particularly those protected by National and International legislation or considered to be of particular nature conservation importance. This report will describe the ecology of the Proposed Development area, with emphasis on habitats, flora and fauna, and will assess the potential effects of the Construction and Operational Phases of the Proposed Development on these ecological receptors. The report follows Guidelines for Ecological Impact Assessment in the UK and Ireland, by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018).

1.1 Quality assurance and competence

Synergy Environmental Ltd., T/A Enviroguide Consulting, is wholly Irish Owned multi-disciplinary consultancy specialising in the areas of the Environment, Waste Management and Planning. All of our consultants carry scientific or engineering qualifications and have a wealth of experience working within the Environmental Consultancy sectors, having undergone extensive training and continued professional development.

Enviroguide Consulting professional memberships include the Chartered Institution of Wastes Management (CIWM), the Irish Environmental Law Association and Chartered Institute of Ecology and Environmental Management (CIEEM).

All surveying and reporting have been carried out by qualified and experienced ecologists and environmental consultants. Dr Sanni Hintikka, Ecologist with Enviroguide undertook the desktop research for this report, conducted the habitat, mammal and invasive species surveys, and authored the report. Enviroguide Ecologist and Ornithologist Brian McCloskey undertook the Breeding Bird surveys. Dedicated Bat Surveys were undertaken by Tina Aughney of Bat Eco Services.

Dr Sanni Hintikka has a B.Sc. (Hons) in Zoology and a Ph.D. in Marine Ecology from University College Dublin, and a wealth of experience in desktop research, bioinformatics analyses, literature review and reporting, as well as practical field and laboratory experience including habitat mapping, invasive species surveys, freshwater and marine fish surveys and environmental DNA analysis. Sanni has prepared several Stage I and Stage II Appropriate Assessment Reports and authored a number of Ecological Impact Assessments.

Brian McCloskey is a graduate Ecologist and experienced Ornithologist with 11 years of birding experience. Brian holds a degree in Planning and Environmental management from Technological University Dublin. Brian is a longstanding and active member of Bird Watch Ireland and has provided Ornithology survey work for ecological consultancies, e.g., Vantage points surveys of Gulls, Terns, Raptors, Waders and Wildfowl; hinterland surveys of the above

2 RELEVANT LEGISLATION

An Ecological Impact Assessment (EclA) is a process of identifying, quantifying, and evaluating potential effects of development-related or other actions on habitats, species and ecosystems (CIEEM, 2016). The Proposed Development is a sub-threshold for an Environmental Impact Assessment (EIA) under the Planning and Development Regulations 2001-2021, as amended.

When an EclA is undertaken as part of an EIA process it is subject to the EIA Regulations (under the EU Planning and Development [Environmental Impact Assessment] Regulations 2001-2021). An EclA is not a statutory requirement, however it is a best practice evaluation process. This EclA has been undertaken to support and assess the Proposed Development planning application and assesses the potential impacts that the Proposed Development may have on the ecology of the site and its environs. Where potential for a risk to the environment is identified, mitigation measures are proposed on the basis that by deploying these mitigation measures the risk is eliminated or reduced to an insignificant level. This EclA is provided to assist the Competent Authority with its decision making in respect of the Proposed Development.

2.1 National Legislation

2.1.1 Wildlife Act 1976 (as amended)

The Wildlife Act 1976 (as amended) was enacted to provide protection to birds, animals, and plants in Ireland and to control activities which may have an adverse impact on the conservation of wildlife. With regard to the listed species, it is an offence to disturb, injure or damage their breeding or resting place wherever these occur without an appropriate licence from the National Parks and Wildlife Service (NPWS). This list includes all wild birds along with their nests and eggs. Intentional destruction of an active nest from the building stage up until the chicks have fledged is an offence. This includes the cutting of hedgerows from the 1st of March to the 31st of August. The act also provides a mechanism to give statutory protection to Natural Heritage Areas (NHAs). The Wildlife Amendment Act 2000 widened the scope of the Act to include most species, including the majority of fish and aquatic invertebrate species which were excluded from the 1976 Act.

2.1.2 EU Habitats Directive 1992 and EC (Birds and Natural Habitats) Regulations 2011 (as amended)

The EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992) provides protection to particular species and habitats throughout Europe. The Habitats Directive has been transposed into Irish law through, *inter alia*, the EC (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011) (as amended).

Annex IV of the EU Habitats Directive provides protection to a number of listed species, wherever they occur. Under Regulation 23 of the Habitats Directive, any person who, in regard to the listed species, "Deliberately captures or kills any specimen of these species in the wild, deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration, deliberately takes or destroys eggs from the wild or damages or destroys a breeding site or resting place of such an animal shall be guilty of an offence."

There are 25 Annex I species that regularly occur in Ireland and a total of 165 Special Protection Areas have been designated.

2.2.2 EU Habitats Directive

The Habitats Directive aims to protect some 220 habitats and approximately 1000 species throughout Europe. The habitats and species are listed in the Directives annexes, where Annex I covers habitats and Annex II, IV and V cover species. There are 59 Annex I habitats in Ireland and 33 Annex IV species which require strict protection wherever they occur. The Directive requires the designation of Special Areas of Conservation for areas of habitat deemed to be of European interest. The SACs together with the SPAs from the Birds Directive form a network of protected sites called Natura 2000.

2.2.3 Water Framework Directive

The EU Water Framework Directive (WFD) 2000/60/EC is an important piece of environmental legislation which aims to protect and improve water quality. It applies to rivers, lakes, groundwater, estuaries, and coastal waters. The Water Framework Directive was agreed by all individual EU member states in 2000, and its first cycle ran from 2009 – 2015. The Directive runs in 6-year cycles, so the second (current) cycle runs from 2016 – 2021. The aim of the WFD is to prevent any deterioration in the existing status of water quality, including the protection of good and high water quality status where it exists. The WFD requires member states to manage their water resources on an integrated basis to achieve at least 'good' ecological status, through River Basin Management Plans (RBMP), by 2027.

2.2.4 Bern and Bonn Convention

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982) was enacted to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was introduced to give protection to migratory species across borders in Europe.

2.2.5 Ramsar Convention

The Ramsar Convention on Wetlands is an intergovernmental treaty signed in Ramsar, Iran, in 1971. The treaty is a commitment for national action and international cooperation for the conservation of wetlands and their resources. In Ireland there are currently 45 Ramsar sites which cover a total area of 66,994 Ha.

4 METHODOLOGY

This section details the steps and methodology employed to undertake an Ecological Impact Assessment of the Proposed Development.

4.1 Scope of Assessment

The specific objectives of the study were to:

- Undertake baseline ecological surveys and evaluate the nature conservation importance of the Site of the Proposed Development;
- Identify and assess the direct, indirect, and cumulative ecological implications or impacts of the Proposed Development during its lifetime; and
- Where possible, propose mitigation measures to remove or reduce those impacts at the appropriate stage of development.

4.2 Desk Study

A desktop study was carried out to collate and review available information, datasets and documentation sources pertaining to the Site's natural environment. The desktop study relied on the following sources:

- Information on species records and distributions, obtained from the National Biodiversity Data Centre (NBDC) at www.maps.biodiversityireland.ie ;
- Information on waterbodies, catchment areas and hydrological connections obtained from the Environmental Protection Agency (EPA) at www.gis.epa.ie ;
- Information on bedrock, groundwater, aquifers and their statuses, obtained from Geological Survey Ireland (GSI) at www.gsi.ie ;
- Information on the network of designated conservation sites, boundaries, qualifying interests and conservation objectives, obtained from the National Parks and Wildlife Service (NPWS) at www.npws.ie ;
- Satellite imagery and mapping obtained from various sources and dates including Google, Digital Globe, Bing and Ordnance Survey Ireland;
- Information on the existence of permitted developments, or developments awaiting decision, in the vicinity of the Proposed Development from South Dublin City Council (<https://www.dublincity.ie>) and the National Planning Database (<https://housinggovie.maps.arcgis.com/>);
- Information on the extent, nature and location of the Proposed Development, provided by the applicant and/or their design team;
- The current conservation status of birds in Ireland taken from Gilbert et al. (2021).
- The pollinator friendly planting code provided by The All-Ireland Pollinator Plan (2021-2025) available at www.pollinators.ie

A comprehensive list of all the documents and information sources consulted in the completion of this document is provided in Section 10, References.

4.3.4 Bat Surveys

Bat surveys were undertaken over the course of a week, from the 12th of July to the 19th of July, and included Daytime Inspections of buildings and structures, assessment of trees for their Bat Potential, Night-time Bat Detector Surveys, and Passive Static Detector surveys. The survey methodologies are summarised in the below sections and detailed in the Bat Report (Appendix IV).

4.3.4.1 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.

4.3.4.1.1 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 indicates that bat usage of a crevice, for example, has occurred in the past. Inspections are undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

Buildings were assessed to determine their suitability as a bat roost and described using the parameters *Negligible*, *Low*, *Medium* or *High* suitability using the *Building Bat Roost Classification System & Survey Effort* (adapted from Collins, 2016 and Marnell et al., 2022) as a guide.

4.3.4.1.2 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 (12th July 2022), 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.

Daytime inspections were undertaken of all of the trees within the proposed development site. These inspections followed the Phase 1 guidance (Collins, 2016) in order to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections were undertaken visually, from the ground, with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs.

4.3.4.1.3 Bat Habitat & Commuting Routes Mapping

The survey site was assessed during daytime walkabout surveys (12th July 2022), in relation to potential bat foraging habitat and potential bat commuting routes. Such habitats were classified according to Fossitt (2000) while hedgerows were classified according to BATLAS

Two Wildlife Acoustics SongMeter Mini Bat passive full spectrum recording units were deployed during this static bat detector survey and left to record from 12th to 19th July 2022. One detector was deployed on a tree within the norther woodland belt, and another within the attic space of the Clonbrone House. One other detector was deployed in the rear garden of the house, but it failed to record and therefore is excluded from further analysis.

4.3.5 Invasive Species Surveys

The Site was assessed for the presence of invasive plant species during the habitat surveys undertaken. This survey was also conducted within the optimal survey period for flora, i.e., when the majority of plant species are in flower or more obviously present.

4.4 Assessment

The value of the ecological resources, i.e., the habitats and species present or potentially present, was determined using the ecological evaluation guidance given in the National Roads Authority's Ecological Assessment Guidelines (NRA, 2009a), presented in Appendix I. This evaluation scheme, with values ranging from locally important to internationally important, seeks to provide value ratings for habitats and species present that are considered ecological receptors of impacts that may ensue from a proposal. As per the NRA guidelines, impact assessment is only undertaken of Key Ecological Receptors (KERs).

The assessment of the potential impact of the Proposed Development on the identified KERs was carried out with regard to the criteria outlined in the draft EPA Guidelines (EPA, 2022), presented in Appendix II. These guidelines set out a number of parameters such as quality, magnitude, extent and duration that should be considered when determining which elements of the Proposed Development could constitute impact or sources of impacts.

4.5 Limitations

An extensive search of available datasets for records of rare and protected species within proximity of the Proposed Development site has been undertaken as part of this assessment. However, the records from these datasets do not constitute a complete species list. The absence of species from these datasets does not necessarily confirm an absence of species in the area.

Typically, mammal surveys are best carried out during November to March when vegetation has died back, however the extent of vegetation at the Site was not found to be limiting at the time of the surveys. Considering the overall nature and location of the Site, including the extensive urban landscape surrounding it, the Site is unlikely to support significant populations of protected larger mammals such as badger. In addition, information on typical species utilising the habitat types found on site were used to predict potential mammal presence on site. Therefore, it is considered that an appropriate evaluation of mammal potential at the Site was undertaken in view of this EclA.

the site are derived. The potential for effects on European Sites is fully considered in the Appropriate Assessment Screening Report that accompanies this application.

Natural Heritage Areas (NHAs) are designations under the Wildlife Acts to protect habitats, species, or geology of national importance. The boundaries of many of the NHAs in Ireland overlap with SAC and/or SPA sites. Although many NHA designations are not yet fully in force under this legislation (referred to as 'proposed NHAs' or pNHAs), they are offered protection in the meantime under planning policy which normally requires that planning authorities give recognition to their ecological value.

Identification of Designated Sites

The methodology used to identify relevant designated sites comprised the following:

- Use of up-to-date GIS spatial datasets for European and nationally designated sites and water catchments – downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie) to identify designated sites which could potentially be affected by the Proposed Development;
- The catchment data were used to establish or discount potential hydrological connectivity between the Project Boundary and any designated sites.
- All designated sites within the precautionary zone of influence (European Sites within 15km of the Proposed Development Site, and nationally designated sites within 5km) were identified and are shown in Figure 3 and listed in Table 1.
- The potential for connectivity with designated sites at distances outside of these precautionary distances was also considered in this initial assessment. In this case, there is no potential connectivity between the Proposed Development Site and designated sites located at a distance greater than the precautionary distances from the Proposed Development.
- Table 1 provides details of all relevant designated sites as identified in the preceding steps. The potential for pathways between European Sites and the Proposed Development Site was assessed on a case-by-case basis using the Source-Pathway-Receptor framework. Those designated sites where a pathway was identified are highlighted in green. Pathways considered included:
 - a. Direct pathways e.g. proximity (i.e. location within the designated site), water bodies, air (for both air emissions and noise impacts).
 - b. Indirect pathways e.g. disruption to migratory paths, 'Sightlines' where noisy or intrusive activities may result in disturbance to shy species.
- The site synopses and conservation objectives of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report.

The result of this preliminary screening concluded that there is a total of three SACs, one SPAs and four pNHAs located within the precautionary Zone of Influence (ZOI) of the Proposed Development Site. The distances to each site listed are taken from the nearest possible point of the Proposed Development Site boundary to nearest possible point of each European site or pNHA.

TABLE 1. DESIGNATED SITES WITHIN THE ZONE OF INFLUENCE OF THE PROPOSED DEVELOPMENT AND POTENTIAL PATHWAYS BETWEEN THEM. SITES THAT HAVE BEEN SCREENED INTO THIS ECIA FOR FURTHER ASSESSMENT ARE SHADED IN GREEN.

Site Name & Code (Receptor)	Distance to Proposed Development	Potential Pathway to receptors
Special Area of Conservation		
Rye Water Valley / Carton SAC (001398)	3.1 km	None – Refer to AA Screening Report accompanying this application
Glenasmole Valley SAC (001209)	11.9 km	
Wicklow Mountains SAC (002122)	13.9 km	
Special Protection Area		
South Dublin Bay and River Tolka Estuary SPA (004024)	3.6 km	None – Refer to AA Screening Report accompanying this application.
Proposed Natural Heritage Area		
Liffey Valley (000128)	0.3 km	Yes – Potential hydrological connection via surface water sewer network from the Site to the river Liffey.
Royal Canal (002103)	1.8 km	None – Significant distance between the Site and these pNHAs and thus there is no potential for a pathway via the air (both air emissions and noise impacts). No hydrological connectivity.
Grand Canal (002104)	2.8 km	
Rye Water Valley/Carton (001398)	3.1 km	

A designated site will only be at risk from likely significant effects where the Source-Pathway-Receptor link exists between the Proposed Development and the site. As such, this report will focus on the designated sites highlighted in Table 1, namely:

- Liffey Valley pNHA (000128)

5.2.1.1 Liffey Valley pNHA (000128)

The following is extracted from the Site Synopsis for the Liffey Valley pNHA (NPWS, 2009):

“The Liffey Valley site is situated along the River Liffey between Leixlip Bridge on the Kildare-Dublin border and downstream of the weir at Glenaulin, Palmerstown, Co. Dublin. The river meanders through low hills for much of its course through the site and forms the focus for the site itself. The Mill Race between Palmerstown and the weir at the Wren’s Nest Public House is also included in the site. The river is a Salmon river and there are a series of weirs along the river between Palmerstown and Leixlip. The water level in the Mill Race has dropped and the channel has been filled with vegetation in a number of areas as a result.

A wet marsh occurs on the strip of land between the Mill Race and the river east of the metal bridge and west of the paint factory. This marsh is fed by seepage from the Mill Race and plant species such as Bulrush (Typha latifolia), Marsh-marigold (Caltha palustris) and sweet-grass (Glyceria spp.) occur here. This strip of land also contains rough grassland which is not regularly grazed. Much of the river bank and the banks of the Mill Race are fringed with willow (Salix spp.) and Alder (Alnus glutinosa).

The threatened Green Figwort (Scrophularia umbrosa), a species listed in the Irish Red Data Book, is recorded from a number of stations along the river within the site. This stretch of the

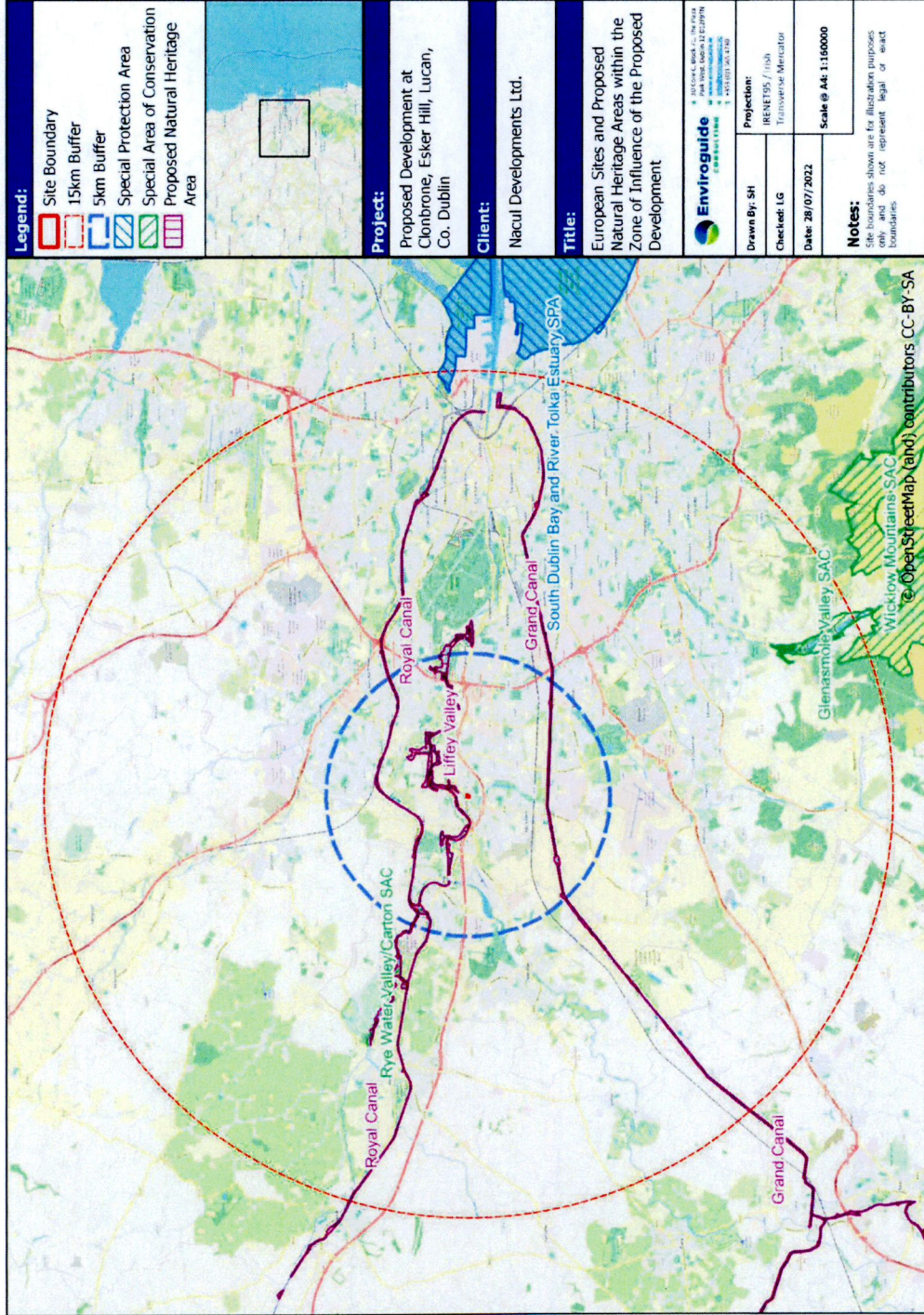


FIGURE 3. DESIGNATED PROTECTED SITES WITHIN 15KM OF THE PROPOSED DEVELOPMENT SITE.



FIGURE 4. MAP OF HABITAT TYPES (CODES FOLLOW FOSSITT, 2000) AND ECOLOGICAL CONSTRAINTS AT THE SITE.



FIGURE 6. EXAMPLE OF SCRUB (WS1) HABITAT AT THE SOUTHERN HALF OF THE SITE. INLET SHOWS APPROXIMATE LOCATION AND DIRECTION OF PHOTO.

Additionally, two smaller areas of ornamental/non-native scrub (WS3) were found in the northeast corner of the Site within the red line boundary (Figure 7). One area was found between the shed and the northern boundary wall and was largely dominated by Ivy (English Ivy *Hedera helix* and Persian Ivy *Hedera colchica*). Other species in this area included Hazel (*Corylus avellana*), Bramble (*Rubus fruticosus*), Elder (*Sambucus nigra*) and the invasive Cherry Laurel (*Prunus laurocerasus*). The other area of ornamental/non-native scrub was located at the northern corner and was dominated by an unidentified species of *Cotoneaster*. Some species belonging to the *Cotoneaster* family are considered to be invasive species with *Medium* impact (Kelly et al. 2013). The *Cotoneaster* dominated scrub also contained Hazel (*Corylus avellana*), Elder (*Sambucus nigra*), Ivy (*Hedera helix*), Lords-and-Ladies (*Arum maculatum*), Nettle (*Urtica dioica*), Great Willowherb (*Epilobium hirsutum*) and Foxglove (*Digitalis purpurea*). This scrub habitat continues along the northern boundary, between the Site and the woodland to the north.



FIGURE 7. EXAMPLE OF ORNAMENTAL/NON-NATIVE SCRUB (WS3) WITH *COTONEASTER* SPP. INLET SHOWS APPROXIMATE LOCATION AND DIRECTION OF PHOTO.

5.3.5 Tree Trunk piles

Two piles of tree trunks were recorded at the Site within the northern amenity grassland (Figure 9) and between the scrub and amenity grassland south of the access road. These piles have been left undisturbed for > 2 years. These piles provide potential sheltering, resting and nesting habitat for wildlife (incl. invertebrates) due to the disorganised piling of the tree trunks, and support a low level of mosses and lichens at present. Some scrub species from the surrounding habitats grows on and in the immediate surroundings of these piles, such as Bush Vetch (*Vicia sepium*), Hazel (*Corylus avellana*), Great Willowherb (*Epilobium hirsutum*), Bramble (*Rubus fruticosus*) and Rhododendron (*Rhododendron ponticum*).



FIGURE 9. EXAMPLE OF A PILE OF TREE TRUNKS AT THE SITE OF THE PROPOSED DEVELOPMENT.

5.3.6 Clonard House Boundary

The boundary between the access road and the neighbouring Clonard House is made up of two kinds of fencing and young coniferous trees (Figure 10). The beginning of the driveway (when entering the Site) is bounded by a wire fence on the north side, and changes into a wood fence and young/semi-mature trees at approx. halfway up towards the Clonbrone house. This is a very narrow habitat, and does not provide any significant cover that could be utilised by local fauna for shelter. It also supports very limited floral species, including Holly (*Ilex aquifolium*) and Ivy (*Hedera helix*). Additionally, the trees are considered to be still too young to be of any significant value to birds as nesting habitat.

- Records of species placed on the Waiting List or identified as Least Concern, Data Deficient, Near Threatened or Not Evaluated in national red lists (Lockhart et al., 2012; Wyse Jackson et al., 2016), unless they are listed on the Flora Protection Order

In addition, data from various sources (e.g., Inland Fisheries Ireland, Flora Protection Order Map Viewer) were used to determine the presence of species in the vicinity of the Proposed Development. Records from the NBDC are provided in Appendix III.

5.4.1 Flora

5.4.1.1 Rare and Protected Flora

Species records from the NBDC online database and the Flora Protection Order (FPO) – Bryophytes Map Viewer² were studied for the presence of rare or protected flora. Three species of rare flora (2 EN, 1 VU) have been recorded within the relevant tetrad, namely

- Green Figwort *Scrophularia umbrosa* - Endangered
- Hairy St John's-wort *Hypericum hirsutum* – Endangered (listed on FPO)
- Yellow Archangel *Lamiastrum galeobdolon subsp. montanum* - Vulnerable

No rare or protected species were recorded at the Site of the Proposed Development or in the woodland immediately adjacent to the Site during field surveys.

5.4.1.2 Invasive Plant Species

There are NBDC records of seven invasive plant species within the relevant tetrad associated with the Site of the Proposed Development. Of these, three are listed as *High* impact invasive, and four as *Medium* (Kelly et al. 2013).

High Impact:

- Cherry Laurel *Prunus laurocerasus*
- Giant Hogweed *Heracleum mantegazzianum*
- Indian Balsam *Impatiens glandulifera*

Medium Impact:

- Himalayan Honeysuckle *Leycesteria formosa*
- Douglas Fir *Pseudotsuga menziesii*
- Water Fern *Azolla filiculoides*
- Sycamore *Acer pseudoplatanus*

In addition, three of the species are listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011, namely Water Fern, Giant Hogweed, and Indian Balsam (also known as Himalayan Balsam).

A total of five invasive species of plant were recorded at the Site during field surveys. Three of the above invasive species were recorded, namely Cherry Laurel, Himalayan Honeysuckle and Sycamore. In addition, two other invasive species were recorded at the Site: *Cotoneaster* and *Rhododendron ponticum*. Some species of *Cotoneaster* are considered to be *Medium* impact invasives, while *R. ponticum* is considered to be a *High* impact invasive species. None

² <https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e>

TABLE 2. BIRD SPECIES RECORDED AT THE SITE OF THE PROPOSED DEVELOPMENT DURING BREEDING BIRD SURVEY ON THE 3RD OF AUGUST 2022.

Species Common Name	Species Scientific Name	Notes	BoCCI Status
Blackbird	<i>Turdus merula</i>		Green
Buzzard	<i>Buteo buteo</i>	Confirmed breeding near but not on the Site (Flyover)	Green
Blackcap	<i>Sylvia atricapilla</i>	Confirmed Breeding. Recently fledged young. No NBDC records for O03H.	Green
Black-headed Gull	<i>Larus ridibundus</i>		Amber
Blue Tit	<i>Cyanistes caeruleus</i>		Green
Chaffinch	<i>Fringilla coelebs</i>		Green
Coal Tit	<i>Parus ater</i>		Green
Collared Dove	<i>Streptopelia decaocto</i>		Green
Dunnock	<i>Prunella modularis</i>		Green
Goldcrest	<i>Regulus regulus</i>		Amber
Goldfinch	<i>Carduelis carduelis</i>		Green
Great Tit	<i>Parus major</i>		Green
Hooded Crow	<i>Corvus cornix</i>		Green
House Sparrow	<i>Passer domesticus</i>		Amber
Jackdaw	<i>Corvus monedula</i>		Green
Magpie	<i>Pica pica</i>		Green
Raven	<i>Corvus corax</i>	No NBDC records for O03H.	Green
Robin	<i>Erithacus rubecula</i>	Confirmed breeding. Recently fledged young.	Green
Rook	<i>Corvus frugilegus</i>		Green
Siskin	<i>Carduelis spinus</i>		Green
Song Thrush	<i>Turdus philomelos</i>	Confirmed breeding. Recently fledged young.	Green
Swallow	<i>Hirundo rustica</i>		Amber
Woodpigeon	<i>Columba palumbus</i>		Green
Wren	<i>Troglodytes troglodytes</i>		Green

The 22 bird species recorded within the O03H tetrad but not during the BBS are listed in Table 3 below, and includes two species listed as *Red*, seven listed as *Amber* and 11 species listed as *Green* in the BoCCI4. The remaining two species are not listed in BoCCI4, and include the Common Crane *Grus grus* which has not bred in Ireland since the 18th century, and was excluded from BoCCI4 on those grounds. Pheasant *Phasianus colchicus* is not included in BoCCI as it is a non-native introduced species.

TABLE 3. BIRD SPECIES RECORDS WITHIN THE 2KM TETRAD O03H IN THE NBDC DATABASE, BUT NOT DURING BBS ON THE 3RD OF AUGUST 2022.

Species Common Name	Species Scientific Name	BoCCI Status
Bohemian Waxwing	<i>Bombycilla garrulus</i>	Green
Bullfinch	<i>Pyrrhula pyrrhula</i>	Green
Common Crane	<i>Grus grus</i>	NA
Cormorant	<i>Phalacrocorax carbo</i>	Amber
Fieldfare	<i>Turdus pilaris</i>	Green
Grey Heron	<i>Ardea cinerea</i>	Green
Greenfinch	<i>Carduelis chloris</i>	Amber
House Martin	<i>Delichon urbicum</i>	Amber
Jay	<i>Garrulus glandarius</i>	Green
Kestrel	<i>Falco tinnunculus</i>	Red
Kingfisher	<i>Alcedo atthis</i>	Amber
Little Egret	<i>Egretta garzetta</i>	Green
Long-tailed Tit	<i>Aegithalos caudatus</i>	Green
Mallard	<i>Anas platyrhynchos</i>	Amber
Mistle Thrush	<i>Turdus viscivorus</i>	Green
Moorhen	<i>Gallinula chloropus</i>	Green
Mute Swan	<i>Cygnus olor</i>	Amber

5.4.2.5 Other Fauna at the Site

A record of Jenkin's Spire Snail (*Potamopyrgus antipodarum*), a *Medium* impact invasive freshwater snail, has been recorded within the relevant tetrad, however no suitable habitat for this snail exists at the Site. Due to lack of wet habitats within the Site, no protected or rare aquatic/semi-aquatic fauna are expected to occur within it. No other fauna of note has been recorded within the tetrad O03H or during field surveys.

5.5 Designated sites, habitat and species evaluation

Designated fauna which have the potential to utilise habitats within the immediate area of the Proposed Development, or for which records exist in the wider area, have been evaluated below in Table 4 for their conservation importance. In addition, designated sites and habitats have been evaluated. This evaluation follows the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009b). The rationale behind these evaluations is also provided. The term 'Key Ecological Receptors' KERs is used when impacts upon receptors are likely. Habitats and species are evaluated based on their conservation status, distribution and the estimated population size or importance.

Designated Sites/Species/Habitats	Evaluation	Key Ecological Receptor (KER)	Rationale
BL3 – Buildings and artificial surfaces (excl. Clonbrone House) BL1 - Stonewall ED2 – Spoil and bare ground			The extent of the stonewall at the entrance is small, and therefore not considered to provide any significant habitat for small urban fauna.
Clonbrone house (BL3)	Local importance (higher value)	Yes	Houses a small Common Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>) roost in the attic.
Wood piles and associated scrub	Local importance (higher value)	Yes	Due to the extent, nature and age of these piles of tree trunks, they are considered as highly suitable habitat for Hedgehog (<i>Erimaceus europaeus</i>) and other small mammals. However, it is noted that hedgehog scat was not observed during the Site Visit.
Clonard House Boundary	Negligible value	No	This boundary is formed by young trees and is very narrow in nature, providing very limited shelter for local fauna. It is also considered to contain only negligible species richness in terms of flora.
Woodland belt (to the north of Site, outside application boundary)	Local importance (higher value)	Yes	Mature woodland belt that provides an important ecological corridor between the green space north of Lucan Road and the wider landscape to the southwest of the Proposed Development. This woodland is the easternmost section of the Esker Bench Lawns Park. Potentially impacted by Construction activities.
FAUNA			
Mammals (excl. bats)			
Hedgehog (<i>Erimaceus europaeus</i>)	Local importance (higher value)	Yes	Records from the area according to NBDC, however limited evidence of Hedgehog was recorded during field survey. Hedgehogs are known to be well adapted to urban living and the Site contains habitats that are considered suitable for Hedgehog (old mature wood piles) with the adjacent woodland and scrub with tall grasses providing good foraging habitat. It is therefore considered likely that Hedgehog occurs at the Site.
Red Fox (<i>Vulpes vulpes</i>)	Local importance (lower value)	No	The Red Fox is a common urban mammal, and tracks through scrub, especially within the southwestern area, could be formed by commuting local foxes. Surrounding landscapes provide suitable habitat for local fox populations, and due to their highly mobile nature and lack of dens at the Site, any foxes occurring at the Site are considered to be of 'Local importance (lower value)'.

6 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

As per the relevant guidelines, likely effects have been assessed for Key Ecological Receptors only, as listed in Table 4. All impacts are described **in the absence of mitigation.**

The following were identified as KERs:

Designated Sites

- Liffey Valley pNHA (000128)

Habitats

- Scrub Habitats (both WS1 and WS3)
- Treelines WL2
- Clonbrone House
- Woodpiles a.k.a. hedgehog heaven
- Woodland belt

Species/Species Groups

- Hedgehog (*Erinaceus europaeus*)
- Bird assemblage
- Bat assemblage
- Aquatic fauna within the Liffey

The potential for significant effects on European Sites within Dublin Bay, arising as a result of the Proposed Development has been ruled out in the AA Screening accompanying this application under separate cover. The same rationale applies to the other designated sites in Dublin Bay, namely, the Ramsar Sites of North Bull Island and Sandymount Strand/Tolka Estuary, as well as the Dublin Bay Biosphere. As such, these designated sites are not considered further in this EclA.

The Liffey Valley pNHA (000128) is considered here due to potential impacts via the surface water systems from the Site, which outfall into the Liffey Valley pNHA in Lucan.

Potential sources of impacts from the Proposed Development have been identified as follows:

- Construction Phase
 - Uncontrolled releases of silt, sediments and/or other pollutants to air due to earthworks.
 - Surface water run-off containing silt, sediments and/or other pollutants into nearby waterbodies.
 - Surface water run-off containing silt, sediments and/or other pollutants into the local groundwater.
 - Waste generation during the Construction Phase comprising soils, construction and demolition wastes.
 - Increased noise, dust and/or vibrations as a result of construction activity.
 - Increased dust and air emissions from construction traffic.
 - Increased lighting on and in the vicinity of the Site as a result of construction activity.

6.1.2.3 Tree Trunk piles

The two piles of tree trunks at the Site are proposed to be removed to facilitate the Proposed Development. Due to their age and unorganised form, the woodpiles are estimated to provide resting, nesting and hibernating habitat for local Hedgehogs. The potential for winter hibernation by hedgehogs within these woodpiles is considered relatively high, as there is little in the way of suitably robust features within the nearby habitats, including the woodland belt to the north. The loss of these woodpiles therefore constitutes a potential *negative, permanent, moderate* impact on a local scale in the absence of mitigation and/or compensatory measures.

6.1.2.4 Woodland belt

This woodland is not within the red line boundary of the Site, however as it is directly adjacent to the Proposed Development there is potential for impacts on individual trees within this woodland arising from Construction activities at the Site.

There is potential for Construction works to cause damage to the roots of the trees near the boundaries from using heavy machinery within the root protection area of these trees (please refer to Arborist Report for details). Without mitigation and preventative measures to protect the root zones of these trees, the potential impact on the mature trees of the woodland near the northern Site boundary during construction works of the Proposed Development is considered to be *negative, long-term* and *moderate* at a local scale.

Additionally, as the woodland belt is sloping at a downgradient from the Site, there is potential for Construction-related surface water discharges to cause harm to the understory flora and potential fauna living within. For instance, a heavy rainfall event in the absence of best practice and prevention measures could result in overland run-off containing silts/sediments, concrete and other pollutants to flow into the woodland and cover the ground flora. This risk constitutes a potential *negative, short-term, moderate* impact at a local scale.

6.1.3 Impacts on Fauna

6.1.3.1 Hedgehog

Hedgehogs (*Erinaceus europaeus*) are primarily nocturnal mammals that may use the scrub and woodpiles at the Site as day-nests, with the woodpiles providing potential hibernation habitat. Clearance of vegetation and of the woodpiles to facilitate the Proposed Development may put hedgehogs that are potentially present at the Site at risk of injury and/or death, which constitutes a *negative, short-term, moderate* impact to the local populations.

6.1.3.2 Birds

The Proposed Development will see the removal of a number of mature trees and scrub habitats at the Site. These habitats are likely to provide foraging, nesting and resting habitat for local bird populations. Their loss will be offset to a degree by the planting of new hedgerows and trees across the Site, however, it will take several years for the newly planted trees and hedgerows to mature and provide the same level of value to local bird populations as the existing habitats. It should be noted that the woodland and the local landscapes provide very similar habitats (i.e., scrub, hedgerows and treelines), and the habitat area lost within the application Site is not considered to be of significant extent in the local context.

Therefore, considering the above, the loss of potential foraging, nesting and resting habitats, constitutes a *negative, long term, not significant* impact on birds at a *local* scale.

6.2.2 Impacts on Fauna

6.2.2.1 Birds

Collisions with Site structures

The height of buildings, coupled with the use of glass in their design can in some cases have the potential to impact on local birds (both migratory and non-migratory) through collisions. This is a result of birds being unable to distinguish between reflections in glass and the natural environment (resulting in birds flying into windows that appear to be trees or sky), and their inability to perceive clear glass as a solid object (City of Toronto, 2016).

Birds can strike clear glass while attempting to reach habitat and sky seen through corridors, windows positioned opposite each other in a room, ground floor lobbies, glass balconies or glass corners. The impact of striking a reflective or clear window in full flight often results in death.

The physical location of buildings and structures can also affect the likelihood of bird collisions. Structures placed on or near areas regularly used by large numbers of feeding, breeding, or roosting birds, or on local flight paths, such as those between foraging and roosting areas can present a higher risk of collision.

The Site itself is not deemed to be located in a sensitive area in terms of bird flight paths i.e., it is not located along the coast, or near any Special Protected Areas (SPAs) designated for wetland bird populations and is in itself not deemed to represent suitable *ex-situ* feeding/roosting habitat for any such species due to its size and location.

In addition, the Proposed Development entails building heights to a maximum of 2 storeys in height. As such, there is no risk of migrating birds colliding with the structures due to their height (Migrating species tend to commute far above this with Swans and Geese flying up to 2500ft (ca.750m) during migration along Irish Coasts (Irish Aviation Authority, 2020).

6.2.2.2 Bats

Public lighting

There will be an increase in human activity (noise and light levels) (Operational Operations) as a result of the proposed development and due to the medium level of bat biodiversity and activity, it is considered that this will have a *negative, permanent, slight* impact on local bat populations.

Collision risk with Buildings

Regarding collisions with proposed structures at the Site, it is noted that bats commute and forage largely using echolocation and as such are capable of navigating buildings unless largely made of smooth reflective metal or glass. In this regard collisions are not deemed to represent a significant risk, and light spill is the more likely obstruction to bat movements in the absence of mitigation.

6.3 Do nothing impact

If the Proposed Development were not to go ahead, the scrub habitats at the Site would likely continue to mature and provide a level of sheltering, foraging and nesting/resting habitat for local urban fauna. In the absence of preventative measures, the invasive floral species could

6.4 Cumulative impacts

If the Proposed Development and existing or proposed projects or plans impact on the same KERs, there is potential to lead to cumulative impacts which could be of a higher level of significance. This applies to potential impacts on bats due to the combined loss of suitable commuting and/or foraging habitat in the locality and potential impacts on birds due to the combined loss of nesting or foraging habitat in the locality.

6.4.1 Existing Granted Planning Permissions

There are several existing planning permissions on record in the area ranging from small-scale extensions and alterations to existing residential properties to some larger-scale developments. **No developments** with the potential to result in likely *significant* in-combination impacts on any KERs were identified. The larger, more recent applications are detailed below:

Planning Ref: SD16A/0072/EP. **Applicant:** Board of Management. **Address:** Saint Joseph's College, Post Primary School and Scoil Mhuire Girls National School, Lucan Road, Lucan, Co. Dublin **Decision date:** 26/06/2021. **Decision:** Grant extension of duration permission. **Description:** (1) Demolition of existing single and two storey post primary school buildings (1050sq.m) to the east of the main school building. (2) Construction of a part two, part three storey post primary school extension (3346sq.m in total) configuring as follows; (a) three storey extension (1817sq.m) north of the main school building along the Lucan Road forming a new post primary school pedestrian entrance off the Lucan Road, (b) two storey extension (1340sq.m) to the east of main school buildings, (c) two storey extension (escape stairs 55sq.m) to the south of main school buildings on the west side of the two storey classroom block, (d) single storey extension (133sq.m) at first floor north of the existing PE hall. (3) Reconfiguration of the existing vehicular and pedestrian access off Lucan Heights to form the main post primary school vehicular entrance and secondary pedestrian entrance. (4) The reconfiguration of the existing primary school pedestrian entrance in its current location off the Lucan Road and the re-designation of the existing post primary school vehicular entrance as the primary school vehicular entrance. (5) All associated site works.

No potential for significant in-combination effects due to:

- This application has been granted under the condition that "The drainage infrastructure, including the disposal of surface water, shall fully comply with all of the technical requirements of the Council's Water Services Section and/or Irish Water as appropriate." As such, it is assumed that sufficient mitigation/prevention measures for both Construction and Operational Phases of this development are in place to eliminate adverse effects via the surface water network into the river Liffey.
- Permitted development does not propose removal of existing bird/bat habitats

Planning Ref: SD18A/0429. **Applicant:** Liam Treacy & Donal Dixon. **Address:** Block 3, Millbank Business Park, Lower Lucan Road, Lucan, Co. Dublin. **Decision date:** 06/01/2020. **Decision:** Grant permission. **Description:** Demolition of a one storey warehouse building (c.1,051.2sq.m) and site boundary wall and the construction of 11 three storey residential units; 11 three bed units ranging in size from c. 105.9 – 112.2sq.m all with associated private back gardens, balconies and terrace areas; vehicular and pedestrian access is proposed off the Lower Lucan Road via two entrance points; 17 car parking spaces (including 1 disabled); sheltered bicycle storage and bin storage at surface level; a central public open space area of

house and sheds and the construction of three houses; two 3 bedroom 3 storey; semi-detached houses extending to 131.50sq.m each and one 3-bedroom; 3 storey detached house extending to 131.5sq.m; and all associated site works. Each house will have 2 off-street parking spaces to the front of the house (the total number of car spaces will be 6).

No potential for significant in-combination effects due to:

- The development is relatively small in scale and not directly adjacent to any waterbodies.
- The request for additional information states the following regarding environmental impact assessment: *Having regard to the modest nature of the proposed development, and the distance of the site from nearby sensitive receptors, there is no likelihood of significant effects on the environment arising from the proposed development.*

Planning Ref: SD17A/0241 and PL06S.249325. **Applicant:** Sharon O'Brien **Address:** 17 Esker Lawns, Lucan, Co. Dublin. **Decision date:** 14/03/2018. **Decision:** Grant Permission. **Description:** Permission for the demolition of an existing side extension to the west and rear shed to the north of the existing house, the construction of 2 new 2 storey, semi-detached 3 bedroom houses to the west of the site, along with proposed parking for proposed houses no's 1 and 2 and revised parking for existing no. 17 Esker lawns, with associated site works and new boundary walls.

No potential for significant in-combination effects due to:

- The development is relatively small in scale and not directly adjacent to any waterbodies.
- The development has been granted permission under condition that "*The drainage infrastructure, including the disposal of surface water, shall fully comply with all of the technical requirements of the Council's Water Services Section and or Irish Water as appropriate*" and "*All works and drawings for this development shall comply with the requirements of the Greater Dublin Regional Code of Practice for Drainage Works*"

6.4.2 Relevant Policies and Plans

The following policies and plans were reviewed and considered for possible in-combination effects with the Proposed Development.

- Dublin City Biodiversity Action Plan 2015-2020
- Draft Dublin City Biodiversity Action Plan 2021-2025
- South Dublin County Development Plan 2022 – 2028
- Draft Biodiversity Action Plan for South Dublin County – Connecting with Nature 2020 – 2026

The draft Biodiversity Action Plan for South Dublin County is set out to protect and improve biodiversity, and as such will not result in negative in-combination effects with the Proposed Development. The South Dublin County Development Plan 2022 – 2028 has directly addressed the protection and enhancement of biodiversity and natural heritage through specific policies (NCBH1, NCBH2, NCBH3, NCBH4, NCBH5). The relevant recommendations and mitigation measures have been integrated into the plan.

7 MITIGATION AND ENHANCEMENT MEASURES

7.1 Mitigation 1: Construction Phase measures

7.1.1 Surface Water and Groundwater Management

All works carried out as part of the Proposed Development will comply with all Statutory Legislation including the Local Government (Water Pollution) acts, 1977 and 1990 and the contractor will cooperate fully with the Environmental Section of South Dublin County Council.

Personnel working on the Site will be trained in the implementation of environmental control and emergency procedures. Procedures and relevant documents produced will be formulated in consideration of standard best international practice including but not limited to:

- CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors.
- Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 2005.
- BPGCS005, Oil Storage Guidelines.
- UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004; Construction Industry Research and Information Association CIRIA C648: Control of water pollution from linear construction projects: Technical guidance (Murnane et al. 2006).
- CIRIA C648: Control of water pollution from linear construction projects: Site guide (Murnane et al. 2006).

The following standard measures will protect surface- and groundwaters as well as the sloping woodland belt north of the Site during the Construction Phase of the Proposed Development:

- Silt fencing will be installed along the northern boundary to act as a temporary sediment control device to protect the sloping woodland belt downgradient to the north of the Proposed Development.
- This fencing will be inspected daily based on Site and weather conditions for any signs of contamination or excessive silt deposits and records of these checks will be maintained. Poned water from the trench will be pumped into a sediment tank and discharged based on Site authorisations or disposed of via a permitted wastewater contractor. Under no circumstances will any wastewater generated onsite be released into the sloping woodland.
- There will be no cement washout on Site except for washout of chutes, the washings of which will be collected into an appropriate contained for compliant off-Site management.
- Run-off from the working Site or any areas of exposed soil will be channelled and intercepted at regular intervals for discharge to silt-traps or lagoons with overflows directed to land rather than a surface water sewer.

- Construction-proof barriers that will define the limits for machinery drivers and other construction staff will be erected around the trees and hedge vegetation being retained, to define a "Work Exclusion Zone"
- All weather notices will need to be erected on the fences with words such as: "Tree Protection Fence — Keep Out".
- The fencing will be inspected on a regular basis during the duration of the Construction Phase and will remain in place until heavy building and landscaping work have finished and its removal is authorized by the project Arboriculturist.

During the Construction Phase, the following good housekeeping measures will be followed:

- All construction works are to be well planned in advance so as not to put pressure on the protective zone around the trees. All works are to occur from outside the protective zones.
- Where work space between the building lines and the protective fence lines is limited/ restricted, alternative work methods will need to be looked at so as to keep the work areas to their minimum in order to reduce the extent of soil and root damage occurring to the trees proposed for retention.
- For light access works within the work exclusion zone, the installation of suitable ground protection in the form of scaffold boards, woodchip mulch or specialist ground protection mats/plates may be acceptable. These are to be reviewed with the project Arboriculturist.
- Site operations to take care to avoid contact between retained trees/hedging and any wide/tall loads or plant with booms, jibs and counterweights.
- Materials, which can contaminate the soil, e.g. concrete mixings, diesel oil and vehicle washings, cannot be discharged within 10m of a tree stem.
- Fires cannot be lit in a position where their flames can extend to within 5 m of foliage, branches or trunk. This will depend on the size of the fire and the wind direction.
- Notice boards, wires and such like cannot be attached to any trees. Site offices, material storage and contractor parking will need to be located outside the work exclusion zones of the tree and hedge vegetation being retained.
- Services entering and leaving the site area are to be routed so they run outside the work exclusion zones (fenced off areas) of the trees being retained.
- Where changes to ground levels within the Root Protection Area (RPA) occur as a result of landscaping, these are to be either graded into the finished levels starting outside the RPA or alternatively, retaining wall structures are to be used differentiating between the different levels.
- All soft and hard landscaping within the RPA of the trees to be retained are to be carried out manually and the soil levels are not to be lowered or raised resulting in root damage to the trees.
- It will be important within these areas that all works are carried out manually with minimal intervention with machinery and where machinery is required; this will need to

- 3) Trees proposed 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).
- 4) 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:
 - a) Category 2: undertake a dusk/dawn survey to determine if bats are present. Complete a daytime check of trees using an endoscope. Remove deadwood in the presence of a bat specialist in order to check limbs for roosting bats.

7.2.3.2 Provision of Bat Boxes

A bat box scheme will be erected as part of the landscaping plan for the proposed development. This is in the form of two rocket bat boxes to be erected along the northern boundary habitat while four summer bat boxes (e.g. Woodcrete 1FF design) are recommended to be erected in consultation with the bat specialist. Bat boxes scheme will be sited carefully and this will be undertaken by a bat specialist. The rocket bat boxes will be erected on a 5m pole fixed in 1m³ of 40 newton strength concrete (Please see Bat Report for details). Monitoring will be required and the details presented below. The design of bats boxes chosen are self-cleaning (i.e. open at the bottom to allow bat droppings to fall out) and therefore no maintenance is required in relation to potential bat dropping build-up inside the boxes.

Bat boxes scheme will need to be re-sited carefully. The bat specialist will erect the bat boxes with assistance from the contractor. Some general points that will be followed 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 of bat boxes and predation of roosting 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. Therefore the bat boxes are to be erected mature trees to the rear of the proposed development site and away from public street lighting.

7.2.3.3 Bat-friendly lighting measures

7.2.3.3.1 Construction Phase Lighting Scheme

Subject to grant of permission, the Construction Phase lighting plan will be prepared by the main contractor when they are appointed. Every effort will be made to ensure that there will be no night-time construction lighting within or directed into vegetated areas. To ensure there is no light spill into these areas, the following luminaire specifications, taken from latest guidance (ILP, 2018), will be adhered to during the Construction Phase:

Any external lighting for the proposed development should strictly follow the above guidelines and these should be strictly implemented during construction and operation phase of the proposed development.

7.2.3.4 Monitoring of Bat mitigation measures

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 other bat mitigation measures. All mitigation measures should be checked to determine that they were successful. A full summer bat survey is recommended post-works.

Specific monitoring is recommended in relation to the proposed lighting scheme to determine that a level of <1 Lux is achieved along the boundaries of the proposed development site.

7.2.4 Fauna within the river Liffey

The surface water and groundwater mitigation and management measures detailed in Section 7.1 will serve to protect the water quality of the Liffey, which in turn will limit and/or eliminate any potential negative impacts on aquatic species that are sensitive to water quality changes, and the semi-aquatic species that rely on them.

7.2.5 Timing of vegetation clearance

The following table provides guidance for when vegetation clearance is permissible. Information sources include British Hedgehog Preservation Society's *Hedgehogs and Development* and *The Wildlife (Amendment) Act, 2000*. The preferred period for vegetation clearance is within the months of September and October. Vegetation will be removed in sections working in a consistent direction to prevent entrapment of protected fauna potentially present (e.g. Hedgehog). Where this seasonal restriction cannot be observed, a check for active roosts and nests, will be carried out immediately prior to any Site clearance by an appropriately qualified Ecologist / Ornithologist and repeated as required to ensure compliance with legislative requirements.

TABLE 5. SEASONAL RESTRICTIONS ON VEGETATION REMOVAL. RED BOXES INDICATE PERIODS WHEN CLEARANCE/WORKS ARE NOT PERMISSIBLE.

Ecological Feature	January	February	March	April	May	June	July	August	September	October	November	December
Breeding Birds	Vegetation clearance permissible		<u>Nesting bird season</u> No clearance of vegetation or works to relevant structures permitted unless confirmed to be devoid of nesting birds by an ecologist.						Vegetation clearance permissible			

Reduction of dust related impacts

The following general dust control measures will be followed for the duration of the Construction Phase of the Proposed Development and will ensure no significant dust related impacts occur to nearby sensitive receptors including local faunal species.

- In situations where the source of dust is within 25m of sensitive receptors screens (permeable or semi-permeable) will be erected.
- Haulage vehicles transporting gravel and other similar materials to site will be covered by a tarpaulin or similar.
- Access and exit of vehicles will be restricted to certain access/exit points.
- Vehicle speed restrictions of 20km/hr will be in place.
- Bowsers will be available during periods of dry weather throughout the construction period.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bower will operate to ensure moisture content is high enough to increase the stability of the soil thereby reducing the amount of dust.
- Stockpiles will be stored in sheltered areas of the site, covered, and watered regularly or as needed if exposed during dry weather.
- Gravel should be used at site exit points to remove caked-on dirt from tyre tracks.
- Equipment should be washed at the end of each work day.
- Hard surfaced roads will be wet swept to remove any deposited materials.
- Unsurfaced roads will be restricted to essential traffic only.
- If practical, wheel-washing facilities should be located at all exits from the construction site.
- Dust production as a result of site activity will be minimised by regular cleaning of the site access roads using vacuum road sweepers and washers. Access roads should be cleaned at least 0.5km on either side of the approach roads to the access points.
- Public roads outside the site shall be regularly inspected for cleanliness, as a minimum daily, and cleaned as necessary. A road sweeper will be made available to ensure that public roads are kept free of debris.
- The frequency of cleaning will be determined by the site agent and is weather and activity dependent
- The height of stockpiles will be kept to a minimum and slopes should be gentle to avoid windblown soil dust.
- The following will be dampened during dry weather:
 - Unpaved areas subject to traffic and wind
 - Stockpiles
 - Areas where there will be loading and unloading of dust-generating materials

gardens is undertaken and that native trees, such as those listed above, are planted. These tree species are all small native trees with a small root bulb

7.4.2 Hedgehog Highways and Compensatory habitat

To promote hedgehogs at the Site and avoid a net loss of habitat for hedgehogs, the tree trunk piles at the Site will be partly relocated to an alternative location within the Site to provide future habitat for hedgehogs. The relocated pile of tree trunks should maintain a high level of heterogeneity in the placement, providing large enough crevices and holes for hedgehogs. Retaining / relocating the tree trunk piles will also serve to maintain and/or improve habitats for invertebrate species that would typically utilise this type of habitat as day-to-day shelter, nesting and foraging, as well as potentially promote cavity nesting bee species.

Additionally, to promote safe hedgehog foraging and commuting at the Site, the fencing surrounding the back gardens of the houses will incorporate holes approx. 13cm in diameter just above ground level. These holes interconnecting the gardens are known as Hedgehog Highways, and they will allow hedgehogs to move freely through the back gardens. Hedgehogs will help maintain healthy garden invertebrate populations, as they eat beetles, caterpillars, worms and other invertebrates.



FIGURE 11. EXAMPLES OF HEDGEHOG HIGHWAYS INTEGRATED INTO FENCING.

8 RESIDUAL IMPACTS

Residual impacts are impacts that remain once mitigation has been implemented or impacts that cannot be mitigated. Table 6 provides a summary of the impact assessment for the identified Key Ecological Resources (KERs) and details the nature of the impacts identified, mitigation proposed and the classification of any residual impacts.

Key Ecological Receptor	Level of Significance	Potential Impact	Impact Without Mitigation			Proposed Mitigation & Enhancement measures	Residual Impact
			Quality	Scale	Duration		
Hedgehog (<i>Erinaceus europaeus</i>)	Local Importance (higher value)	Risk of injury and/or mortality during Construction Phase.	Negative	Local	Short-term	Moderate	<i>Imperceptible</i>
Bird assemblage	Local Importance (higher value)	Loss of potential foraging and nesting habitat, offset to a degree by planting of new trees and hedgerows.	Negative	Local	Long-term	Not significant	<i>Positive, long-term, moderate impact at local scale.</i>
		Disturbance due to noise/dust generated during Construction Phase	Negative	Local	Short-term	Moderate	<i>Imperceptible</i>
		Mortality during construction Phase.	Negative	Local	Short-term	Significant	<i>Imperceptible</i>

9 CONCLUSION

It is considered that, provided mitigation measures proposed are implemented and adhered to in full, there will be no significant negative impact to any valued habitats, designated sites or individual or group of species as a result of the Proposed Development.

Based on the successful implementation of the mitigation measures, and proposed works to be carried out in accordance with current best practice and the landscape plan, there will be no significant ecological impact arising from construction and the day-to-day operation of the Proposed Development. The planting of a mix of native and non-native pollinator friendly species across the Site, relocating existing habitats to new locations within the Site, connecting the garden with Hedgehog Highways, and the installation of a number of bat boxes will all be of benefit to the long-term biodiversity on the Site.

Kelly, J., O'Flynn, C., and Maguire, C. (2013). Risk analysis and prioritisation for invasive and non-native species in Ireland and Northern Ireland. A report prepared for the Northern Ireland Environment Agency and National Parks and Wildlife Service as part of Invasive Species Ireland

Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) Ireland Red List No.8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Lundy, M.G., Aughney, T., Montgomery, W.I., & Roche, N. (2011). Landscape conservation for Irish bats and species specific roosting characteristics. Bat Conservation Ireland.

Macklin, R., Brazier, B. & Sleeman, P. (2019). Dublin City otter survey. Report prepared by Triturus Environmental Ltd. for Dublin City Council as an action of the Dublin City Biodiversity Action Plan 2015-2020.

Marnell, F., Looney, D. & Lawton, C. (2019) Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.

NBDC. (2022). National Biodiversity Data Centre online mapping [ONLINE]. Available at: <http://maps.biodiversity.ie/Map.aspx>. [Accessed August 2022].

NPWS. (2009). Proposed Natural Heritage Area Site Synopses Portfolio.

NPWS. (2010). Circular NPW 1/10 & PSSP 2/10. Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Department of Environment, Heritage and Local Government.

NPWS. (2013a). The Status of Protected EU Habitats and Species in Ireland. Overview Volume 1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. Editor: Deirdre Lynn

NRA. (2009a). Environmental Assessment and Construction Guidelines. National Roads Authority (now Transport Infrastructure Ireland), Dublin.

NRA. (2009b). Guidelines for Assessment of Ecological Impacts of National Road Schemes. National Roads Authority (now Transport Infrastructure Ireland), Dublin.

NRA. (2010). Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads(now Transport Infrastructure Ireland), Dublin.

Smith, G.F., O'Donoghue, P., O'Hora, K. and Delaney, E. (2011). Best practice guidance for habitat survey and mapping. The Heritage Council, Kilkenny.

Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

	<ul style="list-style-type: none"> - Area of High Amenity, or equivalent, designated under the County Development Plan. - Resident or regularly occurring populations (assessed to be important at the County level) of the following: <ul style="list-style-type: none"> - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list. - Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. - County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP (Biodiversity Action Plan), if this has been prepared. - Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. - Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
<p>Local Importance (Higher Value)</p>	<ul style="list-style-type: none"> - Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; - Resident or regularly occurring populations (assessed to be important at the Local level) of the following: <ul style="list-style-type: none"> - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list. - Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; - Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
<p>Local Importance (Lower Value)</p>	<ul style="list-style-type: none"> - Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; - Sites or features containing non-native species that are of some importance in maintaining habitat links.

Long-term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years
Reversible	Effects that can be undone, for example through remediation or restoration.

	House Martin	<i>Delichon urbicum</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	Amber
	House Sparrow	<i>Passer domesticus</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	Amber
	Little Egret	<i>Egretta garzetta</i>	12/10/2017	Birds of Ireland	WA, BD	-	-	Green
	Long-tailed Tit	<i>Aegithalos caudatus</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	Green
	Mallard	<i>Anas platyrhynchos</i>	31/12/2011	Bird Atlas 2007 - 2011	WA, BD	-	-	Amber
	Mistle Thrush	<i>Turdus viscivorus</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	Green
	Mute Swan	<i>Cygnus olor</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	Amber
	Rook	<i>Corvus frugilegus</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	Green
	Song Thrush	<i>Turdus philomelos</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	Green
	White Wagtail	<i>Motacilla alba</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	NA
	Winter Wren	<i>Troglodytes troglodytes</i>	31/12/2011	Bird Atlas 2007 - 2011	WA	-	-	Green
Bats	Brown Long-eared Bat	<i>Plecotus auritus</i>	28/04/2011	National Bat Database of Ireland	HD	-	lc	-
	Daubenton's Bat	<i>Myotis daubentonii</i>	28/04/2011	National Bat Database of Ireland	HD	-	lc	-
	Lesser Noctule	<i>Nyctalus leisleri</i>	28/04/2011	National Bat Database of Ireland	HD	-	lc	-
	Pipistrelle	<i>Pipistrellus pipistrellus sensu lato</i>	28/04/2011	National Bat Database of Ireland	HD	-	lc	-
	Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	16/05/2008	National Bat Database of Ireland	HD	-	lc	-
	West European Hedgehog	<i>Erinaceus europaeus</i>	14/05/2021	Hedgehogs of Ireland	WA	-	lc	-
	Eurasian Badger	<i>Meles meles</i>	17/02/2013	Road Kill Survey	WA	-	lc	-
Other Protected/Rare flora & fauna	Green Figwort	<i>Scrophularia umbrosa</i>	10/07/2020	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	-	-	EN	-
	Hairy St John's-wort	<i>Hypericum hirsutum</i>	11/09/2021	Community Foundation for Ireland Records	FPO	-	EN	-
	Yellow Archangel	<i>Lamiastrum galeobdolon</i> subsp. <i>montanum</i>	08/04/2019	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	-	-	VU	-
Invasive flora	Douglas Fir	<i>Pseudotsuga menziesii</i>	02/09/2005	Species Data from the National Vegetation Database	-	Medium	-	-
	Water Fern	<i>Azolla filiculoides</i>	31/12/2003	National Invasive Species Database	-	Medium (S.I. 477)	-	-
	Cherry Laurel	<i>Prunus laurocerasus</i>	11/09/2021	Community Foundation for Ireland Records	-	High	-	-
	Giant Hogweed	<i>Heracleum mantegazzianum</i>	14/06/2021	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	-	High (S.I. 477)	-	-
	Himalayan Honeysuckle	<i>Leycesteria formosa</i>	10/11/2021	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	-	Medium	-	-
	Indian Balsam	<i>Impatiens glandulifera</i>	11/09/2021	Community Foundation for Ireland Records	-	High (S.I. 477)	-	-
	Sycamore	<i>Acer pseudoplatanus</i>	11/09/2021	Community Foundation for Ireland Records	-	Medium	-	-
Invasive fauna	Jenkins' Spire Snail	<i>Potamopyrgus antipodarum</i>	02/09/2016	A national macroinvertebrate dataset collected for the biomonitoring of Ireland's river network, 2007-2018 (EPA)	-	Medium	-	-

APPENDIX IV – BAT SURVEY REPORT

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

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

NPWS licence C13/2020 (Licence to handle bats, expires 31st December 2022);

NPWS licence 08/2020 (Licence to photograph/film bats, expires 31st December 2022) ;

NPWS licence DER/BAT 2022-36 (Survey licence, expires 24th March 2025).

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 2022-37 (Survey licence, expires 24th March 2025).

Applicant Name: Nacul Developments Ltd.

Project Title: "Clonbrone", on Lucan Newlands Road / Esker Hill, Lucan, Co. Dublin, K78 Y5C2.

Application Address: Lucan Newlands Road / Esker Hill, Lucan, Co. Dublin, K78 Y5C2.

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
23 rd August 2022	Draft 1	By email to Enviroguide Consulting
16 ^h September 2022	Final	By email to Enviroguide Consulting

Purpose

This document has been prepared as a Report for Enviroguide Consulting. 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.

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1. Introduction

Bat Eco Services was commissioned by Enviroguide Consulting to undertake a bat survey of a proposed development site located at "Clonbrone" on Lucan Newlands Road / Esker Hill, Lucan, Co. Dublin, K78 Y5C2 and this entailed daytime inspection of internal and external spaces of buildings, dusk surveys and static surveillance.

1.1 Relevant Legislation & Bat Species Status in Ireland

1.1.1 Irish Statutory Provisions

A small number of animals and plants are protected under Irish legislation (Nelson, *et al.*, 2019). The principal statutory provisions for the protection of animal and plant species are under the Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. See www.npws.ie/legislation for further information.

The codes used for national legislation are as follows:

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

1.1.2 EU Legislation

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

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

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

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

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of conservation status for 59 habitats and 60 species. There are three volumes with the third listing details of the species assessed.

Article 12 of the Habitats Directive requires Member States to take measures for the establishment of a strict protection regime for animal species listed in Annex IV(a) of the Habitats Directive within the whole territory of Member States. Article 16 provides for derogation from these provisions under

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is an offence. The most recent guidance document is "Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final".

Regulation 51(2) of the 2011 Regulations provides –

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

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

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

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

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

shall be guilty of an offence."

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

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

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. *Nathusius' pipistrelle* *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species. A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

Irish bat species list is presented in Table 1 along with their current status.

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

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

1.2.1 Bat Survey Requirements & Timing

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

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

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

Table 3. The applicability of survey methods.

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

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

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

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

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

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

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

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

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

The guidelines consulted recommend that the potential impacts of a proposed development on bats are assessed as early as possible in the design stage to determine any areas of conflicts. In particular the Table 4 (presented as Figure 1d below) and Figure 20 (presented as Figure 1c) from Marnell *et al.* (2022) are referenced during this process.

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

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

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

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

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

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

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

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

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 <i>Myotis daubentonii</i>	Category 4	Light sensitive
Whiskered bat <i>Myotis mystacinus</i>	Category 4	Light sensitive
Natterer's bat <i>Myotis nattereri</i>	Category 4	Light sensitive
Leisler's bat <i>Nyctalus leisleri</i>	Category 2	Light tolerant
Nathusius' pipistrelle <i>Pipistrellus nathusii</i>	Category 3	Semi-tolerant
Common pipistrelle <i>Pipistrellus pipistrellus</i>	Category 3	Semi-tolerant
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	Category 3	Semi-tolerant
Brown long-eared bat <i>Plecotus auritus</i>	Category 4	Light sensitive
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	Category 4	Light sensitive

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

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

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

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

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

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

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

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

Key
 * Large well-insulated hibernation boxes may be more successful
 N/A -not applicable; bat boxes should not be considered as replacement roosts
 H - tree hollow-type box, providing a void in which bats can cluster
 C - tree crevice-type box, with 25-35mm crevices
 ? - few data on which to base an assessment

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

1.2.3.2.1 Effectiveness of Bat Boxes as a Mitigation Measure

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

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

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

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

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

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

1.2.3.3 Landscaping For Bats

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

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

1.3 Project Description

1.3.1 Site Location

The application site is located on Lucan Newlands Road / Esker Hill, Lucan, Co. Dublin, K78 Y5C2. The proposed development consists of an existing 2 storey detached dwelling (162m²) and associated out-buildings on site along with mature gardens.



Figure 2a: Red line boundary of proposed development (Supplied by Enviroguide Consulting).

1.3.2 Proposed Project

Nacul Developments Ltd. seeks permission for development at a site known as "Clonbrone", on Lucan Newlands Road / Esker Hill, Lucan, Co. Dublin, K78 Y5C2. The proposed development consists of the demolition of an existing 2 storey detached dwelling (162m²) and associated out-buildings on site, and the construction of 7 no. 2 storey (plus dormer level), 5 bedroom houses, comprised of 3 no. detached houses and 4 no. semi-detached houses, on a site area of c.0.3ha. The proposed development also provides for all associated site development works, car parking, open spaces and landscaping. Proposed access to the development will be via the existing vehicular entrance gate on the Lucan-Newlands Road / Esker Hill.

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 4a: Bat Roost Types (adapted from Collins 2016).

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

2.1.1 Building & Structure Inspection

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

2.2 Night-time Bat Detector Surveys

2.2.1 Dusk & Walking Transect Bat Surveys

Dusk Surveys were completed on the 12th and 18th July 2022 from 10 minutes before sunset to 110 minutes post sunset and the surveyors position themselves within the proposed development site to determine the general bat activity of the proposed development site. This was following by a walking transect of the proposed development site and immediate vicinity of the proposed development site.

The following equipment was used:

Surveyor 1: Bat Logger M2 Full Spectrum Bat Detector and Pettersson D200 Heterodyne Bat Detector.

Surveyor 2: Anabat Scout Full Spectrum Bat Detector and Pettersson D200 Heterodyne Bat Detector.

2.2.2 Filming

A Guide TrackIR Pro25 and Pro19 thermal imagery scope filming (x2 units) were also deployed on 12/7/2022 to capture potential emerging bats from potential roosting sites. This was completed from 10 minutes before sunset till at least 120 minutes after sunset and 110 minutes before sunrise to 10 minutes after sunrise. Captured film was watched post-survey and any emerging bats were noted.

2.2.3 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 positioned 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 (12th to 18th July 2022).

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Building & Structure Inspection

A 2-storey dwelling and garden shed were inspected on 12th July 2022. Bat droppings (*Pipistrellus* species) were recorded in the attic space of the dwelling. There was one area of accumulation of droppings (on storage boxes within the attic space below the roof rafters – Plate 1) and a small scatter of dropping in other areas of the attic including on the chimney walls. There is no roof felt (Plate 3) in this attic space and there are chip-board sheets along one side of the roof which is likely to be where the bats are roosting (Plate 2) as bats were not visible during the daytime inspection.



Plate 1: Bat droppings in the attic space of the dwelling.



Plate 3: Chimney breast and slates with parching (no roof felt present) in attic space of dwelling.

3.2 Night-time Bat Detector Surveys

The primary purpose of the night-time surveys were to determine the bat activity usage of the survey area and to determine if bats were roosting in the buildings located on-site. The wooded area on the slope between the proposed development site and Lucan Road was not walked in the hours of darkness for Health & Safety reasons but a static recording unit was located on a mature tree along the boundary of this wooded area to mitigate for this and record for any potential bat activity.

3.2.1 Dusk Bat Surveys

Bat detector surveys were completed on 12/7/2022 (Dusk Survey - Weather conditions: 18oC, patchy cloud cover, calm and dry), 18/7/2021 (Dusk Survey – Weather conditions: 13oC, patchy cloud cover, calm and dry). Thermal Imagery scopes (x2 units) were deployed on 12/7/2022 to film the dwelling with emphasis on the roof, chimney and fascia/soffit areas.



Figure 3a: Thermal Imagery scope filming – screenshot of views captured.

3.2.1.1 Dusk Survey 12/7/2022 (Night 1)

Surveyor 1 was located in front of the dwelling while Surveyor 2 was located to the rear of the dwelling. The thermal imagery scopes were also set up to film the front and rear of the dwelling to record any emerging bats around the chimneys and ridge tiles.

The following is a synopsis of the bat activity recorded during the Dusk Survey on Night 1:

Surveyor 1 recorded the first bat at 22:18 hrs and this was a soprano pipistrelle. A common pipistrelle was recorded at 22:20 hrs. Both species briefly foraged in the front garden of the survey area.

Surveyor 2 recorded the first bat at 22:07 hrs and this was a common pipistrelle. A soprano pipistrelle was recorded at 22:14 hrs. Both species briefly foraged in the back garden of the survey area. A Leisler's bat was recorded commuting through the survey site at 22:16 hrs from a south-east to north-west direction and foraged in the tree canopy.

Three bats were recorded emerging from the dwelling (recorded on the thermal imagery scopes), all three individuals emerged from the lead flashing around the chimney. This is a small roost and is indicative of a Satellite Roost.

The bats recorded exiting the building on the thermal imagery scopes were not detected emerging on the surveyor's bat detectors during the dusk survey (i.e. did not echolocate during emergence). Sometimes when bats emerge early, they do not echolocate as they can see in the light levels during



Figure 3c: Location of bat encounters recorded during dusk surveys.

3.2.2 Passive Static Bat Detector Survey

3.2.2.1 Static Surveillance

The following tables provides details with regards to the static units deployed in 2022 during the bat survey. Three static units were deployed for six nights, two units were located on trees in the garden of the proposed development to document foraging and commuting bats while the third unit was place in the attic space. One unit failed to recorded (located on a tree to the rear of the house).

Table 7a: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Location Description	Survey Period	Results
Mini 1	In attic space	12/7/2022 to 18/7/2022 (6 nights)	Soprano pipistrelle
Mini 2	703566, 735160 ITM On tree in wooded area boundary	12/7/2022 to 18/7/2022 (6 nights)	Leisler's bat, common pipistrelle, soprano pipistrelle, brown long-eared bat and Daubenton's bat.
Mini 5	703596, 735126 ITM	Not applicable	Failed to record

earliest time was on Night 5 when sunset time was approximately 21:45 hrs. Therefore the bat was detected 54 minutes after sunset. This species of bat tends to emerge 40 minutes after sunset and therefore may indicate that there is a roost located close by and individuals commuted to the woodland adjacent to the proposed development site, likely en-route towards the River Liffey.

Table 7b: Time of earliest bat echolocation call for Brown long-eared bats and Daubenton's bat.

Bat Species	Night 1	Night 2	Night 3	Night 4	Night 5	Night 6
Brown long-eared bat	01:59 hrs	None	None	01:20 hrs	None	03:33 hrs
Daubenton's bat	01:41 hrs	01:23 hrs	22:58 hrs	22:51 hrs	22:39 hrs	23:24 hrs

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). At this time of the year, 8 hours per night is generally available to foraging bats (21:30 hrs to 05:30 hrs). (Please see tables in Appendices for nightly breakdown of activity).

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 tend 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.

Over the course of the surveillance period, the average level of bat activity per hour recorded on the static unit (Mini 2) was calculated for each bat species based on the total number of bat passes. Soprano pipistrelle was the most frequently recorded bat species and the level of bat activity is, overall, Low. All other bat species were also recorded at a lower level of bat activity but the number of bat species recorded indicates that the proposed development site is used by five bat species with some *Myotis* species calls which is likely to be Daubenton's bats.

Table 7c: Level of bat activity recorded on Static Bat Detectors deployed during Static Bat Detector Surveys.

	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Daubenton's bat
Mini 2	Low	Low	Low	Low	Low

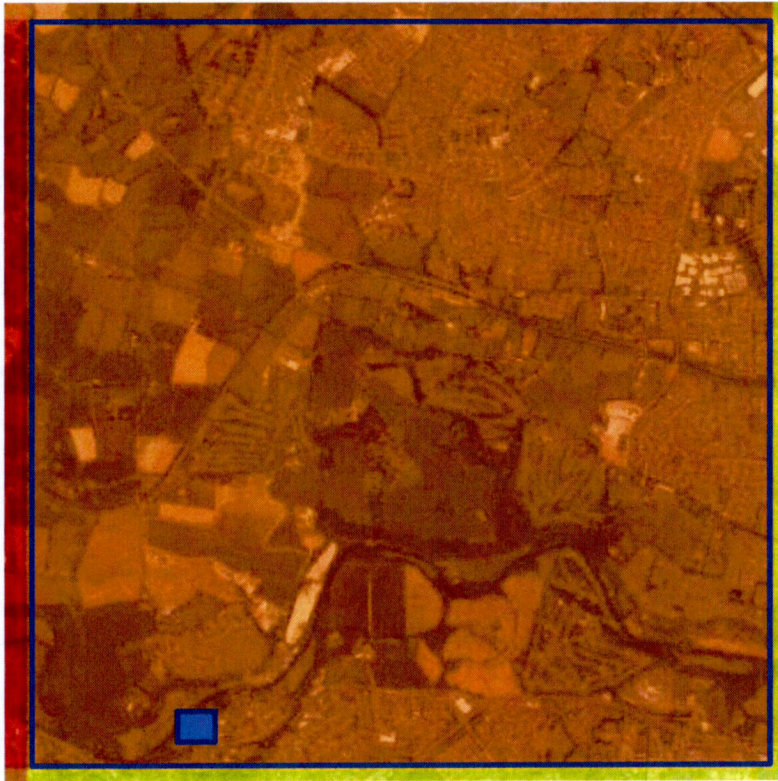


Figure 5: Bat Landscape Favourability Model (All Bats) (Source: NBDC) – Blue Box = approximate proposed development area.

Table 8: Bat Conservation Ireland Bat Landscape Favourability Model – 5km Square value.

Bat species	5km Square
Common pipistrelle	50% (High)
Soprano pipistrelle	43% (Medium to High)
Nathusius' pipistrelle	18% (Low to Medium)
Leisler's bat	51% (High)
Brown long-eared bat	50% (High)
Daubenton's bat	33% (Medium to High)
Natterer's bat	41% (Medium to High)
Whiskered bat	31% (Medium to High)
Lesser horseshoe bat	0% (Not suitable)

4. Bat Ecological Evaluation

4.1 Bat Species Recorded & Sensitivity

Five species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle, Daubenton's bat, brown long-eared bat and *Myotis* species (this species is likely to be Daubenton's bat). The first three species were recorded during both the bat detector surveys (i.e. dusk surveys) and static surveillance and bat activity levels were indicative, primarily, of commuting and foraging individuals. A small soprano pipistrelle Satellite Roost was recorded in the attic space of the dwelling house which will have contributed to the higher, on average level of bat activity of this species compared to all other bat species recorded. The latter two bat species (i.e. brown long-eared bat and Daubenton's bat) were recorded in a low level of bat passes on the static unit located adjacent to the wooded area. The activity levels tended to be later in the night indicating commuting and foraging individuals.

Over the course of the surveillance period, the average level of bat activity per hour recorded on the static units was calculated for each bat species based on the total number of bat passes. Soprano pipistrelle was the most frequently recorded bat species and the level of bat activity is, overall, Low. All other bat species were also recorded at a low level of bat activity but the number of bat species recorded indicates that the proposed development site is used by five bat species with some *Myotis* species calls which is likely to be Daubenton's bats.

Overall, the survey results demonstrate that bats (apart from soprano pipistrelles, which are roosting in the dwelling house) commuted to the proposed development site from a southerly direction and foraged, primarily along the boundary habitats and wooded area adjacent to the proposed development site.

Leisler's bat

- Leisler's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Leisler's bat population is considered to be significantly increasing trend (Aughney *et al.*, 2021).
- The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km²). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.*, 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km.

Common pipistrelle

- Common pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national common pipistrelle population is considered to be significantly increasing trend (Aughney *et al.*, 2021).
- The modelled Core Area for common pipistrelle is a relatively large area that covers much of the island of Ireland (56,485km²). 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).

4.4 Landscape Plan & Tree Protection Plan

The landscape plan indicates that a number of the trees within the proposed development site are proposed to be removed as part of the development. Eight trees were identified as having a Potential Bat Roost (PBR) value but only one of these is proposed to be removed while five PBR trees are recommended to have some works in order to removed dead wood etc. The features proposed to be removed are potential roosting sites for bats.

4.5 Lighting Plan

The proposed lighting plan indicates that there will lighting along northern boundary of the proposed development site. The horizontal illuminance map for full lighting indicated that the LUX range is 1.34 to 12.48 LUX with an average of 5.15 LUX. The horizontal illuminance map for dimmed lighting indicated that the LUX range is 1.00 to 9.36 LUX with an average of 3.87 LUX. While the lower ranges of LUX will be tolerated by light tolerant or semi-tolerant bat species (Please see Table 3: common pipistrelle, soprano pipistrelle and Leisler's bats), the entire range of LUX will prevent light-sensitive bat species from utilising the area with outdoor lighting. As the woodland boundary with the proposed development site is an important boundary for local bat populations (commuting and foraging), additional steps were designed into the lighting plant to reduce the potential impact on local bat populations.

To minimise impact on bat life, the lighting design has incorporated the following:

- LED luminaires will be used as they have low UV output, sharp cut-off, lower intensity, good colour rendition and dimming capability.
- Luminaire is a fixture that is mounted horizontally, ensuring minimal up-light.
- As per BCT recommendations luminaires should be mounted on poles of minimum height possible (preferably 6m and less).
- Glare shields will be utilized in order to minimise any unnecessary light spill onto bat routes along the boundary if this site.

On examination of the horizontal luminance map, the LUX means that glare shields are essential to further reduce light spillage along these linear habitats, particularly adjacent to the public space along the northern boundary.

In addition, the following designs will also reduce impact on local bat populations:

- the lighting is designed to dim by 25% from 00:00 to 06:00hrs.
- the lighting design has positioned the columns away from existing trees with an aim of 6m clearance. This has been achieved for all but one column. However, given the geometry of the layout, the lighting design team have stated that they have achieved the maximum distance possible, and it is unlikely to cause any maintenance or shadowing issues.

An NPWS Derogation Licence will be required in relation to the loss of a satellite roost for soprano pipistrelles. Alternative roosting has been mitigated with the provision of bat boxes. Bat mitigation measures are presented in order to reduce the potential impact of the lighting scheme for the proposed development with additional measures relating to tree felling and the erection of additional bat boxes. If the mitigation measures presented below are strictly implemented, the scale of impact is likely to be reduced to Permanent Slight Negative impact on local bat populations.

5.1 Bat Mitigation Measures

5.1.1 Lighting Plan

This element of the proposed planning application is an 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.

Bats are light sensitive species, hence their nocturnal activities. The three bat species recorded commuting and foraging within the survey area are Light Tolerant or Semi-tolerant bat species. However, it is still important that strict lighting guidelines are required to reduce the potential impact of the proposed development on local bat populations as standard best practice.

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.

Any external lighting for the proposed development should strictly follow the above guidelines and these should be strictly implemented during construction and operation phase of the proposed development. The following table provides details of which of the BCT, 2018 measures will be implemented as part of the proposed lighting plan.

"1 lux line, (Yellow line in horizontal illuminance map), very close to the area to be lit. The black line is 0.5 lux. We have minimised the impact on the trees as much as we can, while complying with SDCC requirements and EU standards."

5.1.2 Landscaping

It is recommended that native tree, shrub and plant species are included in the landscaping plan. It is recommended that night-scented planting is also undertaken to encourage foraging areas for local bat populations.

It is recommended that a native hedgerow with individual trees (Alder, Birch, Crab apple, Rowan etc.) is planted along the northern boundary and is linked in with the current landscaping measures. It is recommended that tree planting in individual gardens is undertaken and that native trees, such as those listed above, are planted. This tree species are all small native trees with a small root bulb.

5.1.3 PBR Tree Felling

In relation to trees proposed to be felled and identified as PBRs, these should be resurveyed in consultation with the tree contractors. The following is recommended:

- i) A Phase Two PBR survey is recommended for the trees identified as a PBR and proposed to be felled/and or tree surgery works. This should be undertaken at least one month prior to tree felling in order to propose a tree felling plan in conjunction with tree contractors.
- ii) Alternative roosting sites (i.e. summer bat boxes) will be erected prior to the removal of tree and tree surgery works on additional trees listed and identified as PBRs. These are recommended to be erected 6 months prior to tree felling to allow local bat populations to become aware of them prior to removal of the trees.
- iii) Trees proposed 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).
- iv) 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:
 - a. Category 2: undertake a dusk/dawn survey to determine if bats are present. Complete a daytime check of trees using an endoscope. Remove deadwood in the presence of a bat specialist in order to check limbs for roosting bats.

5.1.4 Bat Conservation Measures

A bat box scheme will be erected as part of the landscaping plan for the proposed development. This is in the form of two rocket bat boxes to be erected along the northern boundary habitat while four summer bat boxes (e.g. Woodcrete 1FF design) are recommended to be erected in consultation with the bat specialist. Bat boxes scheme will be sited carefully and this will be undertaken by a bat specialist. The rocket bat boxes will be erected on a 5m pole fixed in 1m³ of 40 newton strength concrete (Please see appendices for details). Monitoring will be required and the details presented below. The design of bats boxes chosen are self-cleaning (i.e. open at the bottom to allow bat droppings to fall out) and therefore no maintenance is required in relation to potential bat dropping build-up inside the boxes.

Bat boxes scheme will need to be re-sited carefully. The bat specialist will erect the bat boxes with assistance from the contractor. Some general points that will be followed include:

6. Survey Conclusions

Five species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle, Daubenton's bat, brown long-eared bat and *Myotis* species (this species is likely to be Daubenton's bat). The first three species were recorded during bat detector surveys and static surveillance bat activity levels were indicative of commuting and foraging individuals. A small soprano pipistrelle Satellite Roost was recorded in the attic space of the dwelling house. The latter two bat species were recorded in a low level of bat passes on the static unit located adjacent to the wooded area.

Over the course of the surveillance period, the average level of bat activity per hour recorded on the static units was calculated for each bat species based on the total number of bat passes. Soprano pipistrelle was the most frequently recorded bat species and the level of bat activity is, overall, Low. All other bat species were also recorded at a low level of bat activity but the number of bat species recorded indicates that the proposed development site is used by five bat species with some *Myotis* species calls which is likely to be Daubenton's bats.

Overall, the survey results demonstrate that bats (apart from soprano pipistrelles, which are roosting in the dwelling house) commuted to the proposed development site from a southerly direction and foraged, primarily along the boundary habitats and wooded area adjacent to the proposed development site.

A soprano pipistrelle satellite roost was recorded in the roof space of the dwelling. According to Figure 20 (p. 46) of Marnell *et al.* (2022), the roost status would be considered to have a "Low" conservation significance and mitigation measures required would be "*Flexibility over provision of bat boxes, access to new buildings etc. No condition about timing or monitoring.*"

Eight trees were identified as having a Potential Bat Roost (PBR) value but only one of these is proposed to be removed while five PBR trees are recommended to have some works in order to removed dead wood etc. The features proposed to be removed are potential roosting sites for bats.

The proposed development site is a small area and an overall low level of bat activity was recorded but a high bat biodiversity level was recorded. The results indicate that the boundary of the proposed development site with the wooded area is commuting and foraging habitat for local bat populations.

Therefore the potential impact of the proposed development is, overall, considered to be Permanent Negative and to have a scale of impact of Slight to Moderate impact on named bat species (according to criteria set out in Tables 2c and d, Section 1.2.2). This is primarily in relation to the satellite roost for soprano pipistrelle and the lighting plan for the proposed development scheme and the presence of light-sensitive bat species.

An NPWS Derogation Licence will be required in relation to the loss of a satellite roost for soprano pipistrelles. Alternative roosting has been mitigated with the provision of bat boxes. Bat mitigation measures are presented in order to reduce the potential impact of the lighting scheme for the proposed development with additional measures relating to tree felling and the erection of additional bat boxes. If the mitigation measures presented below are strictly implemented, the scale of impact is likely to be reduced to Slight Negative impact on local bat populations.

Bat mitigation measures are presented in order to reduce the potential impact of the lighting scheme for the proposed development. If the mitigation measures presented above are strictly implemented, the scale of impact is likely to be reduced to Permanent Slight Negative impact on local bat populations.

Downs, N.C., Beaton, V., Guest, J., Polanski, J., Robinson, S.L. and Racey, P.A. (2003) The effects of illuminating the roost entrance on the emergence behaviour of *Pipistrellus pygmaeus*. *Biological Conservation* 111, p. 247-252.

EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive) 1992.

Eisenbeis G and Hassel F. (2000). Zur Anziehung nachtaktiver Insekten durch Straßenlaternen – eine Studie kommunaler Beleuchtungseinrichtungen in der Agrarlandschaft Reinheßens Attraction of nocturnal insects to street lights – a study of municipal lighting systems in a rural area of Rheinhessen (Germany)]. *Natur und Landschaft* 75: 145–56.

EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports. EPA, Ireland.

Frank K.D. (1988). Impact of outdoor lighting on moths: an assessment. *J Lepidop Soc* 42: 63–93.

Gunnell, K., Grant, G. and Williams, C (2012) Landscape and urban design for bats and biodiversity. The Bat Conservation Trust, London.

Hanski, I. (1998) Metapopulation Dynamics. *Nature*, 396, 41-49.

Holker, F., Wolter, C., Perkin, E.K. & Tockner, K. (2010). Light pollution as a biodiversity threat. *Trends Ecol. Evol.* 25, 681–682. <https://doi.org/10.1016/j.tree.2010.09.007>.

Hundt, L. (2012) Bat Surveys: Good Practice Guidelines (2nd Edition). The Bat Conservation Trust, London.

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.

Kolligs D. 2000. Ökologische Auswirkungen künstlicher Lichtquellen auf nachtaktive Insekten, insbesondere Schmetterlinge (Lepidoptera) [Ecological effects of artificial light sources on nocturnally active insects, in particular on moths (Lepidoptera)]. *Faunistisch-Ökologische Mitteilungen Suppl* 28: 1–136.

Lintott P. & Mathews F. (2018) *Reviewing the evidence on mitigation strategies for bats in buildings: informing best-practice for policy makers and practitioners*. CIEEM Commissioned Report

Longcore T. and Rich C. (2004). Ecological light pollution. *Frontiers in Ecology and Environment*. 2: 191-198.

Lundy, M.G., Montgomery, I.W., Roche, N. & Aughney, T. (2011). *Landscape Conservation for Irish Bats & Species Specific Roosting Characteristics* (Unpublished). Bat Conservation Ireland, Cavan, Ireland.

Lysaght, L. and Marnell, F. (eds) (2016) Atlas of Mammals in Ireland 2010-2015, National Biodiversity Data Centre, Waterford.

Marnell, F., Kingston, N. & Looney, D. (2009) *Ireland Red List No. 3: Terrestrial Mammals*, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Marnell, F., Looney, D. & Lawton, C. (2019) Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.

Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Martin, B.; Pérez, H.; Ferrer, M. Light-Emitting Diodes (LED): A Promising Street Light System to Reduce the Attraction to Light of Insects. *Diversity* 2021, 13, 89. <https://doi.org/10.3390/d13020089>.

Speakman, J.R. (1991) Why do insectivorous bats in Britain not fly in daylight more frequently? *Funct. Ecol.* 5, 518–524.

Stebbings, R. E. & Walsh, S. T. (1991) *Bat Boxes: A guide to the history, function, construction and use in the conservation of bats*. The Bat Conservation Trust, 1991.

Stone, E., Jones, G. and Harris, S. (2009). Street lighting disturbs commuting bats. *Current Biology*, **19**: 1123–1127.

Stone, E. L., Jones, G., and Harris, S. (2012). Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats. *Global Change Biology* **18**, 2458–2465. doi:10.1111/j.1365-2486.2012.02705.x

Stone EL, Harris S, Jones G. 2015 Impacts of artificial lighting on bats: a review of challenges and solutions. *Mammal. Biol.* **80**, 213–219. (doi:10.1016/j.mambio.2015.02.004)

Svensson A.M. and Rydell J. (1998). Mercury vapour lamps interfere with bat defence of tympanate moths (*Operophtera* spp.; Geometridae). *Animal Behaviour* **55**: 223–226.

Voigt C.C., Azam, C., Dekker, J., Feguson, J., Fritze, M., Gazaryan, S., Holker, F., Jones, G., Leader, N., Limpens, H.J.G.A., Mathews, F., Rydell, J., Schofield, H., Spoelstra, K., Zagmajster, M. (2018) Guidelines for consideration of bats in lighting projects. EUORBATS Publication Series No. 8. UNEP/EUROBATS Secretariat, Bonn.

Wakefield, A., Broyles, M., Stone, E.L., Jones, G. & Harris, S. (2016). Experimentally comparing the attractiveness of domestic lights to insects: Do LEDs attract fewer insects than conventional light types? *Ecol. Evol.* 6, 8028–8036. <https://doi.org/10.1002/ece3.2527>.

Whilde, A. (1993). *Threatened mammals, birds, amphibians and fish in Ireland. Irish Red Data Book 2: Vertebrates*. Belfast: HMSO.

Wildlife Act 1976 and Wildlife [Amendment] Act 2000. Government of Ireland.

Wilson, R., Wakefield, A., Roberts, N. and Jones, G. (2021) Artificial light and biting flies: the parallel development of attractive light traps and unattractive domestic lights. *Parasite & Vectors*. <https://doi.org/10.1186/s13071-020-04530-3>.

Zeale, M.R.K., Stone, E.L., Zeale, E., Browne, W.J., Harris, S. & Jones, G. (2018). Experimentally manipulating light spectra reveals the importance of dark corridors for commuting bats. *Glob. Chang. Biol.* 24, 5909–5918. <https://doi.org/10.1111/gcb.14462>.



		
<p>Dense Treeline Hedgerow</p>	<p>DT</p>	<p>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.</p> 

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

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

8.3 Appendix 3 Bat Assessment Tables

Table 4.1 Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape, to be applied using professional judgement.		
Suitability	Description Roosting habitats	Commuting and foraging habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	<p>A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions^a and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation^b).</p> <p>A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.^c</p>	<p>Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.</p> <p>Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.</p>
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions ^a and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	<p>Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens.</p> <p>Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.</p>
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions ^a and surrounding habitat.	<p>Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.</p> <p>High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland.</p> <p>Site is close to and connected to known roosts.</p>

^a For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.

^b Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten *et al.*, 2015). This phenomenon requires some research in the UK but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.

^c This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Figure A: Table 4.1 (p 35) Reproduced from Collins (2016).

Table 2 Factors affecting the probability of bats being present.

Factors affecting the probability of a building being used by bats in summer	
Increased probability	<ul style="list-style-type: none"> Disused or little used; largely undisturbed Large roof void with unobstructed flying spaces Large dimension roof timbers with cracks, joints and holes Uneven roof covering with gaps, though not too draughty Entrances that bats can fly in through Hanging tiles or wood cladding, especially on south-facing walls Rural setting Close to woodland and/or water Pre-20th century or early 20th century construction Roof warmed by the sun Within the distribution area of horseshoe bats
Decreased probability	<ul style="list-style-type: none"> Highly urbanised area with few feeding places Small or cluttered roof void (esp. for brown long-eared bat) Heavily disturbed Modern construction with few gaps around soffits or eaves (but be aware these may be used by pipistrelles in particular) Prefabricated with steel and sheet materials Active industrial premises Roof shaded from the sun
Factors affecting the probability of trees being used by roosting bats	
Increased probability	<ul style="list-style-type: none"> In ancient woodland or parkland Large trees with complex growth form Species that typically form cavities, such as beech, willow, oak or ash Visible damage caused by rot, wind, lightning strike <i>etc.</i> Loose bark providing cavities
Decreased probability	<ul style="list-style-type: none"> Coniferous plantation with no specimen trees Young trees with simple growth form and little damage
Factors affecting the probability of underground sites being used by roosting bats	
Increased probability	<ul style="list-style-type: none"> Large enough to develop stable temperature in winter High humidity Undisturbed Close to woodland or water (but note that bats will also use upland sites) Many cracks and crevices suitable for bats
Decreased probability	<ul style="list-style-type: none"> Small and draughty Heavily disturbed In urbanised areas Smooth surfaces with few roosting opportunities

Figure C: Table 2 Reproduced from Marnell *et al.* (2022).

- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore, careful site specific planning for this species is required in order to ensure all elements are maintained.
- Renovation or demolition of derelict buildings.
- Tree felling
- Increasing urbanisation (e.g. increase in lighting)

9.3 Soprano pipistrelle

This species was the second most recorded species along the proposed development site 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 (62,020km²). 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 <i>et al.</i> 2011)	62,020

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

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

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

9.4 Brown long-eared Bat

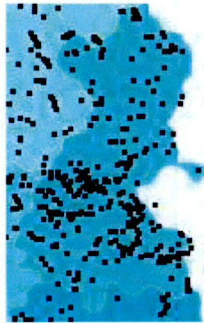
This species is generally considered to be widespread across the island. The modelled Core Area for Brown long-eared bats is a relatively large area that covers much of the island of Ireland (52,820km²) with preference suitable areas in the southern half of the island. The Bat Conservation Ireland Irish 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
Estimated Irish Population Size	64,000 -115,000 (2007-2012)
Estimate Core Area (Lundy <i>et al.</i> 2011)	49,929 km ²

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

9.5 Bat Conservation Ireland Bat Species Maps

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



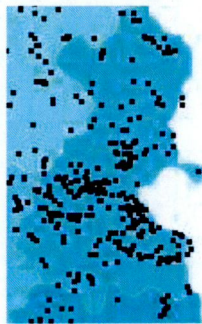
Common pipistrelle



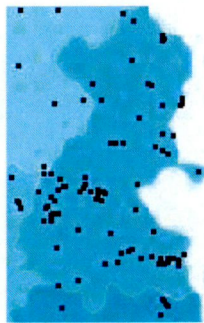
Nathusius' pipistrelle



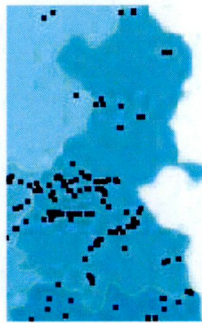
Soprano pipistrelle



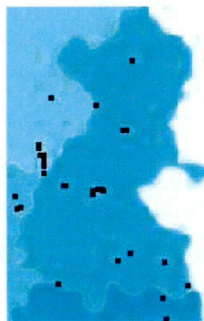
Leisler's bat



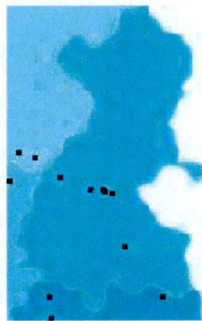
Brown long-eared bat



Daubenton's bat



Natterer's bat



Whiskered bat