Bat Survey Report

Meenbog Wind Farm

Planning & Environmental Consultants

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1 INTRODUCTION

McCarthy Keville O'Sullivan (MKO) was commissioned by Planree Ltd. to complete a comprehensive assessment of the potential effects on bats of a proposed wind farm at Meenbog, Co. Donegal. This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the development on bats. Where necessary, mitigation is prescribed to minimise any identified significant effects.

Bat surveys were undertaken by MKO at the site in 2014 as part of a previous planning application (ABP Ref: PA0040). Previous reports and survey data were reviewed as part of the current assessment. In addition, a series of bat surveys were designed in accordance with Bat Conservation Ireland's guidelines for wind turbine developments (BCI, 2012a). Additional bat surveys were undertaken throughout 2016 and 2017.

Bat surveys adopted a four-season approach and employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level and at height. The aim of these surveys was to determine how bats are using the proposed development site and surrounding landscape. Specifically, to:

- identify the species present and their abundance
- locate any roosts, foraging areas or commuting routes
- determine seasonal variation in bat species assemblages and habitat use

1.1 Statement of Authority

Bat surveys undertaken in 2016 and 2017 were conducted by MKO ecologists; Chris Peppiatt (BSc, PhD), Úna Nealon (BSc, PhD), Pat Roberts (BSc, MCIEEM) and Andrew O'Donoghue (BSc). Staff have relevant academic qualifications and are competent experts in undertaking bat surveys to this level.

Bat activity surveys were carried out and results compiled by Chris Peppiatt (BSc, PhD). Chris is a bat expert with over 12 years' professional experience, including echolocation survey work, demolition and tree felling supervision, bat box monitoring, roost counts, etc. He has previously undertaken bat surveys for wind energy developments in Clare, Cork, Donegal, Galway, Kerry, Limerick, Longford, Mayo, Roscommon and Tipperary. In addition, Chris is a member of the Heritage Council Bat Panel and has held an NPWS bat handling licence since 2005.

Scope development, surveys at height, impact assessment and reporting was undertaken by Úna Nealon (BSc, PhD). Úna's primary expertise lies in bat ecology, particularly in relation to wind farm EIA. Building on previous consultancy experience, she completed her PhD with the Centre for Irish Bat Research, examining the impacts of wind farms on Irish bat species. Her unique background leaves her ideally suited to undertake scope development for wind energy bat surveys, including the practical application of bat survey guidelines at Irish wind energy sites. She is also practiced in bat survey methods at potential development sites using multiple techniques. Furthermore, she is skilled in bat impact assessment and the design of mitigation measures where she applies scientific and technical knowledge to produce practical solutions.

This bat survey report was reviewed by Pat Roberts (BSc, MCIEEM). Pat has over 10 years' experience in management and ecological assessment. He has supervised the majority of ecological assessments (300+) completed by the company, including more recently, over 200 assessments required in accordance with Article 6(3) of the Habitats Directive.

1.2 Proposed Development Site

The proposed wind farm is located at Meenbog, Co. Donegal, approx. 9 km southwest of the twin towns of Ballybofey and Stranorlar, Co. Donegal and approx. 14 km north east of Donegal Town. The proposed site also adjoins Co. Tyrone and is located approx. 17 km from Castlederg (Figure 1.1). Access to the site is gained along the N15 National Road and by a network of connecting local and tertiary roads, and forestry tracks.

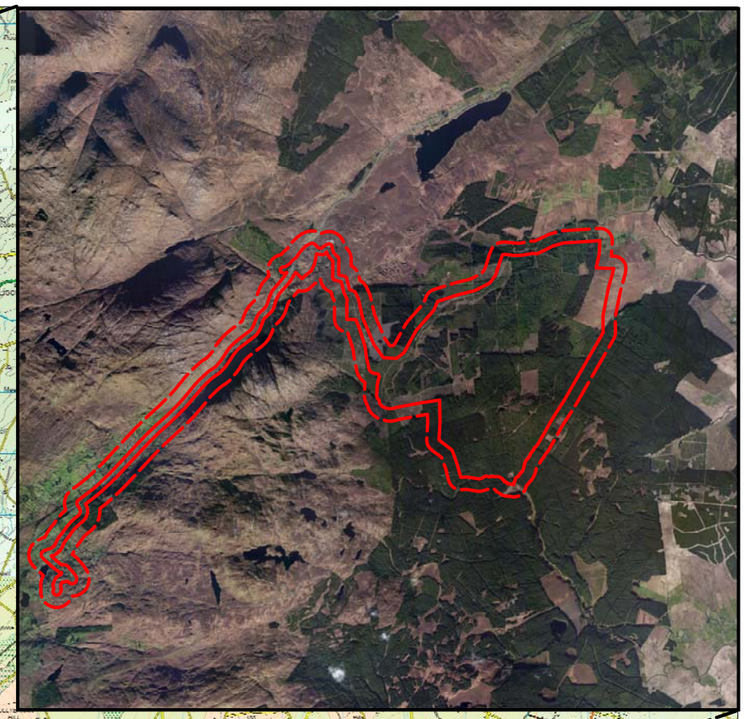
The site is dominated by commercial forestry, planted on blanket bog and the remainder is occupied mainly by upland blanket bog, wet grassland, cutover bog and wet heath. The site is also bordered on all sides by forestry plantations. The site drains to the Bunadowen River and the Glendergan River which are tributaries of the Mourne Beg River. In addition, a number of existing wind farms are located in the wider region.

The Study Area was defined by the developable area and a 200 m buffer (Hundt, 2012) (Figure 1.1). The proposed wind energy development will encompass 19 wind turbines and associated works. The proposed turbines will have a maximum blade tip height of up to 156.5 m. A map of the proposed site layout is provided in Figure 1.2.

Map Legend

Site Boundary

200 m Buffer



MAP TITLE: **Site Location & Aerial**		MAP NO.: **Figure 1.1**	SCALE: **1:100,000**
PROJECT TITLE: **160415 - Meenbog Bat Surveys**			DATE: **08-12-2017**
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Map Legend

- Proposed Turbine Location
- Proposed Met Mast Location
- Proposed Substation Compound
- Proposed Borrow Pit Areas
- Proposed Temporary Construction Compound
- Proposed Temporary Construction Compound/ Proposed Amenity Area
- Existing Roads - Upgrade Proposed
- Existing Tracks - Upgrade Proposed
- Grid Connection Cabling Route
- Proposed New Roads
- Proposed Amenity Walkways
- 200m Buffer
- Site Boundary

MAP TITLE: **Proposed Site Layout**		MAP NO.: **Figure 1.2**	SCALE: **1:25,000**
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2 BACKGROUND

Wind energy provides a clean, sustainable alternative to fossil fuels in generating electricity. However, wind energy development can impact wildlife, directly through mortality and indirectly through disturbance and habitat loss. Bat fatalities have been reported at wind energy facilities around the world, raising concern about the cumulative impacts of such developments on bat populations (Arnett et al. 2016). No large scale studies have been undertaken in Ireland to date. However, a study from the UK estimated bat fatalities at 0 – 5.25 bats per turbine per month (Mathews et al. 2016). While these results are not directly applicable to Ireland due to differences in bat species and behaviour, Ireland shares more similarities with bat assemblages of Great Britain, compared to those of mainland Europe.

Investigative research in North America and mainland Europe have revealed the mechanisms for bat mortality at wind turbines. Fatalities arise from direct collision with moving turbine blades (Horn et al. 2008, Cryan et al. 2014) and barotrauma (Baerwald et al. 2008), i.e. internal injuries caused by air pressure changes. Why bats fly in the vicinity of wind turbines has been attributed to several different behavioural and environmental factors, e.g. habitat associations, weather conditions, species ecology, etc.

Pre-construction bat surveys are undertaken to gain an insight into bat activity in the absence of turbines and to predict and mitigate against any future risks identified. Survey design and analyses of results at the proposed development site was undertaken with reference to the latest policy and legislation, scientific literature and industry guidelines. Any spatial, temporal or behavioural factors that may put bats at risk were fully considered.

2.1 Irish Bats: Legislation, Policy and Status

Ireland has nine resident bat species, comprising more than half of Ireland's native terrestrial mammals (Montgomery et al., 2014). This is considerably less than the 53 bat species found in mainland Europe (Rodrigues, 2015) and 17 in Great Britain (Hundt, 2012).

All Irish bats are protected under European legislation, namely the Habitats Directive (92/43/EEC). All Irish species are listed under Annex IV of the Directive, requiring strict protection for individuals, their breeding sites and resting places. The lesser horseshoe bat (*Rhinolophus hipposideros*) is further listed under Annex II of the Directive, requiring the designation of conservation areas for the species. Under this Directive, Ireland is obliged to maintain the favourable conservation status of Annex-listed species. This Directive has been transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011.

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976-2012). Under these legislation, it is an offence to intentionally disturb, injure or kill a bat or disturb its roost. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS).

The NPWS monitors the conservation status of European protected habitats and species and reports their findings to the European Commission every 6 years. The most recent report for the Republic of Ireland was submitted in 2013. Table 2.1 summarises

the current conservation status of Irish bat species and identified threats to Irish bat populations.

Table 2.1: Irish bat species conservation status and threats

Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	▪ Urbanised areas (e.g. light pollution) ▪ Bridge/viaduct repairs ▪ Pesticides usage ▪ Removal of hedges, scrub, forestry ▪ Water pollution ▪ Other pollution and human impacts (e.g. renovation of dwellings with roosts) ▪ Infillings of ditches, dykes, ponds, pools and marshes ▪ Management of aquatic and bank vegetation for drainage purposes ▪ Abandonment of pastoral systems ▪ Spieleology and vandalism ▪ Communication routes: roads - forestry management
Soprano pipistrelle *Pipistrellus pygmaeus*	Favourable	
Nathusius' pipistrelle *Pipistrellus nathusii*	Favourable	
Leisler's bat *Nyctalus leisleri*	Favourable	
Daubenton's bat *Myotis daubentoni*	Favourable	
Natterer's bat *Myotis nattereri*	Favourable	
Whiskered bat *Myotis mystacinus*	Favourable	
Brown long-eared bat *Plecotus auritus*	Favourable	
Lesser horseshoe bat *Rhinolophus hipposideros*	Favourable	

2.2 Collision Risk for Irish Species

Bat species at high risk of wind turbine collision share several morphological and ecological similarities. Species at high risk tend to be open-air foragers with long narrow wings and use high-intensity, narrow-band echolocation calls (Schuster, 2015). This pattern is consistent in North America, Europe and Australia.

Guidance provided by Natural England (2014) utilised this information to provide a collision risk assessment for British bat species. Table 2.2 summarises the results of this risk assessment with respect to species that occur in Ireland. Four species are identified as high or medium risk. They are common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Nathusius' pipistrelle (*Pipistrellus nathusii*) and Leisler's bat (*Nyctalus leisleri*). These four species have also displayed significant mortality at wind energy facilities in mainland Europe (EUROBATS, 2016).

Table 2.2: Collision risk level for Irish bat species (Natural England, 2014)

Low Risk	Medium Risk	High Risk
Myotis species	Common pipistrelle	Leisler's bat
Brown long-eared bats	Soprano pipistrelle	Nathusius' pipistrelle
Lesser horseshoe bats		

No systematic fatality studies have been undertaken at Irish wind farms to date. However, there are isolated reports of a small number of Irish bat fatalities. These include pipistrelle bats (n=8) and Leisler's bat (n=1) (Nealon, 2016).

2.3 Guidance

A number of guidelines for surveying bats at wind energy developments have been produced in Europe, the UK and Ireland. These guidelines aid in designing bat surveys at potential wind energy sites, assessing risk and developing mitigation and compensation strategies to minimise negative effects. The various guidelines differ in their level of technical detail and reference to published research findings. It is important that every assessment considers the scale of any likely impacts and takes a proportionate approach, with reference to published advice and guidelines.

2.3.1 EUROBATS

At a European level, the Advisory Committee to the EUROBATS Agreement, to which Ireland is a signatory, have produced *Guidelines for Consideration of Bats in Wind Farm Projects* which outlines an approach for assessing the potential impacts of wind turbines on bats during planning, construction and operation phases (Rodrigues, 2015). However, these guidelines are based on continental scenarios and include more diverse species and behaviours than those typical of Ireland. As such, EUROBATS guidance may recommend a level of survey that may prove inappropriate in Irish scenarios. Nevertheless, the guidance is evidence-based and provides a useful European context, within which Member States are encouraged to produce specific national guidance, focusing on local circumstances.

2.3.2 Bat Conservation Trust (BCT)

The second edition of the BCT's *Bat Survey Good Practice Guidelines* (Hundt, 2012) includes a chapter on survey methodologies for assessing the potential impacts of wind turbines on bats. The document provides technical guidance for consultants carrying out impact assessments. However, the recommendations are not based on any research findings specific to the UK.

A third edition to the guidelines, published in early 2016, removed the chapter on surveying wind turbine developments. New wind farm guidance is being drafted in partnership with relevant organisations and with regard to recent research findings in the UK. This new guidance was due for publication in late 2016 but has not yet been made available. Until this new guidance is published, the chapter in the 2nd edition is still applicable.

2.3.3 Bat Conservation Ireland (BCI)

BCI produced *Wind Turbine/Wind Farm Development Bat Survey Guidelines* (BCI, 2012a). This document provides advice to practitioners and decision makers in Ireland on necessary qualifications for surveyors, health and safety considerations, pre-construction and post-construction survey methodologies and information to be included in a report. In the absence of comprehensive Irish research, these guidelines provide generalised methodology rather than detailed technical advice.

2.3.4 Other Useful Publications

Prior to the publication of the BCT guidelines, *Natural England's Bat and Onshore Wind Turbines: Interim Guidance* provided a pragmatic interpretation of the EUROBATS recommendations, as applied to onshore wind energy facilities in the UK (Natural England, 2014). In addition, the Chartered Institute of Ecology and Environmental Management (CIEEM) publishes advice on best practice as well as updates on the current state of knowledge in the *Technical Guidance Series* and in the quarterly publication *In Practice*.

In addition to specific wind farm guidance documents, other sources on bat survey, assessment and mitigation were consulted. Conservatively, these included:

- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn) (Collins, 2016)
- The Bat Worker's Manual, 3rd Edition (Mitchell-Jones and McLeish, 2004)
- Ecological and Behavioral Methods for the Study of Bats, 2nd Edition (Kunz and Parsons, 2009)
- Irish Bats in the 21st Century (Roche et al., 2014)
- British Bat Calls: A guide to species identification (Russ, 2012)
- Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring (Hill, 2005)
- The Lesser Horseshoe Bat: Conservation Handbook (Schofield, 2008)
- Bats and Appropriate Assessment Guidelines, Version 1 (BCI, 2012b)
- Bat Mitigation Guidelines (Mitchell-Jones, 2004)
- Bat Mitigation Guidelines for Ireland. (Kelleher and Marnell, 2006)
- Bat Conservation: Global evidence for the effects of interventions (Berthinussen et al., 2014)
- Best practice guidelines for the conservation of bats in the planning of national road schemes (NRA, 2006a)
- Guidelines for the treatment of bats during the construction of national road schemes (NRA, 2006b)
- Bat Surveys – NIEA Specific Requirements (Northern Ireland Environment Agency, 2017)

3 METHODS

3.1 Consultation

A consultation exercise was undertaken for the proposed development. A Scoping Document, comprising a description of the site and the proposed development, was circulated to consultees in Ireland in November and December 2016. As part of this exercise, prominent conservation groups were contacted and BCI were specifically invited to comment on the potential of the proposed development to affect bats. In addition, an "Intention to Submit a Planning Application" document was submitted to the Department for Infrastructure (DfI) in Northern Ireland in January 2017. The DfI then circulated the document to the relevant statutory consultees.

A meeting was also held between project ecologists and NPWS representatives on the 14th February 2017. During the meeting, issues raised by the NPWS and ABP (under ABP Ref: PA0040) were addressed. This included an outline of all additional surveys undertaken (including additional bat surveys) and a summary of results to date. Discussions that followed covered the interpretation and presentation of survey results and assessment of effects.

3.2 Desktop Study

A desktop review of published and unpublished material was undertaken prior to conducting field surveys. The aim of the desktop review was to identify the presence of species of interest or designated sites within the Study Area and surrounding region.

3.2.1 Bat Survey Reports 2014

Bat survey reports, prepared for a previous planning application (ABP Ref: PA0040), were reviewed as part of the desktop study. MKO ecologists undertook bat surveys within the Study Area and the wider surrounding area in June, July and August 2014. Figure 3.1 presents the areas surveyed as part of this study. These surveys included a combination of methods including desktop studies, roost surveys, walked and driven transects and static detector surveys at ground level.

Roost Surveys

A search for roosts was undertaken within the Study Area and the wider area throughout all site visits in 2014. Searches were undertaken both during daylight hours and before dawn (when bats can be tracked back to their roosts). Searches focused on buildings and bridges, as trees of interest lacked high potential roost features.

Walked and Driven Transects

Activity surveys, comprising walked and driven transects, were undertaken within the Study Area and the surrounding region. The surveyor followed set transect routes and surveyed for bats with an Echo Meter EM3 (Wildlife Acoustics, MA, USA). Surveys commenced 30 minutes before sunset until 3 hours after sunset and for two hours preceding sunrise. A summary of transect survey effort is presented in Table 3.1a and 3.1b, and transect routes followed are shown in Figure 3.1.

Map Legend

- 2014 Study Area
- Site Boundary
- 200 m Buffer
- 2014 Transect Routes
- 2014 Static Detector Locations
- 2014 Identified Roosts

Roost 1
Roost 2
Roost 3
S1:T1
S1:T2
S1:T3
S1:T4
S2:T1
S2:T2
S2:T3
S2:T4
S2:T5
S2:T6
S3:T1
S3:T2
S3:T3
S3:T4
S3:T5
S3:T6
S3:T7
S3:T8
S3:T9
S4:T1
S4:T2
S4:T3
S4:T4
S4:T5
S4:T6

MAP TITLE: **2014 Bat Survey Methods**		MAP NO.: **Figure 3.1**	SCALE: **1:70,000**
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Table 3.1a: Transect survey effort within Study Area in 2014

Dates	Sunset	Sunrise	Effort (h)	Effort (km)
23rd – 24th June 2014	22:12	04:54	5.17	27.93
28th – 29th July 2014	21:43	05:34	4.28	32.66
29th – 30th August 2014	20:35	06:30	3.48	21.53
Total			**12.93 hours**	**82.12 km**

Table 3.1b: Transect survey effort outside Study Area in 2014

Dates	Sunset	Sunrise	Effort (h)	Effort (km)
24th -25th June 2014	22:12	04:15	4.75	25.17
25th – 26th June 2014	22:13	04:54	3.83	29.23
26th – 27th June 2014	22:12	04:54	4.42	24.90
25th – 26th July 2014	21:49	05:28	3.65	27.69
26th – 27th July 2014	21:47	05:29	3.67	26.55
27th – 28th July 2014	21:44	05:29	3.68	26.78
26th – 27th August 2014	20:42	06:24	4.25	30.42
27th – 28th August 2014	20:40	06:25	4.07	46.11
30th – 31st August 2014	20:25	06:32	3.15	20.62
Total			**35.47 hours**	**257.47 km**

Static Detector Surveys

Static detectors were deployed at seven locations within the Study Area and the wider area throughout summer 2014. A Song Meter SM2BAT+ (Wildlife Acoustics, Inc; MA, USA) 16-bit full spectrum bat detector was deployed at each location and set to record from sunset until sunrise each night. Locations of static detectors are described in Table 3.2 and shown in Figure 3.1.

Table 3.2: Static detector deployments at ground level in 2014

ID	Date	Grid Ref.	Habitat description	Effort
Jun 14 – 1	23rd – 28th June 2014	E207363 N386137	Within conifer plantation, next to track	27.5
Jun 14 – 2	23rd - 28th June 2014	E213277 N388579	Attached to a fence in a heath/bog habitat, with conifer plantations 70 m to the NW and 80 m to the E	27.5
Jul 14 – 1	25th – 30th July 2014	E221158 N388103	Situated in young conifer plantation in approx. 20 m off road	40
Jul 14 – 2A	25th – 30th July 2014	E214426 N388689	Detector set with two microphones – one set on bog	40
Jul 14 – 2B	25th – 30th July 2014	E214336 N388720	Detector set with two microphones – second set close to a stream	40
Aug 14 – 1	26th – 31st August 2014	E212760 N388711	Within conifer plantation adjacent to track	37.5
Aug 14 – 2	26th – 31st August 2014	E217736 N390575	Lowland site to the NE of the study area. Situated in scrub/mature trees adjacent to pasture	37.5
Total				**250 hours**

3.2.2 National Bat Database of Ireland

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. A search of the National Bat Database of Ireland was last carried out on the 9th June 2017 and examined bat presence and roost records within a 10 km radius of the Study Area (BCI 2012a, Hundt 2012).

In addition, the following BCI monitoring reports were reviewed:

- All Ireland Daubenton's Bat Waterway Monitoring Scheme 2006-2011. Irish Wildlife Manuals, No. 61 (Aughney et al., 2012)
- Car-based bat monitoring in Ireland 2003-2011. Irish Wildlife Manuals, No. 60. (Roche et al., 2012)
- Brown Long-eared Bat roost monitoring scheme for the Republic of Ireland: synthesis report 2007-2010. Irish Wildlife Manuals, No.56. (Aughney et al., 2011)
- BATLAS 2020 Pilot Project Report (Abbott et al., 2015)
- Irish Bat Monitoring Schemes. BATLAS Republic of Ireland Report for 2008-2009 (Carden et al., 2010)
- An investigation of the impact of development projects on bat populations: Comparing pre- and post-development bat faunas (Aughney, 2008)
- Lesser Horseshoe bat: population trends and status of its roosting resource. Irish Wildlife Manuals, No 85 (Roche et al., 2015)

3.2.3 Designated Sites

The National Parks and Wildlife Service (NPWS) map viewer and website provides information on rare and protected species, sites designated for nature conservation and their conservation objectives. A search was undertaken of sites, specifically designated for the conservation of bats, within a 10 km radius of the Study Area (Hundt, 2012). This included European designated sites, i.e. SACs, and nationally designated sites, i.e. NHAs and pNHAs.

3.2.4 Habitat and Landscape

Ordnance survey maps (OSI 1:5,000 and 1:50,000) and aerial imagery (ortho-based maps) were reviewed to identify any habitats and features likely to be used by bats. Maps and images of the Study Area and general landscape were examined for suitable foraging or commuting habitats including woodlands and forestry, hedgerows, treelines and watercourses. In addition, any potential roost sites, such as buildings and bridges, were noted for further investigation.

In addition, the Geological Survey Ireland (GSI) online mapping tool and UBSS Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within the Study Area (BCI, 2012a) (last searched on 10th October 2017). Furthermore, the archaeological database of national monuments was also reviewed for any evidence of manmade structures, e.g. souterrains, that may be used by bats (last searched on 10th October 2017).

3.3 Habitat Suitability Assessment

Bat walkover surveys were carried out in summer 2014 (June, July and August), spring, summer and autumn 2016 (monthly between April and October) and in winter 2017 (January). During these surveys, habitat types within the Study Area were recorded and assessed for their suitability to support bats at every stage of their annual life cycle. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories, divided into *High*, *Moderate*, *Low* and *Negligible*, are described fully in Appendix 1.

3.4 2016-2017 Field Survey

3.4.1 Survey Design

The aim of surveying bats at wind energy sites is to identify and assess the potential impacts on local, and hence national, bat populations (BCI, 2012a). To do this, surveys must compile the following information (Hundt, 2012):

- Bat species assemblages on site, noting high, medium and low risk groups
- Relative frequency of site use by different species throughout the active season
- Spatial and temporal distribution of activity for different species
- Nature of activity for different species where possible, e.g. foraging, commuting, roosting.

The results of the desktop study, including previous survey results and initial habitat assessments, were used to determine any outstanding bat survey requirements with reference to BCI guidance (BCI, 2012a). Bat surveys in 2016 and 2017 employed a combination of methods including roost surveys, manual activity surveys along fixed transects, static activity surveys at ground level and at height. The resulting data were combined with previous survey results to provide a comprehensive impact assessment using spatial and temporal bat activity data, and roost surveys across all seasons and over multiple years.

3.4.2 Roost Surveys 2016/2017

A search for bat roosts was undertaken within the Study Area across all seasons in 2016/2017. The aim was to determine the presence of roosting bats and the need for further survey work or mitigation.

The site was visited in spring (April and May 2016), summer (June, July and August 2016), autumn (September and October 2016) and winter (January 2017). A walkover was carried out and all structures and trees were assessed for their potential to support roosting bats (see Appendix 1 for criteria in assessing roosting habitats). Any potential roost sites were subject to a preliminary roost assessment. This comprised a detailed inspection of the exterior and interior (if accessible) to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises.

Bat roosts previously identified in June, July and August 2014 were revisited in April 2016 and January 2017 to undertake roost assessments within previously unsurveyed seasons.

3.4.3 Manual Transects 2016

Manual activity surveys comprised walked and driven transects between dusk and dawn. The aim of these surveys was to identify bat species using the site and gather any information on bat behaviour and important features used by bats.

A series of representative transect routes were chosen throughout the Study Area. Transect routes were prepared with reference to the proposed layout, desktop and walkover survey results as well as any health and safety considerations and access limitations. As such, transect routes generally followed existing roads and tracks. Transect descriptions are provided in Table 3.3 and transect routes are shown in Figures 3.2 and 3.3.

Map Legend

- Site Boundary
- 200m Buffer
- Transect Route
- Proposed Turbine

Tran 2
Tran 3
Tran 4
Tran 5
Tran 6
Tran 7

N
W
E
S

MAP TITLE: **Bat Survey: Transect Routes (Apr 2016)**	MAP NO.: **Figure 3.2**	SCALE: **1:25,000**	
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Map Legend

- Site Boundary
- 200 m Buffer
- Transect Route
- Proposed Turbine

Tran 1
Tran 2
Tran 3
Tran 4
Tran 5
Tran 6
Tran 7

N
W
E
S

MAP TITLE: **Bat Survey : Transect Routes (May - Oct 2016)**	MAP NO.: **Figure 3.3**	SCALE: **1:25,000**	
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Table 3.3: Description of manual transect routes 2016

Transect No.	Start Point	End Point	Length	Habitats present
Tran 1	E207746 N387573	E205674 N385179	3.49 km	Forestry track (BL3). Conifer Plantation (WD4) on both sides. Eroding Upland River (FW1) runs parallel to transect >100 m away. Rivers intersects transect at five locations.
Tran 2	E206109 N384609	E205837 N384325	1.15 km	Forestry track (BL3). Conifer Plantation (WD4) on both sides. Eroding Upland River (FW1) runs adjacent to transect.
Tran 3	E207193 N385961	E205829 N385174	1.62 km	Forestry track (BL3). Conifer Plantation (WD4) on both sides. Intersects Eroding Upland River (FW1) at one location.
Tran 4	E208028 N385978	E207174 N384979	2.60 km	Forestry track (BL3) and ride (WD4). Borders Conifer Plantation (WD4) on both sides for the majority. Also borders Wet Heath (HH3) and Dystrophic Lakes (FL1) in parts. Intersects Eroding Upland River (FW1) at two locations.
Tran 5	E208466 N387589	E207235 N386016	2.39 km	Forestry track (BL3). Conifer Plantation (WD4) on both sides. Intersects Eroding Upland River (FW1) at one location.
Tran 6	E210221 N387859	E207756 N387231	2.83 km	Local access road (BL3). On the western end, borders Conifer Plantation (WD4) on both sides. On the eastern end, borders Upland Blanket Bog (PB2), Wet Grassland (GS4) and several short sections of Hedgerows (WL1) and Treelines (WL2). Intersects Eroding Upland River (FW1) at two locations.
Tran 7	E209320 N387814	E209320 N387645	0.31 km	Local access road to disused farmhouse and outbuildings (BL3). Borders Wet Grassland (GS4) and a short section of Treelines (WL2).

During each manual survey, transects were walked or driven by one surveyor, recording bats in real time. Driven transects followed the methodology described by Roche et al. (2012). The surveyor was equipped with an active spectrum bat detector, the Echo Meter EM3+ (Wildlife Acoustics, Maynard, MA, USA) or with a dual heterodyne/time expansion bat detector, the D240X Ultrasound Detector (Pettersson Elektronik AB, Uppsala, Sweden), where stereo headphones were used to hear the heterodyne signal on one channel and the time expansion signal on the other.

Where possible, species identification was made in the field and any other relevant information was also noted, e.g. numbers, behaviour, features used, etc. All bat echolocation was recorded on the Echo Meter EM3+ or on a Roland digital recorder for subsequent analysis to confirm species identifications (Section 3.4.6).

Manual surveys commenced 30 minutes before sunset and concluded at sunrise. The order of transects as well as the start and finish points were alternated between survey nights across the season, to allow for varying emergence times of different bat species.

Manual transects were undertaken monthly between April and October 2016. Transects were completed over 1 - 3 nights per month. A total of 141.39 km was surveyed over 36.48 survey hours in 2016. Table 3.4 describes survey effort with regard to manual transects.

Table 3.4: Summary of manual survey effort in 2016

Survey Night	Start Time – Finish Time	Sunset - Sunrise	Effort (km)	Effort (h)
26th – 27th April 2016	20:45 – 06:00	20:57 – 05:59	17.38	3.05
28th – 29th May 2016	22:00 – 02:39	21:52 – 05:04	13.85	4.40
29th – 30th May 2016	22:00 – 23:56	21:53 – 05:03	9.11	1.88
28th – 29th June 2016	21:45 – 03:22	22:13 – 04:57	18.45	5.20
25th – 26th July 2016	21:45 – 02:34	21:46 – 05:31	17.83	4.42
28th – 29th July 2016	23:35 – 23:45	21:41 – 05:36	0.62	0.17
28th – 29th August 2016	20:34 – 02:19	20:34 – 06:33	20.66	5.72
31st August – 1st September 2016	21:45 – 21:55	20:27 – 06:38	0.31	0.17
26th -27th September 2016	19:35 – 01:10	19:21 – 07:26	15.00	5.53
29th – 30th September 2016	22:08 – 22:37	19:13 – 07:32	3.45	0.35
24th – 25th October 2016	19:20 – 23:11	18:12 – 08:20	15.00	3.8
26th - 27th October 2016	01:59 – 02:39	18:06 – 08:24	3.45	0.72
27th - 28th October 2016	01:37 – 02:39	18:06 – 08:26	6.28	1.07
Total Survey Effort			**141.39 km**	**36.48 hours**

3.4.4 Static Detector Surveys at Ground Level 2016

Manual bat activity surveys provide a snapshot of activity across a site. Automated bat detector systems deployed at ground level were used to record activity in fixed locations over prolonged periods of time.

Models employed included the Song Meter SM3BAT and SM4BAT (Wildlife Acoustics, Maynard, MA, USA). Settings used were those recommended by the manufacturer for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates.

The autumn migration period has been previously identified as a high risk period for bats at wind energy sites (Arnett et al. 2008, Rydell et al 2010). As such, detectors at ground level were deployed to record in August, September and October 2016. Detector locations are shown in Figure 3.4 and a summary of survey effort is outlined in Table 3.5. This includes the total number of nights surveyed and total number of hours surveyed, accounting for varying sunset and sunrise times.

Map Legend

- Site Boundary
- 200 m Buffer
- Proposed Turbine
- Static Detector at Ground Level
- Static Detector at Ground Level & at Height (Met Mast)

Ground-09
Ground-10
Ground-08-A
Ground-08-B
Mast

N
W
E
S

MAP TITLE: **Bat Survey: Static Detector Locations**	MAP NO.: **Figure 3.4**	SCALE: **1:25,000**	
PROJECT TITLE: **160415 - Meenbog Bat Surveys**		DATE: **11-12-2017**	
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160415-2017.12.11-F**	

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Table 3.5: Summary of static detector at ground level survey effort 2016

ID	Survey Period	Grid Ref	Habitat	No. Nights	No. Hours
Ground-08-A	29th August – 9th September 2016	E207515 N387113	Sitka spruce on edge of ride through closed canopy forestry	11	126.17
Ground-08-B	29th August – 9th September 2016	E207531 N387028	Lone young conifer in open by Bunadaowen River	11	126.17
Ground-09	29th August – 26th September 2016	E207846 N387621	Young Alder plantation by road	28	310.77
Ground-10	27th September – 23rd October 2016	E208154 N387539	Downy Birch in birch woodland by Bunadaowen River in wider area of mature conifer forestry	24	313.68
Total Survey Effort				**74 nights**	**876.79 hours**

3.4.5 Static Detector Surveys at Ground Level and at Height 2017

Studies have shown activity levels recorded at ground level may differ to those recorded at height and assessing bat activity levels from only ground level data may overestimate activity levels experienced at height for certain species, e.g. pipistrelle bats and may underestimate those for high-flying species, e.g. Leisler's bat (Collins and Jones, 2009). Therefore, simultaneous surveying at ground level and at height was also undertaken using static detectors throughout 2017.

One SM3BAT detector was installed on a meteorological mast within the Study Area (IG Ref: E206857 N385326). The detector was equipped with two microphones; one at ground level and one at height (approx. 75 m above ground level). The detector was set to record for at least 5 consecutive nights per month between March and October 2017 inclusive. The location of the met mast is illustrated in Figure 3.4. Table 3.6 describes survey effort in relation to met mast bat monitoring.

Table 3.6: Summary of met mast survey effort 2017

ID	Survey Period	Habitat	No. Nights	No. Hours
Mast-03-High	8th – 16th March 2017	Mast at height	8	102.48
Mast-03-Low	8th – 16th March 2017	Mast at ground level	8	102.48
Mast-04-High	24th April – 5th May 2017	Mast at height	11	105.48
Mast-04-Low	24th April – 5th May 2017	Mast at ground level	11	105.48
Mast-05-High	25th May – 8th June 2017	Mast at height	14	109.77
Mast-05-Low	25th May – 8th June 2017	Mast at ground level	14	109.77
Mast-06-High	23rd June – 8th July 2017	Mast at height	15	115.65
Mast-06-Low	23rd June – 8th July 2017	Mast at ground level	15	115.65
Mast-07-High	25th July – 6th August 2017	Mast at height	12	107.23
Mast-07-Low	25th July – 6th August 2017	Mast at ground level	12	107.23
Mast-08-High	27th August – 6th September 2017	Mast at height	11	116.03
Mast-08-Low	27th August – 6th September 2017	Mast at ground level	11	116.03
Mast-09-High	26th September – 4th October 2017	Mast at height	8	99.82
Mast-09-Low	26th September – 4th October 2017	Mast at ground level	8	99.82
Mast-10-High	13th October – 20th October 2017	Mast at height	7	99.70
Mast-10-Low	13th October – 20th October 2017	Mast at ground level	7	99.70
Total effort at height			*86*	*856.16*
Total effort at ground level			*86*	*856.16*
Total effort			**172 nights**	**1,712.32 hours**

3.4.6 Bat Call Analysis

All recordings were later analysed using bat call analysis software, BatSound (Pettersson Elektronik AB, Uppsala, Sweden), Kaleidoscope Converter and Viewer, v.3.1.7 and v.4.3.2 (Wildlife Acoustics, Maynard, MA, USA) or AnalookW 4.1 (Titley Scientific, Brendale, Australia). Bat species were identified using established call parameters, to identify individual species or genera. In addition, any information on bat behaviour contained within echolocation calls, e.g. social calls, feeding buzzes, were noted.

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2016).

- For the purposes of the manual activity survey, a bat pass was defined as one to several calls of a single species/species group, separated by a time interval (i.e. when the bat flew away).
- For the purposes of the static detector study, a bat pass is defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and separated by a 2s gap.

4 SURVEY LIMITATIONS

Survey design and effort was created with reference to best practice guidelines for surveying bats and wind farms in Ireland (BCI, 2012a). The survey design was continually assessed to determine its appropriateness to the bat species diversity and level of activity encountered at the proposed site. Bat surveys carried out in 2016 and 2017, in combination with previous survey results from 2014, exceed minimum guideline standards (BCI, 2012a).

No seasonal limitations have been identified with this bat assessment. Activity monitoring concentrated on the main activity season from March/April to October/November inclusive (BCI, 2012a). In addition, the site was visited each season and habitats were assessed for their potential to support bats throughout all aspects of their yearly cycle (BCI, 2012a).

In general, manual transects were undertaken in optimal survey conditions i.e. no heavy rain or strong winds with dusk temperatures above 7 °C (BCI, 2012a). Where rain was encountered, bat surveys were paused and resumed when rain stopped. Temperatures dropped below 7 °C during manual surveys in April 2016 and this is likely to have affected bat activity. However, a review of temperature data for the nearest Met Éireann synoptic station (Finner) shows that low temperatures are representative of site conditions in April 2016. Met Éireann reported an overall mean temperature of 7°C for Finner in April 2016 (http://met.ie/climate/monthly-data.asp?Num=2075).

Onsite weather monitoring was not undertaken as part of bat surveys for the proposed site. However, weather conditions for the nearest Met Eireann weather station were considered in the analyses of static monitoring results. Moderate to strong breezes, low temperatures and moderate to heavy rain were occasionally recorded during monitoring periods. However, this is considered normal for the site and does not present a significant limitation to the survey work.

Static detector locations were restricted in extent, focused mainly along the northern boundary of the site and the met mast. Static detector surveys sampled the dominant habitat types present within the study area over prolonged periods of time while transect surveys covered the full extent of the study area over shorter time periods. Therefore, a combination of methods achieved comprehensive spatial and temporal coverage of the study area and this was not considered a significant limitation.

It should be noted that detection distances can vary between species and method employed. For example, Leisler's Bat has a much larger detection distance of 80 m compared to 25 m for pipistrelle species (Barataud and Tupinier, 2012). This may lead to an overestimation of Leisler's activity when compared to pipistrelles. In addition, automatic detectors have a larger detection distance than manual detectors.

The analysis of bat data is subject to experience. All survey data collected in the course of this study was analysed by MKO ecologists, Úna Nealon (BSc, PhD) and Chris Peppiatt (BSc, PhD), with extensive experience in bat call analyses. Species were identified according to Russ (2012). Where reliable identifications were not possible, bat calls were identified to genus level and not to species level. Criteria for species identification are described fully in Section 3.4.6.

5 SURVEY RESULTS

5.1 Consultation

The results of the scoping and consultation exercise are described fully in the main EIS/EIAR. However, the following recommendations were made, specifically in relation to bats.

Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs (Feb 2017):

- Faunal surveys of the receiving environment to be undertaken at appropriate times of the year to identify any rare or protected species that use the site and surrounding areas, including but not limited to…mammal surveys, including multi-season bat surveys.
- The EIS process should identify any pre-and post-construction monitoring which should be carried out. The post construction monitoring should include bird and bat strikes/fatalities including the impact on any such results of the removal of carcasses by scavengers. Monitoring results should be made available to the competent Authority and copied to this Department. A plan of action needs to be agreed at planning stage with the Planning Authority if the results in future show a significant mortality of birds and/or bat species.

Northern Ireland Environment Agency (Mar 2017):

- Bats are a European Protected Species under the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended). Due to recent research highlighting the potential impacts to bats from wind turbines and the high legal protection afforded to bats, NIEA require bat surveys to be carried out on all proposed windfarm sites with the potential to host bats, which includes upland sites.
- Bat surveys should be conducted to NIEA, Natural Heritage bat survey specifications for windfarms (http://www.doeni.gov.uk/niea/land-home/plan/surveys.htm). Where caves are present in the nearby area, a detailed assessment of swarming will also be required.

BCI were invited to comment on the proposed development and potential impacts on bats. However, no response was received as of 10th October 2017.

In addition, a consultation meeting was held between project ecologists and an NPWS representative on the 14th February 2017. A summary of survey work was provided, followed by a discussion. One discussion point related to bat activity on site. NPWS requested that the movement of bats throughout the site is spatially demonstrated within the Bat Survey Report.

5.2 Desktop Study

5.2.1 Bat Survey Reports 2014

As part of a previous planning application (ABP Ref: PA0040), MKO ecologists undertook bat surveys within the Study Area and the wider area in June, July and August 2014. These surveys included a combination of methods, including roost surveys, walked transects and static detector surveys at ground level.

5.2.1.1 Roost Surveys

A search for roosts was undertaken within the Study Area and the wider area throughout all site visits in 2014. Two confirmed roost sites were identified within the

Study Area and one further unconfirmed roost was identified in the wider area. These sites are described in Table 5.1 and displayed in Figure 3.1.

Table 5.1: Roost sites identified in 2014

Roost ID	Grid Ref	2014 Survey Summary	Roost Summary
Roost 1	E208148 N387622	A disused building and adjacent stone bridge with suitable crevices. Three nights surveying at dusk &/or dawn in 2014 recorded bats within the bridge each night (two roosting sites within bridge). Little activity found around the disused dwelling.	Confirmed roost within bridge. Estimated 10 Daubenton's bats (*Myotis daubentoni*)
Roost 2	E209276 N387698	Abandoned farmstead with many available access points. Internal inspection recorded bat droppings in several locations but no bats. Roosting potential within the attic was limited. However, a downstairs room had a strong smell of ammonia. During two dawn surveys, *Myotis* species (n=2) were recorded entering the house.	Confirmed bat roost. *Myotis* roost (unconfirmed species).
Roost 3	E210001 N387591	Abandoned house and several sheds with corrugated roofs. One dawn survey found up to 10 *Myotis* bats flying within and between the sheds. However, all bats left the structures and no roosting behaviour was observed.	High potential roost site. However, no roosting bats recorded.

5.2.1.2 Manual Transects

Walked and driven transects were undertaken within the Study Area in June, July and August 2014. Conditions were favourable for bats on all survey nights, i.e. no heavy rain or strong winds with dusk temperatures above 7˚C (Table 5.2) (BCI, 2012a).

Table 5.2: Conditions during manual transects within Study Area in 2014

Date	Sunset	Sunrise	Temp.	Rain	Wind	Cloud	Moon Phase
23rd-24th June 2014	22:12	04:54	6.9-15.8˚C	Dry		0-70%	Waning crescent
28th-29th July 2014	21:43	05:34	15.4-14.4˚C	Drizzle (29min @ 23:01)		100%	New
29th-30th August 2014	20:35	06:30	15.3-11.1˚C	Drizzle (7min @ 23:02)	0-3ms^{-1} (W)	20-100%	Waxing crescent

In total, 49 bat passes were recorded across a total 82.12 km of transects within the Study Area in 2014. Five bat species were recorded, with Leisler's bat and soprano pipistrelle showing the highest activity. Table 5.3 and 5.4 present 2014 manual transect

results within the Study Area as total bat passes and bat passes per km surveyed respectively.

Table 5.3: Manual transect results within Study Area in 2014 (total bat passes)

Species	June 2014	July 2014	August 2014	Total
Common pipistrelle	1	2	5	**8**
Soprano pipistrelle	3	10	0	**13**
Natterer's bat	0	1	0	**1**
Leisler's bat	21	2	0	**23**
Brown long-eared bat	4	0	0	**4**
Total	**29**	**15**	**5**	**49**

Table 5.4: Manual transect results within Study Area in 2014 (bat passes per km)

Species	June 2014	July 2014	August 2014	Total
Total Distance	*27.93*	*32.66*	*21.53*	***82.12***
Common Pipistrelle	0.04	0.06	0.23	**0.10**
Soprano Pipistrelle	0.11	0.31	0.00	**0.16**
Natterer's bat	0.0	0.03	0.00	**0.01**
Leisler's Bat	0.75	0.06	0.00	**0.28**
Brown long-eared bat	0.14	0.00	0.00	**0.05**
Total	**1.04**	**0.46**	**0.23**	**0.60**

A series of transects outside the Study Area, in the wider region, were also undertaken in June, July and August 2014 (Figure 3.1 and Table 3.1b). Transect results showed lower levels of activity within the Study Area compared to some other areas surveyed in the wider region (Figure 5.1 and 5.2).

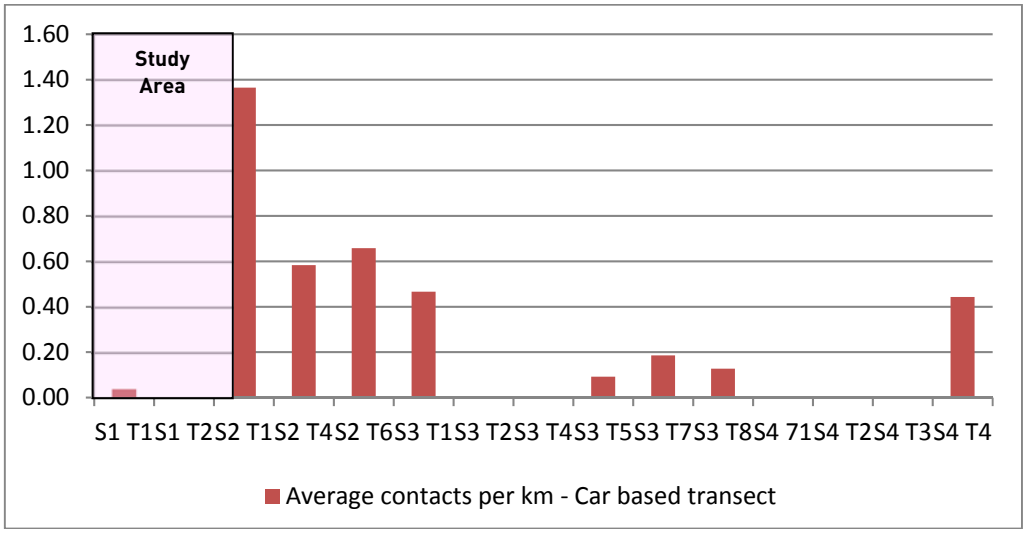

Figure 5.1: 2014 Car transect results; Study Area = S1, outside Study Area = S2 - S4

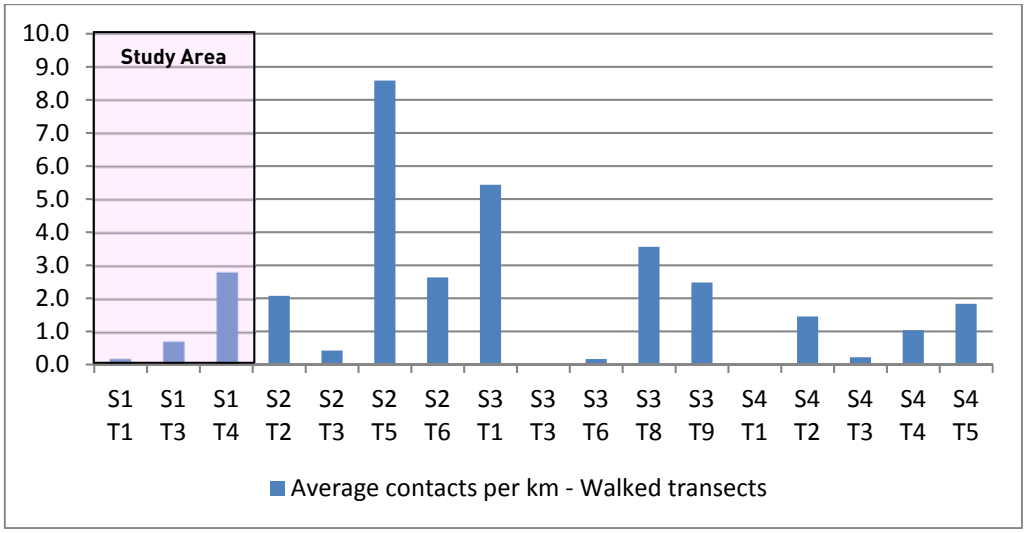

Figure 5.2: 2014 Walked transect results; Study Area = S1, outside Study Area = S2 - S4

In general, upland conifer habitats (including those within the Study Area) and peatland habitats showed low levels of activity. Within the Study Area, higher activity was recorded within conifer edge habitats along the northern boundary (i.e. S1 T4 in Figure 5.2). However, the greatest activity levels were recorded outside the Study Area and were attributed to agricultural lands and to conifer edge bordering Lough Trusk.

5.2.1.3 Static Detector Surveys

Static detectors were deployed at one location within the Study Area and six locations in the wider area throughout summer 2014 (Figure 3.1 and Table 3.2). Daily temperatures ranged from 8.6 – 16˚C and wind speeds varied from light to moderate (1-4 on the Beaufort Scale). In addition, frequent showers and occasional periods of extended rainfall were recorded.

In total, 856 bat passes were recorded over 250 survey hours. At least 5 bat species were recorded, with common pipistrelle and soprano pipistrelle showing the highest activity. Table 5.5 and Table 5.6 provide a summary of static detector monitoring results in 2014, presented as total bat passes and bat passes per survey hour respectively.

Table 5.5: Static detector monitoring results in 2014 (total bat passes)

ID	Jun14-1	Jun14-2	Jul14-1	Jul14-2A	Jul14-2B	Aug14-1	Aug14-2	Total
Common pipistrelle	-	9	13	1	1	2	606	**632**
Soprano pipistrelle	-	4	6	-	2	2	124	**138**
Unidentified pipistrelle	-	10	4	-	2	-	21	**37**
Leisler's bat	-	12	2	-	1	2	10	**27**
Myotis sp.	-	2	-	-	1	2	16	**21**
Brown long-eared	-	-	-	-	-	-	1	**1**
Total	**0**	**37**	**25**	**1**	**7**	**8**	**778**	**856**

Table 5.6: Static detector monitoring results in 2014 (bat passes per hour)

ID	Jun14-1	Jun14-2	Jul14-1	Jul14-2A	Jul14-2B	Aug14-1	Aug14-2	Total
Common pipistrelle	-	0.33	0.33	0.03	0.03	0.05	16.16	**2.53**
Soprano pipistrelle	-	0.15	0.15	0.00	0.05	0.05	3.31	**0.55**
Unidentified pipistrelle	-	0.36	0.10	0.00	0.05	0.00	0.56	**0.15**
Leisler's bat	-	0.44	0.05	0.00	0.03	0.05	0.27	**0.11**
Myotis sp.	-	0.07	0.00	0.00	0.03	0.05	0.43	**0.08**
Brown long-eared	-	-	0.00	0.00	0.00	0.00	0.03	**0.00**
Total	**0**	**1.35**	**0.63**	**0.03**	**0.18**	**0.21**	**20.75**	**3.42**

One bat detector was deployed within the Study Area in June 2014 (Jun14-1). No bat activity was recorded at this location. In the wider area, low levels of bat activity were recorded in upland conifer and peatland habitats (Jun14-2, Jul14-1, Jul14-2A, Jul14-2B, Aug14-1) and relatively high levels were recorded in a lowland site with mature treeline and scrub habitats (Aug14-2).

5.2.2 National Bat Database of Ireland

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10 km radius of the central point of the Study Area (IG Ref: E202166, N384898). A number of observations have been recorded including roosts (n=2), transects (n=3) and ad-hoc observations (n=8). At least four of Ireland's nine resident bat species were recorded within 10 km of the proposed works including common pipistrelle, soprano pipistrelle, Leisler's bat and Daubenton's bat. The results of the database search are provided in Table 5.7.

Table 5.7: BCI data within 10km radius of Study Area (Grid Ref: E202166, N384898)

Survey Type	Location	Species	Survey	Designation
Roost	Donegal Town, Co. Donegal	**Roost type**: Bridge **Species**: Daubenton's bat	Unknown	Annex IV
	Donegal Town, Co. Donegal	**Roost type**: Tree **Species**: Leisler's bat	Unknown	Annex IV
Transect	Donegal Town, Co. Donegal	Daubenton's bat	Waterways Survey	Annex IV
	Belcoo, Co. Fermanagh	*Myotis* spp., common pipistrelle, soprano pipistrelle	Car-based Bat Monitoring	Annex IV
Ad-hoc Observation	Lough Mourne, Co. Donegal	*Myotis* spp.	BATLAS 2010	Annex IV
	Lough Eske, Co. Donegal	Daubenton's bat, *Myotis* spp., Leisler's bat, soprano pipistrelle	BATLAS 2010	Annex IV
	Clogheravaddy, Co. Donegal	Leisler's bat, common pipistrelle, soprano pipistrelle	EIA Survey	Annex IV

Survey Type	Location	Species	Survey	Designation
	Co. Donegal	Common pipistrelle, soprano pipistrelle	Visiting bat specialist	Annex IV
	Co. Donegal	Common pipistrelle	Visiting bat specialist	Annex IV
	Co. Donegal	*Myotis* spp., common pipistrelle, soprano pipistrelle	Visiting bat specialist	Annex IV
	Co. Donegal	Common pipistrelle, soprano pipistrelle	Visiting bat specialist	Annex IV
	Co. Donegal	Soprano pipistrelle	Visiting bat specialist	Annex IV

5.2.3 Designated Sites

Within Ireland, the lesser horseshoe bat is the only bat species requiring the designation of Special Areas of Conservation (SACs) and the Study Area is situated outside the known range of this species. Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs and pNHAs within a 10 km radius of the Study Area found no sites designated for the conservation of bats.

5.2.4 Habitat and Landscape

A review of mapping, photography and previous survey reports provided insight into the habitats and landscape features present at the proposed development site. In summary, the primary land use within the Study Area is commercial forestry, while the remainder supports some peatland and wet grassland habitats. There are several streams and a small lake within the Study Area. A bat habitat assessment for the site is described in Section 5.3.1 and a full assessment of flora and habitats is included in the main EIS/EIAR.

A search of the National Monuments Database revealed the presence of two manmade structures within the Study Area, with possible roosting potential. Table 5.8 describes these structures.

Table 5.8: National Monuments Database: Manmade structures within Study Area

Record	Coordinates	Date	Description
Railway embankment (No. 40908501)	E202134, N384705	1880 - 1890	Former railway embankment. Out of use since 1960. Two embankments built into Barnesmore Mt., constructed of dry stone masonry (local granite). Former single railway line dismantled. Single arched bridge over mountain stream, squared rubble stone construction.
Bridge (No. 40909424)	E200351, N382772	1820 - 1870	Double-arched bridge carrying road over tributary of the Lwerymore River. Built or rebuilt c 1860. Constructed in mildly rock-faced snecked and squared coursed rubble stone masonry.

A review of the GSI online mapper did not indicate the possible presence of any subterranean sites within the Study Area. In addition, a search of the UBSS Cave Database for the Republic of Ireland did not indicate the presence of any caves within the Study Area.

5.3 2016 Field Survey

5.3.1 Habitat Suitability Assessment

The Study Area is dominated by commercial forestry at various stages of the rotational cycle with small areas of upland blanket bog, wet grassland, cutover blanket bog and wet heath. A small dystrophic lake is present in the center of the site as well as several eroding upland rivers and streams found throughout. Results from the desktop review and walkover surveys were used to assess habitats for their suitability to support foraging and commuting bats, and roosting bats, according to Collins (2016). Suitability categories, divided into *High*, *Moderate, Low* and *Negligible*, are described fully in Appendix 1.

With regard to foraging and commuting bats, areas of closed canopy forestry as well as exposed areas of grassland and peatland habitats were considered *Negligible* suitability, i.e. negligible habitat features on site likely to be used by commuting or foraging bats (Collins, 2016).

Forestry edge habitats, created by commercial forestry and roadways/watercourses, may provide greater foraging and commuting opportunities. These habitats within the Study Area are connected to the wider landscape by further adjacent forestry. As such, these habitats were classified as *Moderate* suitability, i.e. habitat connected to the wider landscape that could be used by bats for foraging and commuting (Collins, 2016).

With regard to roosting bats, a targeted roost survey of every tree within the site was considered unnecessary. However, an assessment of forestry habitats was undertaken. Trees present are commercial coniferous species with *Negligible – Low* roosting potential.

Two confirmed bat roosts were identified in structures within the Study Area in 2014 (i.e. Roosts 1 and 2 in Figure 3.1 and Table 5.1). In addition, one further unconfirmed roost outside the Study Area showed *High* potential (i.e. Roost 3). All other structures within the Study Area, including those identified during the desktop study (Table 5.8), were assessed for roosting potential in 2016 and were assigned a *Negligible - Low* roosting value.

5.3.2 Roost Surveys 2016/2017

High potential and confirmed roosts identified in 2014 were resurveyed in April 2016 and January 2017 (Table 5.1 and Figure 3.1). Additional surveys and overall findings are described in Table 5.9.

Table 5.9: Roosts surveyed in 2016/2017

Roost ID	Grid Ref	2016/2017 Survey Summary	Overall Roost Summary
Roost 1	E208148 N387622	A disused building and adjacent stone bridge with suitable crevices. Survey in April 2016 found a total 12 bats in 3 separate crevices within the bridge. No bats were observed within the bridge when the roost was re-surveyed in January 2017. Access to the interior of the building could not be gained. However, no external signs of bat use were recorded.	Confirmed roost within bridge. Estimated 10-12 Daubenton's bats (*Myotis daubentoni*) present in summer 2014 and spring 2016 but absent in winter 2017.
Roost 2	E209276 N387698	Abandoned farmstead with many available access points. April survey recorded droppings throughout this roost and found a single brown long-eared bat roosting within a window frame in a downstairs room. Droppings were recorded during the January survey. However, no bats were observed.	Confirmed bat roost. *Myotis* roost (unconfirmed species) within the roof space recorded in summer 2014. Brown long-eared bat recorded within a downstairs window frame in spring 2016. Droppings were recorded within this roost in winter 2017 but bats were absent.
Roost 3	E210001 N387591	Abandoned house. Surveys in April and January found high roost potential sheds previously identified have been demolished and trees surrounding the house have been felled. Access to house could not be gained for inspection. However, no external signs of bat use were recorded.	No roosting potential.

5.3.3 Manual Transects 2016

Manual transects were undertaken over 1-3 nights each month between April and October 2016, totaling 36.48 hours of survey time (Table 3.4). Table 5.10 presents weather conditions recorded during all manual transects. Surveys were undertaken during favourable conditions with dusk temperatures above 7˚C and no strong winds (BCI, 2012). Where rain was encountered, surveys were paused and resumed once the rain had stopped. Dusk temperatures recorded during the April survey were below 7˚C. However, lower temperatures are considered representative of site conditions at that time of year (Section 4). In addition, early morning temperatures were low during surveys in April, May, August and October 2016.

Table 5.10: Conditions during manual transects in 2016

Date	Temp (Start – End)	Rain	Wind (Beaufort)	Cloud %
26th – 27th April 2016	3.0-1.0 ˚C	Dry (Showers before survey)	0	30%
28th – 29th May 2016	12.0-5.0 ˚C	Dry	0	0-20%
29th – 30th May 2016	12.0-7.0 ˚C	Dry	0-1 N	10-50%
28th – 29th June 2016	11.0-9.0 ˚C	Drizzle (Heavy rain started after survey) *	0-1 SW	75-100%
25th – 26th July 2016	11.0-10.0 ˚C	Survey ended early due to onset of heavy rain*	1 W	30-100%
28th – 29th July 2016	12.0-12.0 ˚C	Dry	1-2 NE	100-80%
28th – 29th August 2016	10.5-3.5 ˚C	Dry	1 S	10-0%
31st August – 1st September 2016	11.5-11.5 ˚C	Survey ended early due to onset of heavy rain*	2 SW	100%
26th -27th September 2016	14.0-11.0 ˚C	Survey ended early due to onset of heavy rain*	3-4 SSE	80-100%
29th – 30th September 2016	10.0-8.0 ˚C	Dry	2 SW	50%
24th – 25th October 2016	8.0-1.0 ˚C	Drizzle delayed survey start*	0	0-50%
26th - 27th October 2016	11.0-10.0 ˚C	Dry	2-4 SW	50%
27th - 28th October 2016	13.0-7.0 ˚C	Heavy drizzle*	0-3 SW	50-100%

*Surveys were paused or ended during periods of rain.

In total, 77 bat contacts were recorded during manual transect surveys in 2016. Pipistrelle species, including common, soprano and unidentified pipistrelles, were encountered most frequently, followed by *Myotis* sp., Leisler's bat and brown long-eared bat (Figure 5.3). Nathusius' pipistrelle was recorded on a single occasion. Table 5.11 presents manual transect results for individual bat species per survey period (i.e. per month). Detailed manual transect results are available in Appendix 2.

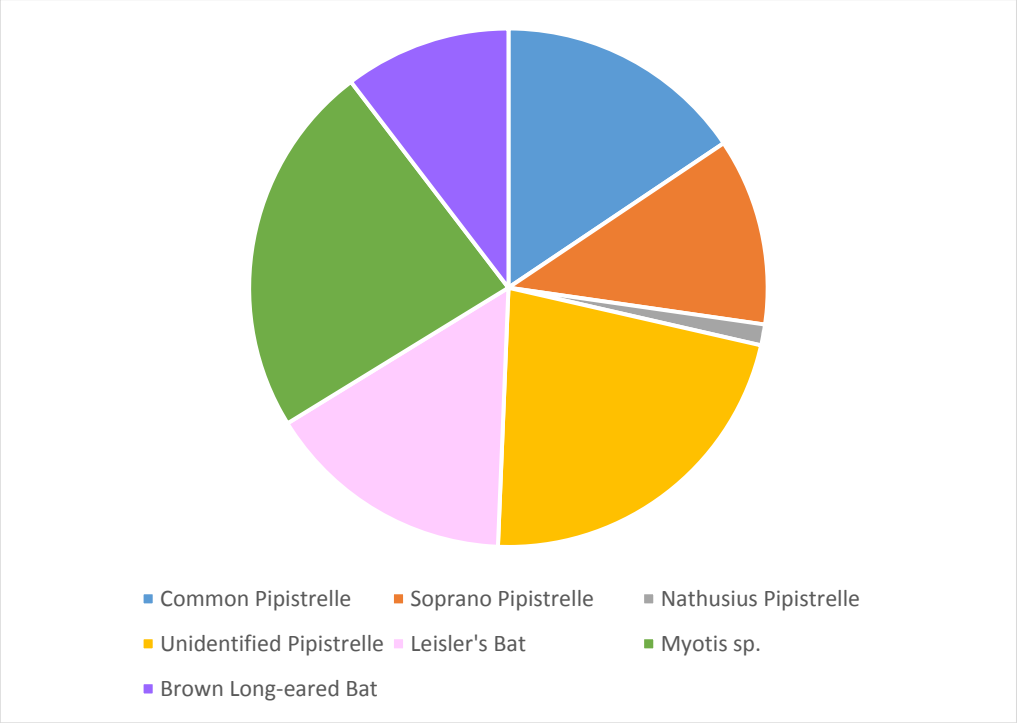

Figure 5.3: 2016 manual transect results: Species composition (total bat contacts)

Table 5.11: Summary of manual transect results in 2016 (total bat contacts)

	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Total
Common Pipistrelle	0	2	2	1	5	2	0	**12**
Soprano Pipistrelle	0	1	2	3	1	2	0	**9**
Nathusius Pipistrelle	0	0	1	0	0	0	0	**1**
Unidentified Pipistrelle	0	4	0	0	12	0	1	**17**
Leisler's Bat	0	3	0	1	7	1	0	**12**
Myotis sp.	0	4	1	2	7	3	1	**18**
Brown Long-eared Bat	0	1	0	1	2	2	2	**8**
Total	**0**	**15**	**6**	**8**	**34**	**10**	**4**	**77**

In addition, transect survey results were calculated as bat passes per km surveyed. Figure 5.4 and Table 5.12 presents these results for individual species per survey period. Pipistrelle sp. and *Myotis* sp. showed the greatest activity levels. No bats were recorded in April (potentially due to low temperatures encountered). Bat activity was also significantly higher in August 2016, compared to other months surveyed.

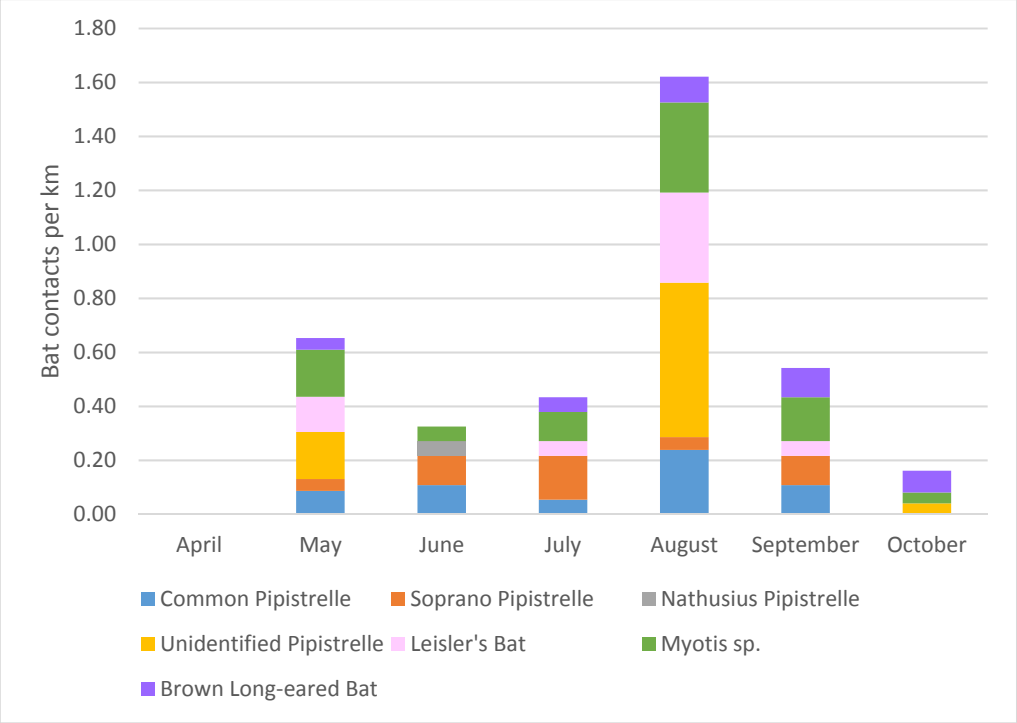

Figure 5.4: Manual transect results: Bat contacts per km in 2016

Table 5.12: Manual transect results in 2016 (bat contacts per survey km)

	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Total
Survey length (km)	*17.38*	*22.96*	*18.45*	*18.45*	*20.97*	*18.45*	*24.73*	*141.39*
Common Pipistrelle	0.00	0.09	0.11	0.05	0.24	0.11	0.00	0.08
Soprano Pipistrelle	0.00	0.04	0.11	0.16	0.05	0.11	0.00	0.06
Nathusius Pipistrelle	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.01
Unidentified Pipistrelle	0.00	0.17	0.00	0.00	0.57	0.00	0.04	0.12
Leisler's Bat	0.00	0.13	0.00	0.05	0.33	0.05	0.00	0.08
Myotis sp.	0.00	0.17	0.05	0.11	0.33	0.16	0.04	0.13
Brown Long-eared Bat	0.00	0.04	0.00	0.05	0.10	0.11	0.08	0.06
Total	0.00	0.65	0.33	0.43	1.62	0.54	0.16	0.54

Figures 5.5 – 5.10 present the spatial distribution of bat activity across all survey months. Bats were most frequently recorded along forestry tracks throughout the site, particularly those close to watercourses, as well as wet grassland, hedgerow and treeline habitats to the north of the site.

Map Legend

- Site Boundary
- 200 m Buffer
- Transect Route
- Proposed Turbine

Bat Species Recorded

- Common pipistrelle
- Soprano pipistrelle
- Unidentified pipistrelle
- Leisler's bat
- Myotis sp.
- Brown long-eared bat

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MAP TITLE: **Transect Survey Results: May 2016**		MAP NO.: **Figure 5.5**	SCALE: **1:15,000**
PROJECT TITLE: **160415 - Meenbog Bat Surveys**			DATE: **14-11-2017**
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160415-2017.11.14-F**	

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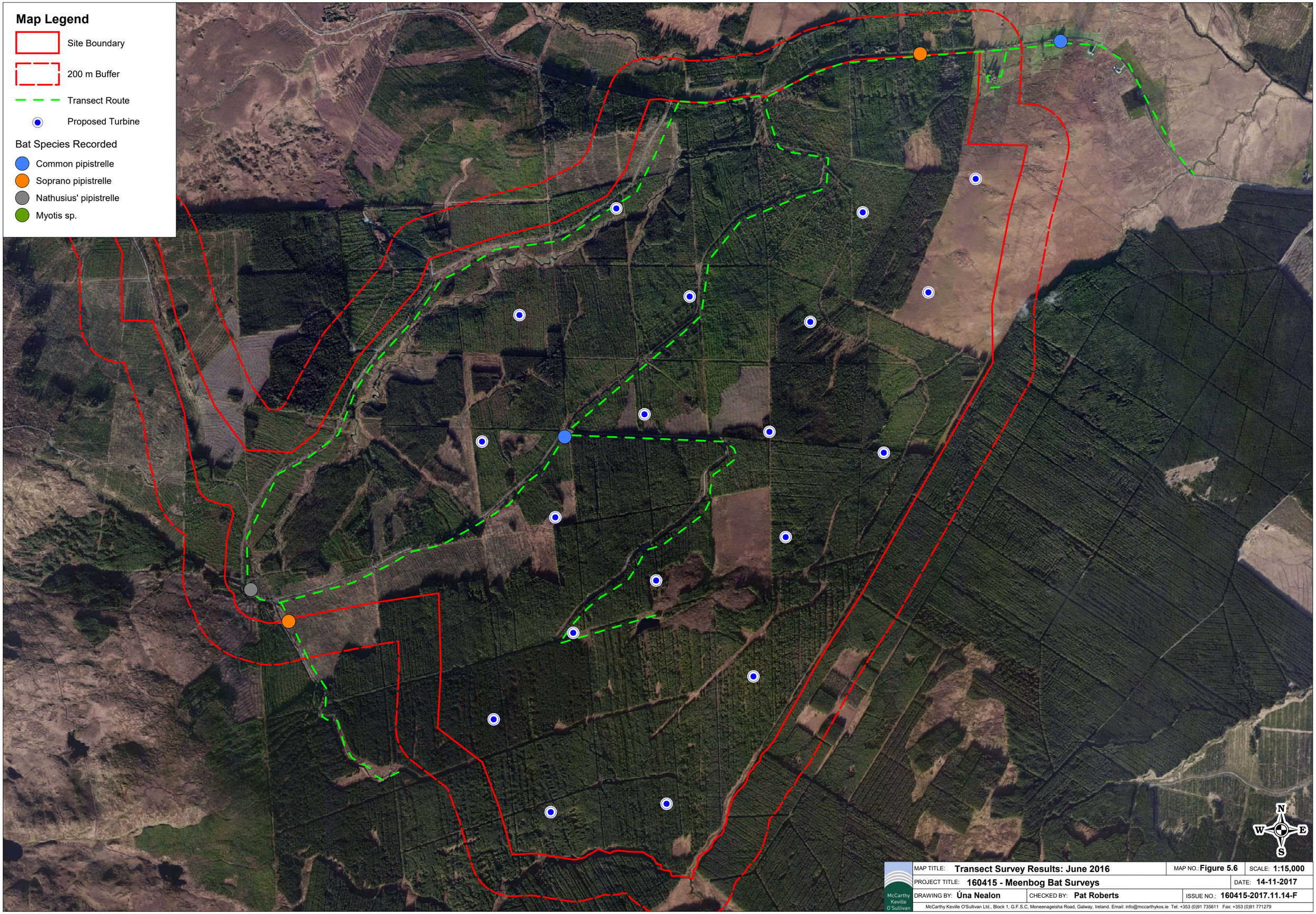

MAP TITLE: **Transect Survey Results: June 2016**		MAP NO.: **Figure 5.6**	SCALE: **1:15,000**
PROJECT TITLE: **160415 - Meenbog Bat Surveys**			DATE: **14-11-2017**
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160415-2017.11.14-F**	

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Map Legend

- Site Boundary
- 200 m Buffer
- Transect Route
- Proposed Turbine

Bat Species Recorded

- Common pipistrelle
- Soprano pipistrelle
- Leisler's bat
- Myotis sp.
- Brown long-eared bat

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MAP TITLE: **Transect Survey Results: July 2016**		MAP NO.: **Figure 5.7**	SCALE: **1:15,000**
PROJECT TITLE: **160415 - Meenbog Bat Surveys**			DATE: **14-11-2017**
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160415-2017.11.14-F**	

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Map Legend

- Site Boundary
- 200 m Buffer
- Transect Route
- Proposed Turbine

Bat Species Recorded

- Common pipistrelle
- Soprano pipistrelle
- Unidentified pipistrelle
- Leisler's bat
- Myotis sp.
- Brown long-eared bat

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MAP TITLE: **Transect Survey Results: August 2016**		MAP NO.: **Figure 5.8**	SCALE: **1:15,000**
PROJECT TITLE: **160415 - Meenbog Bat Surveys**			DATE: **14-11-2017**
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160415-2017.11.14-F**	

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Map Legend

- Site Boundary
- 200 m Buffer
- Transect Route
- Proposed Turbine

Bat Species Recorded

- Common pipistrelle
- Soprano pipistrelle
- Leisler's bat
- Myotis sp.
- Brown long-eared bat

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MAP TITLE: **Transect Survey Results: September 2016**	MAP NO.: **Figure 5.9**	SCALE: **1:15,000**	
PROJECT TITLE: **160415 - Meenbog Bat Surveys**		DATE: **14-11-2017**	
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160415-2017.11.14-F**	

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Map Legend

- Site Boundary
- 200 m Buffer
- Transect Route
- Proposed Turbine

Bat Species Recorded

- Common pipistrelle
- Soprano pipistrelle
- Leisler's bat
- Myotis sp.
- Brown long-eared bat

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MAP TITLE: **Transect Survey Results: October 2016**		MAP NO.: **Figure 5.10**	SCALE: **1:15,000**
PROJECT TITLE: **160415 - Meenbog Bat Surveys**			DATE: **14-11-2017**
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160415-2017.11.14-F**	

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5.3.4 Static Detector Surveys at Ground Level 2016

In total, 504 bat passes were recorded over 74 nights of static monitoring at ground level at four locations, comprising 876.79 survey hours. Most of this activity was attributed to soprano pipistrelle, followed by *Myotis* sp., Leisler's bat, common pipistrelle, brown long-eared bat and unidentified pipistrelle. Table 5.13 and Figure 5.11 provides a summary of these results. All individual bat records arising from static detector monitoring results are appended to this report as Appendix 3.

Table 5.13: Summary of static detector at ground level results in 2016 (total bat contacts)

	Ground-08-A	Ground-08-B	Ground-09	Ground-10	Total
Survey effort (hours)	*126.17*	*126.17*	*310.77*	*313.68*	***876.79***
Common pipistrelle	5	1	35	10	51
Soprano pipistrelle	19	4	179	29	231
Unidentified pipistrelle			6		6
Leisler's bat	6	3	56		65
Myotis sp.	16	11	66	7	100
Brown long-eared bat	5	1	44	1	51
Total	51	20	386	47	504

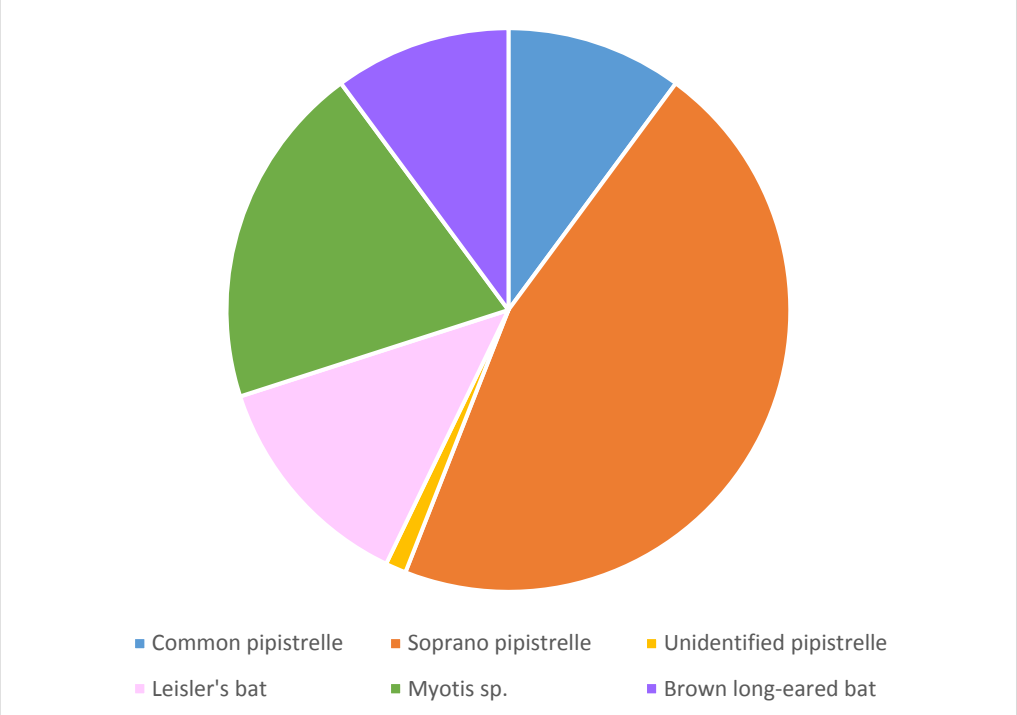

Figure 5.11: Static detectors at ground level 2016: Species composition (total bat passes)

Bat activity was also calculated as total bat passes per hour (bpph) to account for any bias in survey effort, resulting from varying night lengths throughout the survey season (Table 3.5). Table 5.14 and Figure 5.12 presents these results for each monitoring location.

Table 5.14: Summary of static detector at ground level results in 2016 (bpph)

	Ground-08-A	Ground-08-B	Ground-09	Ground-10	Total
Common pipistrelle	0.04	0.01	0.11	0.03	0.06
Soprano pipistrelle	0.15	0.03	0.58	0.09	0.26
Unidentified pipistrelle	0.00	0.00	0.02	0.00	0.01
Leisler's bat	0.05	0.02	0.18	0.00	0.07
Myotis sp.	0.13	0.09	0.21	0.02	0.11
Brown long-eared bat	0.04	0.01	0.14	0.00	0.06
Total	0.40	0.16	1.24	0.15	0.57

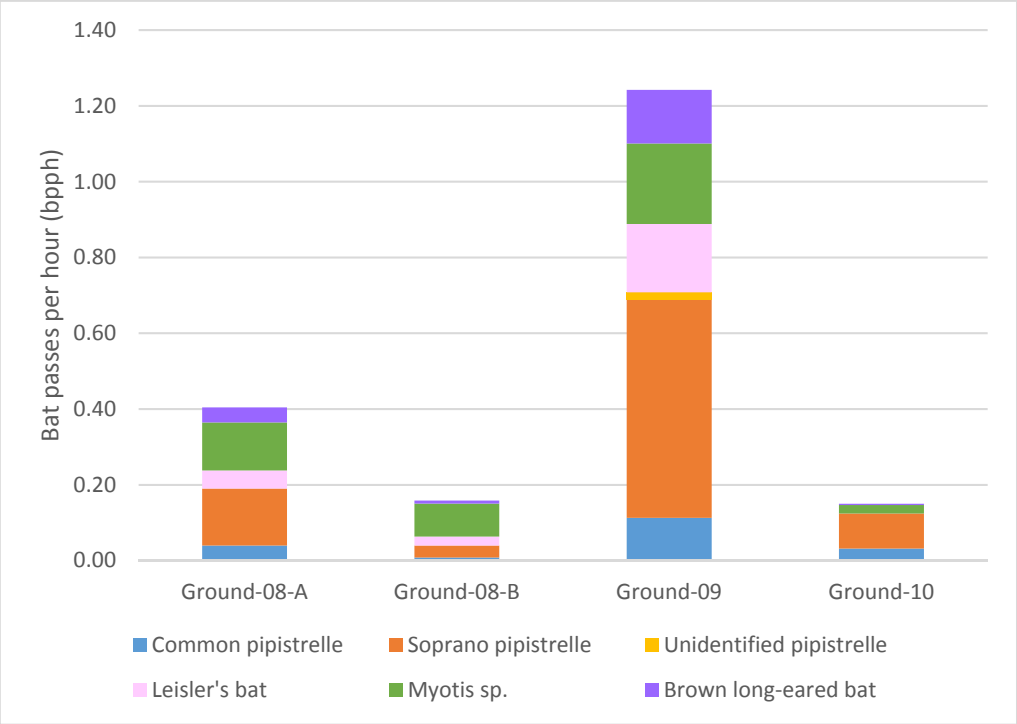

Figure 5.12: Static detectors at ground level 2016: Species composition per location (bpph)

Bat activity was low, totaling 0.57 bat passes per survey hour. However, differences were observed between different species and survey locations (Figure 5.12). Activity was significantly high at a young Alder plantation along the road to the north (Ground-09).

5.3.5 Static Detector Surveys at Ground Level and at Height 2017

In 2017, 86 nights of simultaneous bat monitoring at ground level and at height was achieved. Overall, bat activity was extremely low. No bat activity was recorded on 76 nights (86% of all survey nights). A total 41 bat passes recorded over just 12 nights. Bat activity was more frequently recorded at height compared to ground level and was largely attributed to Leisler's bat (n=29), a high-flying species.

Tables 5.15 and 5.16 present met mast static detector monitoring as total bat passes and as bat passes per survey hour. Figure 5.13 provides a summary of these results. All individual bat records arising from static detector monitoring are appended to this report as Appendix 4.

Table 5.15: Summary of static detector at height results in 2017 (total bat passes)

	Mast – 03		Mast – 04		Mast – 05		Mast – 06		Mast – 07		Mast – 08		Mast – 09		Mast – 10		Total
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	
Effort (h)	*102.48*	*102.48*	*105.48*	*105.48*	*109.77*	*109.77*	*115.65*	*115.65*	*107.23*	*107.23*	*116.03*	*116.03*	*99.82*	*99.82*	*99.70*	*99.70*	***1712.32***
Common pipistrelle	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	**1**
Unidentified pipistrelle	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	**1**
Leisler's bat	-	-	1	7	1	4	2	7	4	10	-	1	-	-	-	-	**37**
Brown long-eared bat	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	**2**
Total	**0**	**0**	**1**	**7**	**1**	**4**	**2**	**7**	**5**	**10**	**0**	**4**	**0**	**0**	**0**	**0**	**41**

Table 5.16: Summary of static detector at height results in 2017 (bpph)

	Mast – 03		Mast – 04		Mast – 05		Mast – 06		Mast – 07		Mast – 08		Mast – 09		Mast – 10		Total
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	
Effort (h)	*102.48*	*102.48*	*105.48*	*105.48*	*109.77*	*109.77*	*115.65*	*115.65*	*107.23*	*107.23*	*116.03*	*116.03*	*99.82*	*99.82*	*99.70*	*99.70*	***1712.32***
Common pipistrelle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Unidentified pipistrelle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	**0.00**
Leisler's bat	0.00	0.00	0.01	0.07	0.01	0.04	0.02	0.06	0.04	0.09	0.00	0.01	0.00	0.00	0.00	0.00	**0.02**
Brown long-eared bat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	**0.00**
Total	**0.00**	**0.00**	**0.01**	**0.07**	**0.01**	**0.04**	**0.02**	**0.06**	**0.05**	**0.09**	**0.00**	**0.03**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**

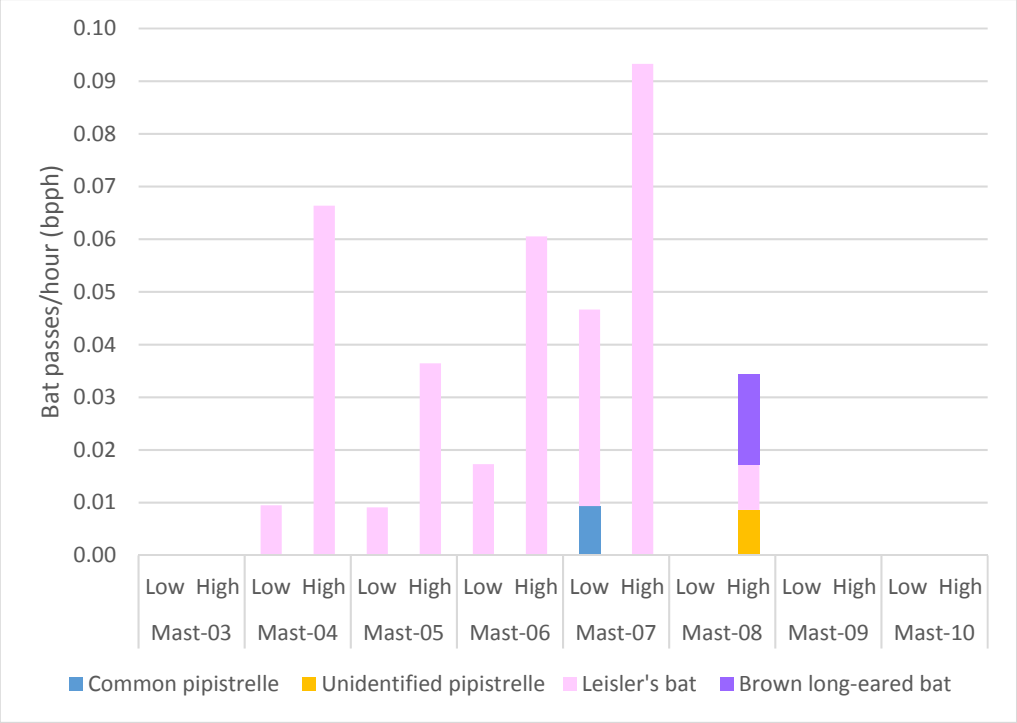

Figure 5.13: Static detectors at met mast 2017: Species composition per mic & per deployment (bpph)

5.4 Summary of Results

Bat surveys were designed in accordance with Bat Conservation Ireland's guidelines for wind turbine developments (BCI, 2012a). Surveys adopted a four-season approach and employed a combination of methods between 2014 and 2017, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level and at height.

Results of the desktop study revealed just two previous roost records. These roosts were recorded somewhere in the environs of Donegal Town (approx. 14km away). Roost inspections revealed two summer roosts within the Study Area. A bridge bordering the site contained 10-12 Daubenton's bats throughout summer 2014 and in spring 2016. An average summer colony size for this species is 20-50 individuals (up to 200), making this a small roost (BCT, 2010). However, the presence of bats throughout spring and summer surveys may indicate the presence of a small maternity colony. In addition, two *Myotis* bats and a single brown long-eared bat were recorded within an abandoned house within the 200 m buffer zone. These are likely opportunistic individuals and do not signify a significant roost.

All-season habitat assessments in 2014, 2016 and 2017 did not find roosts in any other structures or trees within 200 m of the site boundary. In addition, no sites suitable for swarming activity or hibernacula were identified. Other structures and trees within the Study Area were assessed as *Negligible – Low Suitability* in relation to their potential to support roosting bats.

Habitats within the Study Area are dominated by commercial forestry. The remainder of the site comprises peatland, grassland and freshwater habitats. Forestry edge habitats, created by commercial forestry and roadways/watercourses, show potential for foraging and commuting bats and were assessed as *Moderate* suitability. All other habitats were assigned a *Negligible-Low* value.

Overall, recorded bat activity levels were low. In 2014, manual transect results demonstrated that bat activity within the Study Area was significantly lower compared to the wider area, particularly lowland agricultural areas. Within the Study Area, activity was greatest along conifer edge bordering the main road to the north. 2016 results were consistent with these findings (0.6 bat passes/km in 2014 within the Study Area compared to 0.54 bat passes/km in 2016).

Static detector surveys also recorded low levels of activity. In 2014, one bat detector deployed within the Study Area recorded no bats in 27.5 survey hours. In 2016, 0.57 bat passes per hour were recorded. In comparison, a BCI pilot monitoring scheme for woodland bats in the Republic of Ireland recorded averages of 10.83, 14.27 and 47.52 bat passes per hour in three more favourable broadleaved woodlands studied (Roche and Aughney 2007)

Static detector surveys, simultaneously monitoring at ground level and at height, recorded extremely low levels of bat activity across 86 survey nights, with no bats recorded on the majority of nights. Most of the recorded activity was attributed to low numbers of high flying Leisler's bats and occasional instances of pipistrelle species and brown long-eared bat.

No clear seasonal peak in activity was observed during bat surveys. Rather, minor peaks in activity were recorded throughout the season but differed between survey methods and years. Throughout all surveys, pipistrelle species (including common, soprano and unidentified pipistrelles) were encountered most frequently, followed by *Myotis* sp. and Leisler's bat. Other species encountered included brown long-eared bat and a single Nathusius' pipistrelle.

6 LIKELY AND SIGNIFICANT EFFECTS ON BATS

6.1 Assessment of Potential Effects

Potential effects on bats of the proposed wind farm at Meenbog, Co. Donegal is presented in Table 6.1.

Table 6.1: Assessment of potential effects on bats

Analysis of potential effects during construction, operation and decommissioning phases of the proposed development		Unmitigated significance of potential effect (EPA 2002)
Construction Phase		
Habitat loss/ degradation	Loss or degradation of commuting/foraging habitat has potential to reduce feeding opportunities and/or displace bat populations. Construction will result in a loss of forestry habitat within the Study Area. However, linear connectivity will be maintained throughout the site and there will be an overall gain in forestry edge habitat available to foraging and commuting bats.	**Long-term Slight Positive Effect**
	Loss or degradation of roosting habitat has potential to displace bat populations and/ or impact breeding success. One small (potential maternity) colony of Daubenton's bats was identified within a bridge along an existing road bordering the site. This roost will be retained throughout the proposed works. There are no proposals to alter or upgrade this road or bridge. In addition, landscape connectivity to this roost will be maintained. In addition, an abandoned house was found to support several opportunistic individuals. This house will be retained throughout the proposed works and landscape connectivity to this roost will be maintained. No other roosts were identified, including no sites suitable for swarming or hibernation.	**No Effect**

Analysis of potential effects during construction, operation and decommissioning phases of the proposed development		Unmitigated significance of potential effect (EPA 2002)
Disturbance/ Displacement	Bats may be disturbed by increased human presence and increased noise during construction, leading to avoidance of the area. However, the Study Area is not utilised by large populations of bats. In addition, construction works will be temporary and best practice measures will be employed to minimise disturbance.	**Short-term Slight Negative Effect**
Mortality	The potential for bats to be killed during removal of trees or structures was considered in this assessment. No roosts were identified in any trees and roosts identified within structures will be retained.	**No Effect**
Operational Phase		
Disturbance/ Displacement	Bats may be disturbed by noise and/or movement of operational wind turbines, leading to avoidance of the area. However, the Study Area is not utilised by large populations of bats. It is unlikely there will be any significant disturbance or displacement during the operational phase.	**Long-term Imperceptible Negative Effect**
Mortality	Death may occur through collision with turbine blades or as a result of barotrauma. Significant fatalities may negatively affect local and national bat populations. To date, no studies have conclusively linked pre-construction activity surveys to post-construction fatality rates (Hein et al. 2013). However, there is a strong positive correlation between post-construction activity and fatality at wind farms (Kunz et al. 2007, Baerwald and Barclay 2009, Amorim et al. 2012, Korner-Nievergelt et al. 2013). Activity levels for all species during all surveys was assessed as low. In addition, surveys at height revealed low levels of Leisler's bat activity at height, despite substantial survey effort. Therefore, provided there is no significant change in activity as a result of the proposed development, a significant negative effect is not predicted. Post-construction activity monitoring and fatality searches will be undertaken to monitor for any changes.	**Long-term Slight Negative Effect**
Decommissioning Phase		
Habitat loss/ degradation	Activities during the decommissioning phase are similar to those during the construction phase. No significant negative effects are predicted during the decommissioning phase.	**No Effect**

Analysis of potential effects during construction, operation and decommissioning phases of the proposed development		Unmitigated significance of potential effect (EPA 2002)
Disturbance/ Displacement	Activities during the decommissioning phase are similar to those during the construction phase. No significant negative effects are predicted during the decommissioning phase.	**Short-term Slight Negative Effect**
Mortality	Activities during the decommissioning phase are similar to those during the construction phase. No significant negative effects are predicted during the decommissioning phase.	**No Effect**

7 MITIGATION MEASURES

7.1 Derogation Licence

It is illegal to damage or destroy a bat roost in Ireland. Two roosts were identified within the Study Area. However, proposed works will have no direct effect on these roosts and there is no requirement for a derogation licence

7.2 Buffer Distances

Habitats within the Study Area have limited value for bats at present. However, wind farm construction creates linear features and spaces around each turbine, which may provide favourable conditions for flying insects and foraging bats. Forest clearing will, at a minimum, observe a 50 m buffer distance as recommended by Natural England (2014). These vegetation-free areas will be maintained during the operational life of the development.

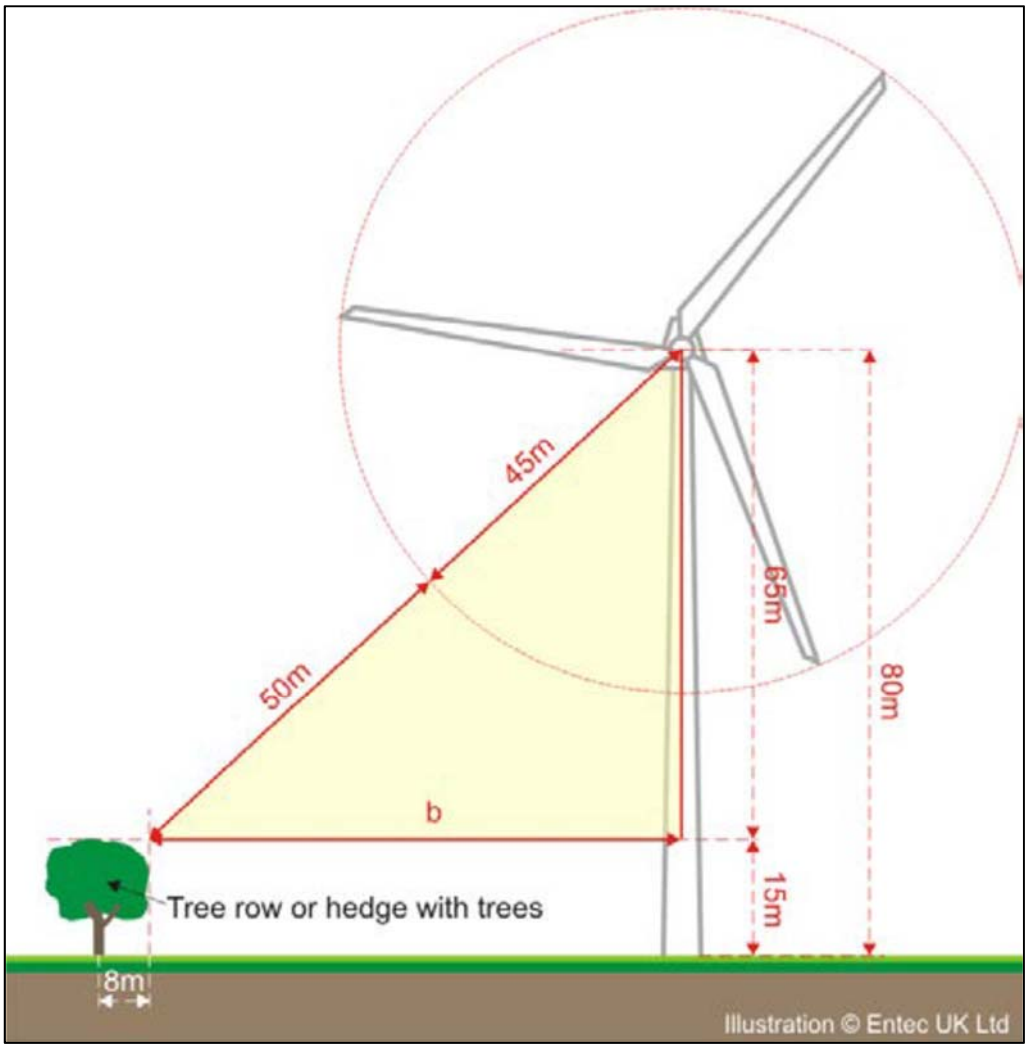

Figure 7.1: Calculation of buffer distances (from Natural England, 2014)

To minimise risk to bat populations our advice is to maintain a 50 m buffer around any feature (trees, hedges) into which no part of the turbine intrudes. This means the edge of the rotor-swept area needs to be at least 50 m from the nearest part of the habitat

feature. Therefore, 50m should be the minimum stand-off distance from blade tip to the nearest feature.

It is incorrect to measure 50 m from the turbine base to habitat feature at ground level as this would bring the blade tips very close to the canopy of a tall hedgerow tree and potentially put bat populations at risk. Instead, it is necessary to calculate the distance between the edge of the feature and the center of the tower (b) using the formula:

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

where: bl = blade length, hh = hub height, fh = feature height (all in metres). For the example above, b = 69.3 m (Figure 7.1).

7.3 Noise Restrictions

During the construction phase, noise limits, noise control measures, hours of operation and selection of plant items will be considered in relation to disturbance of bats. In addition, plant machinery will be turned off when not in use and all plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).

7.4 Lighting Restrictions

Lighting will be avoided wherever possible. Where lighting is required, directional lighting will be used to prevent overspill on to forestry edges. This will be achieved through the use of lighting accessories, such as hoods, cowls, louvers and shields, to direct the light to the intended area only.

7.5 Post-construction Monitoring & Fatality Searches

Post-construction monitoring and fatality searches will be undertaken during the operational phase of the development. The aim of these surveys is to monitor changes in foraging, commuting and roosting behaviour within the site, the effectiveness of prescribed buffer distances and to record any fatalities.

In accordance with consultation recommendations and best practice guidelines, a minimum of three years post-construction monitoring will be undertaken (BCI 2012a, Rodrigues et al. 2015). Late summer and autumn has been previously identified as the highest collision risk period for bats (Mathews et al. 2016). Therefore, 4 searches will be undertaken at monthly intervals between June and September in Years 1, 2 and 3 of the lifetime of the wind farm. Bat corpse searches can be conducted in conjunction with any bird corpse searches and will follow methods outlined by Rodrigues et al. (2015).

Bat corpses, due to their small size and dark colouring, are exceptionally difficult for humans to detect in the field (Mathews et al 2013, Arnett 2006). Therefore, trained sniffer dogs will be employed in fatality searches. In keeping with consultation recommendations best practice guidance, all fatality estimates will incorporate searcher efficiency and scavenger removal trials, specific to the site, as well as the impact of search plot size (BCI 2012a, Hundt 2012, Rodrigues 2015).

In accordance with best practice, post-construction activity surveys will be carried out in conjunction with fatality searches (BCI 2012a, Hundt 2012, Rodrigues 2015). A dusk and a dawn survey will be carried out on the night preceding any bat fatality search. Activity surveys will comprise walked transects and static detector surveys at ground level. The aim of post-construction activity surveys is to assess any changes in bat

activity and habitat use on site, monitor the effectiveness of prescribed buffer distances and to provide context to fatality search results.

Results from post-construction monitoring, fatality searches and efficiency trials will be compiled for each year and reported to NPWS and copied to the Arts, Heritage, Regional, Rural and Gaeltacht Affairs (as per consultation recommendations). Reporting will provide an estimate of overall fatality rates for all turbines, taking into consideration any identified search biases. In addition, fatality estimates will consider any cumulative effects that may arise from adjacent wind farm developments. If a negative effect on bats is observed, a plan of action will be determined with the NPWS without delay.

7.6 Residual Impacts

Taking into consideration the proposed mitigation measures; significant residual effects on bats with regard to habitat loss/degradation, disturbance/displacement or mortality are not anticipated.

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Appendix 1

Criteria for Habitat Suitability Assessment

Guidelines for assessing the potential suitability of a site for bats, based on the presence of habitat features (taken from Collins, 2016)

Suitability	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	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[1] 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[2]. A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential[3].	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. 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.
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 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).	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. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or 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 and surrounding habitat.	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. 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. Site is close to and connected to known roosts.

[1] For example, in terms of temperature, humidity, height above ground, light levels or levels of disturbance.

[2] Larger numbers of Common pipistrelle may be present during autumn and winter in large buildings in highly urbanised areas, based on evidence from the Netherlands (Korsten et al. 2015).

[3] Categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Appendix 2

Manual Transect Results 2016

Carrickaduff Wind Farm Bat Surveys - Manual Transect Results 2016

Month	Transect No.	Direction	Date	Time	Species	X Coord	Y Coord
May	14	F	29-May-16	00:24:37	Common pipistrelle	207756	385970
May	14	R	29-May-16	01:13:05	Leisler's bat	207313	385164
May	14	R	29-May-16	01:13:05	Unidentified pipistrelle	207313	385164
May	14	R	29-May-16	01:41:00	Myotis sp.	207743	385975
May	15	F	29-May-16	02:14:00	Myotis sp.	207885	386785
May	16	F	29-May-16	22:33:00	Unidentified pipistrelle	209636	387875
May	16	R	29-May-16	23:03:37	Leisler's bat	209766	387865
May	16	R	29-May-16	23:07:44	Common pipistrelle	209584	387867
May	17	R	29-May-16	23:21:00	Unidentified pipistrelle	209296	387665
May	16	R	29-May-16	23:43:00	Myotis sp.	208285	387660
May	16	R	29-May-16	23:48:04	Soprano pipistrelle	208077	387603
May	16	R	29-May-16	23:48:25	Leisler's bat	208077	387603
May	16	R	29-May-16	23:48:25	Unidentified pipistrelle	208077	387603
May	16	R	29-May-16	23:50:00	Brown long-eared bat	208077	387603
May	16	R	29-May-16	23:55:00	Myotis sp.	207749	387582
June	13	R	28-Jun-16	23:56:00	Common pipistrelle	207200	385971
June	12	F	29-Jun-16	00:28:08	Soprano pipistrelle	205875	385086
June	11	R	29-Jun-16	01:01:00	Myotis sp.	205693	385238
June	11	R	29-Jun-16	01:01:00	Nathusius' pipistrelle	205693	385238
June	16	F	29-Jun-16	02:14:20	Soprano pipistrelle	208907	387809
June	16	F	29-Jun-16	02:27:25	Common pipistrelle	209581	387869
July	14	F	26-Jul-16	00:09:08	Brown long-eared bat	207753	385974
July	14	F	26-Jul-16	00:20:03	Myotis sp.	207816	385601
July	14	R	26-Jul-16	01:05:21	Common pipistrelle	207686	385496
July	15	F	26-Jul-16	01:35:00	Myotis sp.	207592	386332
July	16	F	26-Jul-16	02:20:06	Soprano pipistrelle	207965	387586
July	17	F	28-Jul-16	23:36:27	Leisler's bat	209259	387705
July	17	F	28-Jul-16	23:39:53	Soprano pipistrelle	209263	387707
July	17	F	28-Jul-16	23:41:25	Soprano pipistrelle	209276	387673
August	14	F	28-Aug-16	21:44:00	Unidentified pipistrelle	207379	385985
August	14	F	28-Aug-16	21:54:00	Unidentified pipistrelle	207933	385964
August	14	F	28-Aug-16	21:55:00	Leisler's bat	207945	385965
August	14	F	28-Aug-16	22:02:00	Unidentified pipistrelle	207952	385839
August	14	F	28-Aug-16	22:05:00	Unidentified pipistrelle	207908	385723
August	14	F	28-Aug-16	22:09:54	Common pipistrelle	207841	385626
August	14	F	28-Aug-16	22:13:45	Unidentified pipistrelle	207714	385524
August	14	F	28-Aug-16	22:16:00	Myotis sp.	207641	385471
August	14	F	28-Aug-16	22:32:00	Myotis sp.	207358	385046
August	14	R	28-Aug-16	22:42:00	Unidentified pipistrelle	207506	385090
August	14	R	28-Aug-16	22:51:00	Unidentified pipistrelle	207210	385038
August	14	R	28-Aug-16	23:05:09	Common pipistrelle	207845	385624
August	14	R	28-Aug-16	23:06:00	Common pipistrelle	207870	385655
August	14	R	28-Aug-16	23:19:00	Unidentified pipistrelle	207538	385984
August	13	R	28-Aug-16	23:26:00	Unidentified pipistrelle	207209	385987
August	13	R	28-Aug-16	23:29:50	Brown long-eared bat	207137	385876

Carrickaduff Wind Farm Bat Surveys - Manual Transect Results 2016

Month	Transect No.	Direction	Date	Time	Species	X Coord	Y Coord
August	13	R	28-Aug-16	23:35:00	Myotis sp.	206972	385703
August	13	R	28-Aug-16	23:36:00	Leisler's bat	206969	385703
August	13	R	28-Aug-16	23:48:00	Myotis sp.	206385	385390
August	13	R	28-Aug-16	23:53:15	Leisler's bat	206205	385304
August	13	R	28-Aug-16	23:55:58	Leisler's bat	206113	385270
August	13	R	29-Aug-16	00:04:36	Brown long-eared bat	205837	385179
August	12	F	29-Aug-16	00:11:00	Leisler's bat	205889	385057
August	12	F	29-Aug-16	00:14:31	Leisler's bat	205947	384964
August	12	F	29-Aug-16	00:16:00	Unidentified pipistrelle	205967	384920
August	12	F	29-Aug-16	00:21:00	Common pipistrelle	206049	384780
August	12	R	29-Aug-16	00:44:00	Myotis sp.	205896	385047
August	11	R	29-Aug-16	00:50:00	Myotis sp.	205743	385198
August	11	R	29-Aug-16	00:52:00	Leisler's bat	205691	385243
August	11	R	29-Aug-16	01:07:00	Common pipistrelle	206105	385954
August	11	R	29-Aug-16	01:11:00	Unidentified pipistrelle	206156	386073
August	11	R	29-Aug-16	01:39:00	Unidentified pipistrelle	207547	387182
August	16	F	29-Aug-16	01:49:00	Myotis sp.	207823	387577
August	17	R	31-Aug-16	21:45:00	Soprano pipistrelle	209330	387750
September	11	F	26-Sep-16	20:31:30	Common pipistrelle	207700	387485
September	11	F	26-Sep-16	20:38:33	Brown long-eared bat	207506	387145
September	11	F	26-Sep-16	21:00:00	Common pipistrelle	206468	386524
September	11	F	26-Sep-16	21:46:07	Myotis sp.	205685	385274
September	12	F	26-Sep-16	21:54:57	Myotis sp.	205888	385057
September	12	R	26-Sep-16	22:10:54	Leisler's bat	205799	384444
September	12	R	26-Sep-16	22:24:34	Soprano pipistrelle	205928	384989
September	13	F	26-Sep-16	22:35:00	Myotis sp.	206204	385300
September	14	R	27-Sep-16	00:23:26	Soprano pipistrelle	207782	385972
September	17	F	29-Sep-16	22:30:27	Brown long-eared bat	209320	387753
October	15	R	24-Oct-16	19:20:00	Daubenton's bat	208175	387557
October	14	R	24-Oct-16	20:50:22	Brown long-eared bat	207453	385269
October	14	R	24-Oct-16	21:07:00	Unidentified pipistrelle	207750	385971
October	13	R	24-Oct-16	21:31:13	Brown long-eared bat	206661	385483

Appendix 3

Static Detector at Ground Level Results 2016

ID	DATE	TIME	Species
Ground-08-A	29/08/2016	23:17:48	Myotis sp.
Ground-08-A	30/08/2016	01:58:09	Brown long-eared bat
Ground-08-A	30/08/2016	02:07:29	Myotis sp.
Ground-08-A	30/08/2016	02:52:29	Soprano pipistrelle
Ground-08-A	31/08/2016	01:37:14	Leisler's bat
Ground-08-A	31/08/2016	02:42:52	Brown long-eared bat
Ground-08-A	31/08/2016	02:44:26	Brown long-eared bat
Ground-08-A	31/08/2016	22:54:29	Soprano pipistrelle
Ground-08-A	31/08/2016	23:16:05	Soprano pipistrelle
Ground-08-A	31/08/2016	23:16:08	Soprano pipistrelle
Ground-08-A	01/09/2016	00:02:51	Brown long-eared bat
Ground-08-A	01/09/2016	01:11:39	Myotis sp.
Ground-08-A	01/09/2016	01:21:43	Common pipistrelle
Ground-08-A	01/09/2016	01:35:28	Myotis sp.
Ground-08-A	01/09/2016	02:58:01	Soprano pipistrelle
Ground-08-A	02/09/2016	21:22:16	Leisler's bat
Ground-08-A	02/09/2016	21:40:14	Common pipistrelle
Ground-08-A	02/09/2016	21:48:28	Soprano pipistrelle
Ground-08-A	02/09/2016	22:26:05	Soprano pipistrelle
Ground-08-A	02/09/2016	22:51:47	Common pipistrelle
Ground-08-A	02/09/2016	23:23:02	Common pipistrelle
Ground-08-A	02/09/2016	23:58:40	Soprano pipistrelle
Ground-08-A	03/09/2016	01:11:14	Soprano pipistrelle
Ground-08-A	03/09/2016	21:40:35	Myotis sp.
Ground-08-A	04/09/2016	00:48:04	Soprano pipistrelle
Ground-08-A	04/09/2016	02:56:29	Soprano pipistrelle
Ground-08-A	04/09/2016	04:49:33	Myotis sp.
Ground-08-A	04/09/2016	21:37:35	Brown long-eared bat
Ground-08-A	06/09/2016	22:06:37	Myotis sp.
Ground-08-A	07/09/2016	00:35:22	Soprano pipistrelle
Ground-08-A	07/09/2016	00:35:36	Soprano pipistrelle
Ground-08-A	07/09/2016	00:35:52	Soprano pipistrelle
Ground-08-A	07/09/2016	00:36:02	Soprano pipistrelle
Ground-08-A	07/09/2016	00:36:16	Soprano pipistrelle
Ground-08-A	07/09/2016	00:38:34	Soprano pipistrelle
Ground-08-A	07/09/2016	00:38:49	Soprano pipistrelle
Ground-08-A	07/09/2016	00:47:34	Leisler's bat
Ground-08-A	07/09/2016	01:42:19	Myotis sp.
Ground-08-A	07/09/2016	02:26:42	Myotis sp.
Ground-08-A	07/09/2016	04:06:05	Leisler's bat
Ground-08-A	07/09/2016	05:19:16	Myotis sp.
Ground-08-A	07/09/2016	05:25:14	Myotis sp.
Ground-08-A	07/09/2016	21:12:08	Myotis sp.
Ground-08-A	07/09/2016	23:29:43	Myotis sp.
Ground-08-A	07/09/2016	23:29:49	Myotis sp.
Ground-08-A	08/09/2016	21:31:00	Leisler's bat
Ground-08-A	08/09/2016	21:50:21	Common pipistrelle
Ground-08-A	08/09/2016	22:01:47	Leisler's bat
Ground-08-A	08/09/2016	22:03:27	Soprano pipistrelle
Ground-08-A	08/09/2016	22:19:26	Myotis sp.
Ground-08-A	08/09/2016	22:39:12	Myotis sp.
Ground-08-B	31/08/2016	01:37:34	Leisler's bat
Ground-08-B	31/08/2016	02:21:20	Common pipistrelle
Ground-08-B	31/08/2016	03:10:08	Leisler's bat
Ground-08-B	01/09/2016	02:58:01	Brown long-eared bat
Ground-08-B	01/09/2016	21:06:56	Soprano pipistrelle
Ground-08-B	02/09/2016	04:39:15	Myotis sp.
Ground-08-B	03/09/2016	21:24:40	Myotis sp.
Ground-08-B	04/09/2016	00:17:55	Myotis sp.
Ground-08-B	04/09/2016	00:23:35	Leisler's bat

ID	DATE	TIME	Species
Ground-08-B	04/09/2016	00:33:37	Myotis sp.
Ground-08-B	04/09/2016	00:48:23	Soprano pipistrelle
Ground-08-B	04/09/2016	00:57:14	Myotis sp.
Ground-08-B	04/09/2016	01:55:37	Myotis sp.
Ground-08-B	04/09/2016	23:54:50	Myotis sp.
Ground-08-B	07/09/2016	04:19:30	Myotis sp.
Ground-08-B	07/09/2016	22:06:16	Myotis sp.
Ground-08-B	08/09/2016	22:08:27	Myotis sp.
Ground-08-B	08/09/2016	22:13:32	Soprano pipistrelle
Ground-08-B	08/09/2016	22:51:30	Soprano pipistrelle
Ground-08-B	09/09/2016	04:31:37	Myotis sp.
Ground-09	29/08/2016	21:29:11	Leisler's bat
Ground-09	29/08/2016	21:40:58	Brown long-eared bat
Ground-09	29/08/2016	21:44:39	Leisler's bat
Ground-09	29/08/2016	22:03:11	Soprano pipistrelle
Ground-09	29/08/2016	22:37:34	Soprano pipistrelle
Ground-09	29/08/2016	23:12:47	Soprano pipistrelle
Ground-09	29/08/2016	23:19:51	Leisler's bat
Ground-09	29/08/2016	23:26:10	Soprano pipistrelle
Ground-09	29/08/2016	23:46:41	Myotis sp.
Ground-09	29/08/2016	23:53:52	Leisler's bat
Ground-09	30/08/2016	00:45:52	Soprano pipistrelle
Ground-09	30/08/2016	02:13:34	Myotis sp.
Ground-09	30/08/2016	02:15:07	Soprano pipistrelle
Ground-09	30/08/2016	02:50:54	Soprano pipistrelle
Ground-09	30/08/2016	02:54:31	Soprano pipistrelle
Ground-09	30/08/2016	02:57:31	Soprano pipistrelle
Ground-09	30/08/2016	04:03:46	Soprano pipistrelle
Ground-09	30/08/2016	04:22:39	Soprano pipistrelle
Ground-09	30/08/2016	05:46:11	Soprano pipistrelle
Ground-09	30/08/2016	21:16:23	Soprano pipistrelle
Ground-09	30/08/2016	21:45:26	Myotis sp.
Ground-09	30/08/2016	22:00:49	Brown long-eared bat
Ground-09	31/08/2016	01:29:32	Leisler's bat
Ground-09	31/08/2016	01:30:10	Leisler's bat

ID	DATE	TIME	Species
Ground-09	31/08/2016	01:48:32	Brown long-eared bat
Ground-09	31/08/2016	01:54:38	Common pipistrelle
Ground-09	31/08/2016	02:56:40	Brown long-eared bat
Ground-09	31/08/2016	21:11:14	Myotis sp.
Ground-09	31/08/2016	21:42:07	Common pipistrelle
Ground-09	31/08/2016	21:58:07	Soprano pipistrelle
Ground-09	31/08/2016	22:11:41	Common pipistrelle
Ground-09	31/08/2016	23:00:05	Brown long-eared bat
Ground-09	31/08/2016	23:07:38	Myotis sp.
Ground-09	31/08/2016	23:14:38	Soprano pipistrelle
Ground-09	31/08/2016	23:20:42	Brown long-eared bat
Ground-09	31/08/2016	23:32:12	Myotis sp.
Ground-09	31/08/2016	23:35:28	Myotis sp.
Ground-09	31/08/2016	23:38:36	Myotis sp.
Ground-09	31/08/2016	23:47:29	Myotis sp.
Ground-09	31/08/2016	23:58:01	Brown long-eared bat
Ground-09	01/09/2016	00:24:44	Myotis sp.
Ground-09	01/09/2016	01:18:34	Common pipistrelle
Ground-09	01/09/2016	02:57:00	Myotis sp.
Ground-09	01/09/2016	03:51:25	Common pipistrelle
Ground-09	01/09/2016	03:58:01	Soprano pipistrelle
Ground-09	01/09/2016	04:05:20	Brown long-eared bat
Ground-09	01/09/2016	04:32:37	Myotis sp.
Ground-09	01/09/2016	04:47:56	Soprano pipistrelle
Ground-09	01/09/2016	04:50:56	Soprano pipistrelle
Ground-09	01/09/2016	04:52:15	Soprano pipistrelle
Ground-09	01/09/2016	05:50:00	Soprano pipistrelle
Ground-09	01/09/2016	22:17:36	Myotis sp.
Ground-09	02/09/2016	05:20:40	Soprano pipistrelle
Ground-09	02/09/2016	05:30:37	Soprano pipistrelle
Ground-09	02/09/2016	05:31:47	Soprano pipistrelle
Ground-09	02/09/2016	05:42:38	Myotis sp.
Ground-09	02/09/2016	21:00:00	Leisler's bat
Ground-09	02/09/2016	21:27:31	Soprano pipistrelle
Ground-09	02/09/2016	21:35:21	Common pipistrelle
Ground-09	02/09/2016	21:39:20	Leisler's bat
Ground-09	02/09/2016	21:46:09	Leisler's bat
Ground-09	02/09/2016	21:51:03	Leisler's bat

ID	DATE	TIME	Species
Ground-09	02/09/2016	21:54:25	Leisler's bat
Ground-09	02/09/2016	22:04:14	Leisler's bat
Ground-09	02/09/2016	22:06:00	Leisler's bat
Ground-09	02/09/2016	22:19:19	Leisler's bat
Ground-09	02/09/2016	22:26:27	Leisler's bat
Ground-09	02/09/2016	22:31:18	Leisler's bat
Ground-09	02/09/2016	22:31:50	Leisler's bat
Ground-09	02/09/2016	22:43:34	Daubenton's bat
Ground-09	02/09/2016	23:04:40	Myotis sp.
Ground-09	02/09/2016	23:17:09	Brown long-eared bat
Ground-09	02/09/2016	23:18:03	Leisler's bat
Ground-09	02/09/2016	23:27:13	Leisler's bat
Ground-09	02/09/2016	23:49:46	Myotis sp.
Ground-09	02/09/2016	23:53:07	Brown long-eared bat
Ground-09	02/09/2016	23:57:01	Brown long-eared bat
Ground-09	03/09/2016	00:13:03	Brown long-eared bat
Ground-09	03/09/2016	00:23:53	Leisler's bat
Ground-09	03/09/2016	00:24:14	Leisler's bat
Ground-09	03/09/2016	01:48:03	Leisler's bat
Ground-09	03/09/2016	02:05:17	Brown long-eared bat
Ground-09	03/09/2016	02:31:29	Soprano pipistrelle
Ground-09	03/09/2016	03:11:34	Common pipistrelle
Ground-09	03/09/2016	05:56:14	Soprano pipistrelle
Ground-09	03/09/2016	21:03:28	Soprano pipistrelle
Ground-09	04/09/2016	01:14:57	Soprano pipistrelle
Ground-09	04/09/2016	01:43:55	Common pipistrelle
Ground-09	04/09/2016	02:28:50	Soprano pipistrelle
Ground-09	04/09/2016	02:37:56	Leisler's bat
Ground-09	04/09/2016	03:31:13	Leisler's bat
Ground-09	04/09/2016	04:19:09	Soprano pipistrelle
Ground-09	04/09/2016	04:21:50	Soprano pipistrelle
Ground-09	04/09/2016	04:24:46	Soprano pipistrelle
Ground-09	04/09/2016	04:53:04	Soprano pipistrelle
Ground-09	04/09/2016	05:12:21	Soprano pipistrelle
Ground-09	04/09/2016	05:52:31	Soprano pipistrelle
Ground-09	04/09/2016	05:53:10	Soprano pipistrelle
Ground-09	04/09/2016	23:02:49	Myotis sp.
Ground-09	05/09/2016	05:13:57	Myotis sp.
Ground-09	05/09/2016	05:14:08	Myotis sp.
Ground-09	05/09/2016	05:15:15	Myotis sp.
Ground-09	05/09/2016	05:15:41	Myotis sp.
Ground-09	05/09/2016	05:15:52	Myotis sp.
Ground-09	05/09/2016	21:07:37	Myotis sp.
Ground-09	06/09/2016	05:49:17	Myotis sp.
Ground-09	06/09/2016	23:25:26	Soprano pipistrelle
Ground-09	06/09/2016	23:25:45	Soprano pipistrelle
Ground-09	06/09/2016	23:35:50	Soprano pipistrelle
Ground-09	06/09/2016	23:47:12	Soprano pipistrelle
Ground-09	07/09/2016	00:29:16	Leisler's bat
Ground-09	07/09/2016	00:56:41	Leisler's bat
Ground-09	07/09/2016	03:19:37	Soprano pipistrelle
Ground-09	07/09/2016	04:02:17	Myotis sp.
Ground-09	07/09/2016	04:04:30	Soprano pipistrelle
Ground-09	07/09/2016	04:06:31	Leisler's bat
Ground-09	07/09/2016	04:44:39	Soprano pipistrelle
Ground-09	07/09/2016	04:57:55	Soprano pipistrelle
Ground-09	07/09/2016	05:05:29	Myotis sp.
Ground-09	07/09/2016	05:06:56	Soprano pipistrelle
Ground-09	07/09/2016	05:10:47	Soprano pipistrelle
Ground-09	07/09/2016	05:26:54	Myotis sp.
Ground-09	07/09/2016	05:27:56	Myotis sp.
Ground-09	07/09/2016	05:38:19	Myotis sp.
Ground-09	07/09/2016	05:48:48	Myotis sp.
Ground-09	07/09/2016	20:36:37	Myotis sp.
Ground-09	07/09/2016	23:54:45	Unidentified pipistrelle
Ground-09	08/09/2016	05:16:49	Soprano pipistrelle
Ground-09	08/09/2016	21:27:11	Leisler's bat
Ground-09	08/09/2016	21:33:48	Leisler's bat
Ground-09	08/09/2016	21:33:58	Leisler's bat
Ground-09	08/09/2016	21:37:34	Common pipistrelle
Ground-09	08/09/2016	21:41:16	Leisler's bat
Ground-09	08/09/2016	21:46:03	Soprano pipistrelle
Ground-09	08/09/2016	21:48:49	Common pipistrelle
Ground-09	08/09/2016	21:54:22	Common pipistrelle
Ground-09	08/09/2016	21:54:39	Leisler's bat
Ground-09	08/09/2016	21:59:36	Soprano pipistrelle
Ground-09	08/09/2016	22:01:58	Soprano pipistrelle

ID	DATE	TIME	Species
Ground-09	08/09/2016	22:36:30	Myotis sp.
Ground-09	08/09/2016	22:51:31	Leisler's bat
Ground-09	08/09/2016	23:27:31	Brown long-eared bat
Ground-09	08/09/2016	23:41:54	Soprano pipistrelle
Ground-09	08/09/2016	23:48:28	Soprano pipistrelle
Ground-09	09/09/2016	00:40:46	Myotis sp.
Ground-09	09/09/2016	01:11:43	Soprano pipistrelle
Ground-09	09/09/2016	02:52:29	Myotis sp.
Ground-09	09/09/2016	03:07:19	Myotis sp.
Ground-09	10/09/2016	01:12:44	Myotis sp.
Ground-09	10/09/2016	01:12:44	Myotis sp.
Ground-09	10/09/2016	03:28:44	Soprano pipistrelle
Ground-09	10/09/2016	04:22:28	Soprano pipistrelle
Ground-09	10/09/2016	04:24:34	Soprano pipistrelle
Ground-09	10/09/2016	04:30:37	Soprano pipistrelle
Ground-09	10/09/2016	04:49:38	Soprano pipistrelle
Ground-09	10/09/2016	21:36:54	Brown long-eared bat
Ground-09	10/09/2016	22:43:08	Soprano pipistrelle
Ground-09	10/09/2016	23:05:51	Leisler's bat
Ground-09	10/09/2016	23:14:36	Myotis sp.
Ground-09	11/09/2016	00:08:18	Brown long-eared bat
Ground-09	11/09/2016	00:15:48	Soprano pipistrelle
Ground-09	11/09/2016	00:32:21	Soprano pipistrelle
Ground-09	11/09/2016	00:59:30	Soprano pipistrelle
Ground-09	11/09/2016	01:10:01	Soprano pipistrelle
Ground-09	11/09/2016	03:27:38	Soprano pipistrelle
Ground-09	11/09/2016	03:32:15	Soprano pipistrelle
Ground-09	11/09/2016	03:39:11	Soprano pipistrelle
Ground-09	11/09/2016	03:41:39	Soprano pipistrelle
Ground-09	11/09/2016	03:50:04	Brown long-eared bat
Ground-09	11/09/2016	04:02:32	Soprano pipistrelle
Ground-09	11/09/2016	04:02:32	Soprano pipistrelle
Ground-09	11/09/2016	04:23:23	Soprano pipistrelle
Ground-09	11/09/2016	04:51:54	Soprano pipistrelle
Ground-09	11/09/2016	05:10:10	Soprano pipistrelle
Ground-09	11/09/2016	05:40:39	Myotis sp.
Ground-09	13/09/2016	21:01:34	Common pipistrelle
Ground-09	13/09/2016	21:10:43	Common pipistrelle

ID	DATE	TIME	Species
Ground-09	13/09/2016	21:38:53	Soprano pipistrelle
Ground-09	13/09/2016	21:48:39	Soprano pipistrelle
Ground-09	13/09/2016	21:50:12	Common pipistrelle
Ground-09	13/09/2016	21:54:10	Leisler's bat
Ground-09	13/09/2016	21:56:38	Leisler's bat
Ground-09	13/09/2016	22:00:23	Leisler's bat
Ground-09	13/09/2016	22:00:23	Leisler's bat
Ground-09	13/09/2016	22:07:01	Soprano pipistrelle
Ground-09	13/09/2016	22:16:56	Brown long-eared bat
Ground-09	13/09/2016	22:31:47	Soprano pipistrelle
Ground-09	13/09/2016	22:33:15	Soprano pipistrelle
Ground-09	13/09/2016	22:39:33	Soprano pipistrelle
Ground-09	13/09/2016	22:45:24	Common pipistrelle
Ground-09	13/09/2016	22:54:38	Common pipistrelle
Ground-09	13/09/2016	23:00:23	Brown long-eared bat
Ground-09	13/09/2016	23:01:48	Soprano pipistrelle
Ground-09	13/09/2016	23:44:41	Soprano pipistrelle
Ground-09	13/09/2016	23:56:56	Common pipistrelle
Ground-09	14/09/2016	00:53:47	Soprano pipistrelle
Ground-09	14/09/2016	01:46:13	Brown long-eared bat
Ground-09	14/09/2016	02:13:09	Myotis sp.
Ground-09	14/09/2016	03:14:35	Soprano pipistrelle
Ground-09	14/09/2016	03:27:24	Soprano pipistrelle
Ground-09	14/09/2016	03:57:01	Soprano pipistrelle
Ground-09	14/09/2016	04:07:36	Soprano pipistrelle
Ground-09	14/09/2016	04:18:51	Soprano pipistrelle
Ground-09	14/09/2016	04:25:56	Soprano pipistrelle
Ground-09	14/09/2016	04:27:02	Soprano pipistrelle
Ground-09	14/09/2016	04:39:56	Soprano pipistrelle
Ground-09	14/09/2016	04:42:08	Soprano pipistrelle
Ground-09	14/09/2016	04:43:58	Soprano pipistrelle
Ground-09	14/09/2016	04:47:05	Soprano pipistrelle
Ground-09	14/09/2016	04:50:54	Soprano pipistrelle
Ground-09	14/09/2016	21:06:19	Soprano pipistrelle
Ground-09	14/09/2016	21:45:21	Brown long-eared bat
Ground-09	14/09/2016	21:52:39	Brown long-eared bat
Ground-09	14/09/2016	23:09:26	Soprano pipistrelle
Ground-09	14/09/2016	23:27:37	Leisler's bat

ID	DATE	TIME	Species
Ground-09	14/09/2016	23:35:49	Soprano pipistrelle
Ground-09	14/09/2016	23:42:51	Brown long-eared bat
Ground-09	14/09/2016	23:47:01	Soprano pipistrelle
Ground-09	14/09/2016	23:59:05	Brown long-eared bat
Ground-09	15/09/2016	00:18:22	Common pipistrelle
Ground-09	15/09/2016	00:22:43	Common pipistrelle
Ground-09	15/09/2016	01:04:57	Brown long-eared bat
Ground-09	15/09/2016	01:27:54	Unidentified pipistrelle
Ground-09	15/09/2016	02:13:54	Soprano pipistrelle
Ground-09	15/09/2016	02:40:55	Unidentified pipistrelle
Ground-09	15/09/2016	02:44:48	Myotis sp.
Ground-09	15/09/2016	03:51:18	Brown long-eared bat
Ground-09	15/09/2016	04:16:24	Myotis sp.
Ground-09	15/09/2016	06:10:17	Soprano pipistrelle
Ground-09	15/09/2016	21:20:22	Leisler's bat
Ground-09	15/09/2016	21:21:07	Soprano pipistrelle
Ground-09	15/09/2016	21:21:42	Leisler's bat
Ground-09	15/09/2016	21:22:12	Leisler's bat
Ground-09	15/09/2016	21:22:29	Leisler's bat
Ground-09	15/09/2016	21:23:01	Leisler's bat
Ground-09	15/09/2016	21:23:16	Leisler's bat
Ground-09	15/09/2016	21:23:33	Soprano pipistrelle
Ground-09	15/09/2016	21:23:50	Leisler's bat
Ground-09	15/09/2016	21:24:13	Leisler's bat
Ground-09	15/09/2016	21:24:27	Leisler's bat
Ground-09	15/09/2016	21:24:53	Leisler's bat
Ground-09	15/09/2016	21:26:01	Leisler's bat
Ground-09	15/09/2016	21:26:19	Leisler's bat
Ground-09	15/09/2016	21:30:08	Leisler's bat
Ground-09	15/09/2016	21:31:03	Leisler's bat
Ground-09	15/09/2016	21:31:25	Leisler's bat
Ground-09	15/09/2016	21:57:46	Myotis sp.
Ground-09	15/09/2016	22:08:16	Myotis sp.
Ground-09	15/09/2016	22:43:21	Myotis sp.
Ground-09	15/09/2016	22:53:22	Brown long-eared bat
Ground-09	15/09/2016	23:00:08	Unidentified pipistrelle
Ground-09	15/09/2016	23:15:18	Common pipistrelle

ID	DATE	TIME	Species
Ground-09	15/09/2016	23:15:18	Soprano Pipistrelle
Ground-09	16/09/2016	00:27:22	Brown long-eared bat
Ground-09	16/09/2016	00:27:48	Soprano pipistrelle
Ground-09	16/09/2016	00:28:17	Common pipistrelle
Ground-09	16/09/2016	00:28:50	Soprano pipistrelle
Ground-09	16/09/2016	00:30:47	Brown long-eared bat
Ground-09	16/09/2016	00:37:33	Soprano pipistrelle
Ground-09	16/09/2016	01:01:28	Common pipistrelle
Ground-09	16/09/2016	01:25:17	Soprano pipistrelle
Ground-09	16/09/2016	01:51:38	Soprano pipistrelle
Ground-09	16/09/2016	02:22:01	Soprano pipistrelle
Ground-09	16/09/2016	02:30:57	Soprano pipistrelle
Ground-09	16/09/2016	02:55:44	Soprano pipistrelle
Ground-09	16/09/2016	03:23:22	Soprano pipistrelle
Ground-09	16/09/2016	03:23:46	Soprano pipistrelle
Ground-09	16/09/2016	03:42:02	Soprano pipistrelle
Ground-09	16/09/2016	05:44:55	Myotis sp.
Ground-09	16/09/2016	06:14:26	Soprano pipistrelle
Ground-09	16/09/2016	21:04:07	Leisler's bat
Ground-09	16/09/2016	21:25:32	Soprano pipistrelle
Ground-09	16/09/2016	21:27:33	Common pipistrelle
Ground-09	16/09/2016	21:39:57	Common pipistrelle
Ground-09	16/09/2016	22:10:31	Soprano pipistrelle
Ground-09	16/09/2016	22:54:03	Myotis sp.
Ground-09	16/09/2016	23:20:04	Soprano pipistrelle
Ground-09	16/09/2016	23:28:05	Soprano pipistrelle
Ground-09	17/09/2016	00:23:01	Soprano pipistrelle
Ground-09	17/09/2016	00:27:07	Myotis sp.
Ground-09	17/09/2016	00:33:16	Common pipistrelle
Ground-09	17/09/2016	00:41:24	Soprano pipistrelle
Ground-09	17/09/2016	01:02:47	Soprano pipistrelle
Ground-09	17/09/2016	01:08:29	Soprano pipistrelle
Ground-09	17/09/2016	01:12:07	Brown long-eared bat
Ground-09	17/09/2016	01:14:25	Soprano pipistrelle
Ground-09	17/09/2016	01:30:43	Soprano pipistrelle
Ground-09	17/09/2016	01:45:44	Myotis sp.
Ground-09	17/09/2016	02:08:21	Soprano pipistrelle
Ground-09	17/09/2016	02:48:07	Soprano pipistrelle
Ground-09	17/09/2016	03:20:20	Common pipistrelle

ID	DATE	TIME	Species
Ground-09	17/09/2016	05:25:14	Soprano pipistrelle
Ground-09	17/09/2016	05:32:20	Soprano pipistrelle
Ground-09	17/09/2016	21:00:41	Soprano pipistrelle
Ground-09	17/09/2016	21:19:50	Myotis sp.
Ground-09	17/09/2016	21:24:35	Common pipistrelle
Ground-09	17/09/2016	21:29:08	Brown long-eared bat
Ground-09	17/09/2016	21:34:56	Soprano pipistrelle
Ground-09	17/09/2016	22:37:39	Common pipistrelle
Ground-09	17/09/2016	22:49:50	Brown long-eared bat
Ground-09	17/09/2016	22:51:10	Brown long-eared bat
Ground-09	17/09/2016	22:53:33	Soprano pipistrelle
Ground-09	17/09/2016	23:02:10	Soprano pipistrelle
Ground-09	17/09/2016	23:20:43	Myotis sp.
Ground-09	17/09/2016	23:32:37	Common pipistrelle
Ground-09	17/09/2016	23:41:11	Common pipistrelle
Ground-09	18/09/2016	01:20:54	Soprano pipistrelle
Ground-09	18/09/2016	01:22:37	Myotis sp.
Ground-09	18/09/2016	02:47:36	Brown long-eared bat
Ground-09	18/09/2016	03:48:53	Soprano pipistrelle
Ground-09	18/09/2016	03:49:15	Soprano pipistrelle
Ground-09	18/09/2016	20:18:48	Soprano pipistrelle
Ground-09	18/09/2016	21:00:32	Soprano pipistrelle
Ground-09	18/09/2016	21:13:07	Soprano pipistrelle
Ground-09	18/09/2016	21:33:06	Brown long-eared bat
Ground-09	18/09/2016	22:27:35	Soprano pipistrelle
Ground-09	18/09/2016	22:28:49	Soprano pipistrelle
Ground-09	18/09/2016	22:41:57	Myotis sp.
Ground-09	18/09/2016	22:56:15	Myotis sp.
Ground-09	18/09/2016	23:24:55	Soprano pipistrelle
Ground-09	18/09/2016	23:25:23	Soprano pipistrelle
Ground-09	18/09/2016	23:26:25	Brown long-eared bat
Ground-09	18/09/2016	23:45:24	Soprano pipistrelle
Ground-09	19/09/2016	00:07:23	Soprano pipistrelle
Ground-09	19/09/2016	00:20:56	Common pipistrelle
Ground-09	19/09/2016	00:25:11	Myotis sp.
Ground-09	19/09/2016	00:35:02	Common pipistrelle
Ground-09	19/09/2016	00:44:59	Myotis sp.
Ground-09	19/09/2016	02:26:53	Soprano pipistrelle

ID	DATE	TIME	Species
Ground-09	19/09/2016	02:53:38	Myotis sp.
Ground-09	19/09/2016	03:43:51	Soprano pipistrelle
Ground-09	19/09/2016	03:56:05	Soprano pipistrelle
Ground-09	19/09/2016	05:20:08	Soprano pipistrelle
Ground-09	19/09/2016	05:27:56	Soprano pipistrelle
Ground-09	19/09/2016	05:29:44	Soprano pipistrelle
Ground-09	19/09/2016	05:31:22	Soprano pipistrelle
Ground-09	19/09/2016	05:36:46	Soprano pipistrelle
Ground-09	19/09/2016	05:39:06	Soprano pipistrelle
Ground-09	19/09/2016	05:42:49	Soprano pipistrelle
Ground-09	19/09/2016	05:43:48	Soprano pipistrelle
Ground-09	19/09/2016	21:04:37	Common pipistrelle
Ground-09	19/09/2016	22:05:58	Soprano pipistrelle
Ground-09	19/09/2016	22:35:06	Brown long-eared bat
Ground-09	19/09/2016	22:35:59	Soprano pipistrelle
Ground-09	19/09/2016	22:38:00	Soprano pipistrelle
Ground-09	19/09/2016	22:51:57	Common pipistrelle
Ground-09	19/09/2016	22:55:52	Soprano pipistrelle
Ground-09	19/09/2016	23:08:02	Brown long-eared bat
Ground-09	19/09/2016	23:34:21	Brown long-eared bat
Ground-09	20/09/2016	00:13:21	Myotis sp.
Ground-09	20/09/2016	01:45:43	Unidentified pipistrelle
Ground-09	20/09/2016	01:48:40	Soprano pipistrelle
Ground-09	20/09/2016	01:54:05	Soprano pipistrelle
Ground-09	20/09/2016	02:01:07	Soprano pipistrelle
Ground-09	20/09/2016	02:11:48	Soprano pipistrelle
Ground-09	20/09/2016	03:00:20	Soprano pipistrelle
Ground-09	20/09/2016	03:08:36	Brown long-eared bat
Ground-09	20/09/2016	03:18:59	Soprano pipistrelle
Ground-09	20/09/2016	03:27:10	Common pipistrelle
Ground-09	20/09/2016	03:33:38	Soprano pipistrelle
Ground-09	20/09/2016	03:34:12	Soprano pipistrelle
Ground-09	20/09/2016	03:34:20	Soprano pipistrelle
Ground-09	20/09/2016	03:38:38	Unidentified pipistrelle
Ground-09	20/09/2016	03:54:59	Myotis sp.
Ground-09	20/09/2016	03:56:31	Myotis sp.
Ground-09	20/09/2016	05:36:56	Myotis sp.
Ground-09	20/09/2016	20:31:15	Soprano pipistrelle

ID	DATE	TIME	Species
Ground-09	20/09/2016	21:17:43	Soprano pipistrelle
Ground-09	20/09/2016	22:22:01	Myotis sp.
Ground-09	21/09/2016	00:11:46	Leisler's bat
Ground-09	21/09/2016	06:10:55	Soprano pipistrelle
Ground-09	21/09/2016	20:11:47	Brown long-eared bat
Ground-09	22/09/2016	03:47:46	Myotis sp.
Ground-09	22/09/2016	20:59:38	Brown long-eared bat
Ground-09	22/09/2016	23:46:18	Soprano pipistrelle
Ground-09	25/09/2016	02:59:41	Soprano pipistrelle
Ground-09	25/09/2016	04:52:03	Soprano pipistrelle
Ground-09	25/09/2016	05:15:27	Soprano pipistrelle
Ground-09	25/09/2016	05:32:16	Soprano pipistrelle
Ground-09	25/09/2016	19:56:32	Brown long-eared bat
Ground-09	25/09/2016	20:17:45	Brown long-eared bat
Ground-09	25/09/2016	22:44:19	Myotis sp.
Ground-09	25/09/2016	23:22:17	Soprano pipistrelle
Ground-09	26/09/2016	00:22:35	Myotis sp.
Ground-09	26/09/2016	06:45:48	Soprano pipistrelle
Ground-09	26/09/2016	06:51:02	Soprano pipistrelle
Ground-10	29/09/2016	22:39:21	Myotis sp.
Ground-10	04/10/2016	19:41:20	Soprano pipistrelle
Ground-10	04/10/2016	23:12:24	Soprano pipistrelle
Ground-10	04/10/2016	23:12:43	Soprano pipistrelle
Ground-10	04/10/2016	23:30:25	Soprano pipistrelle
Ground-10	05/10/2016	02:18:52	Myotis sp.
Ground-10	05/10/2016	03:42:31	Myotis sp.
Ground-10	05/10/2016	20:59:03	Myotis sp.
Ground-10	06/10/2016	06:14:09	Brown long-eared bat
Ground-10	06/10/2016	20:10:35	Common pipistrelle
Ground-10	06/10/2016	20:56:02	Soprano pipistrelle
Ground-10	07/10/2016	22:02:33	Soprano pipistrelle
Ground-10	07/10/2016	22:03:12	Soprano pipistrelle
Ground-10	07/10/2016	23:27:07	Myotis sp.
Ground-10	08/10/2016	02:45:10	Soprano pipistrelle
Ground-10	08/10/2016	04:04:59	Soprano pipistrelle
Ground-10	08/10/2016	06:16:19	Soprano pipistrelle
Ground-10	08/10/2016	19:59:02	Common pipistrelle
Ground-10	08/10/2016	21:25:18	Common pipistrelle

ID	DATE	TIME	Species
Ground-10	08/10/2016	21:45:05	Common pipistrelle
Ground-10	08/10/2016	21:54:08	Common pipistrelle
Ground-10	08/10/2016	22:29:52	Common pipistrelle
Ground-10	11/10/2016	22:26:15	Soprano pipistrelle
Ground-10	11/10/2016	22:33:11	Common pipistrelle
Ground-10	11/10/2016	23:48:37	Soprano pipistrelle
Ground-10	12/10/2016	00:23:02	Soprano pipistrelle
Ground-10	12/10/2016	01:15:24	Soprano pipistrelle
Ground-10	12/10/2016	02:20:11	Soprano pipistrelle
Ground-10	12/10/2016	02:24:31	Common pipistrelle
Ground-10	12/10/2016	02:31:01	Soprano pipistrelle
Ground-10	12/10/2016	04:21:47	Soprano pipistrelle
Ground-10	12/10/2016	06:25:17	Myotis sp.
Ground-10	14/10/2016	19:55:56	Common pipistrelle
Ground-10	14/10/2016	21:24:49	Soprano pipistrelle
Ground-10	14/10/2016	21:27:55	Soprano pipistrelle
Ground-10	15/10/2016	00:50:35	Common pipistrelle
Ground-10	15/10/2016	02:04:32	Soprano pipistrelle
Ground-10	15/10/2016	02:04:43	Soprano pipistrelle
Ground-10	15/10/2016	02:34:03	Soprano pipistrelle
Ground-10	15/10/2016	03:08:11	Soprano pipistrelle
Ground-10	15/10/2016	05:30:01	Soprano pipistrelle
Ground-10	19/10/2016	19:06:07	Soprano pipistrelle
Ground-10	20/10/2016	19:19:06	Myotis sp.
Ground-10	20/10/2016	19:21:49	Soprano pipistrelle
Ground-10	20/10/2016	19:22:12	Soprano pipistrelle
Ground-10	21/10/2016	21:01:49	Soprano pipistrelle
Ground-10	21/10/2016	21:22:11	Soprano pipistrelle

Appendix 4

Static Detector at Met Mast Results 2017

ID	Microphone	Date	Time	Species
MAST-04	Low	30/04/2017	22:52	Leisler's bat
MAST-04	High	30/04/2017	22:52	Leisler's bat
MAST-04	Low	30/04/2017	23:58	Leisler's bat
MAST-04	Low	30/04/2017	23:58	Leisler's bat
MAST-04	Low	03/05/2017	00:57	Leisler's bat
MAST-04	Low	03/05/2017	22:01	Leisler's bat
MAST-04	Low	03/05/2017	22:53	Leisler's bat
MAST-04	Low	03/05/2017	22:53	Leisler's bat
MAST-05	Low	25/05/2017	23:44	Leisler's bat
MAST-05	Low	26/05/2017	02:54	Leisler's bat
MAST-05	Low	27/05/2017	00:31	Leisler's bat
MAST-05	High	27/05/2017	00:31	Leisler's bat
MAST-05	Low	27/05/2017	00:46	Leisler's bat
MAST-06	Low	27/06/2017	22:41	Leisler's bat
MAST-06	High	27/06/2017	22:41	Leisler's bat
MAST-06	Low	27/06/2017	22:42	Leisler's bat
MAST-06	Low	27/06/2017	22:42	Leisler's bat
MAST-06	Low	27/06/2017	22:43	Leisler's bat
MAST-06	Low	27/06/2017	22:43	Leisler's bat
MAST-06	Low	27/06/2017	22:50	Leisler's bat
MAST-06	High	27/06/2017	22:50	Leisler's bat
MAST-06	Low	27/06/2017	22:51	Leisler's bat
MAST-07	Low	25/07/2017	22:24	Leisler's bat
MAST-07	High	25/07/2017	22:24	Leisler's bat
MAST-07	Low	25/07/2017	22:43	Leisler's bat
MAST-07	High	25/07/2017	22:43	Leisler's bat
MAST-07	Low	01/08/2017	22:25	Leisler's bat
MAST-07	High	01/08/2017	22:25	Leisler's bat
MAST-07	Low	01/08/2017	22:26	Leisler's bat
MAST-07	Low	01/08/2017	22:50	Leisler's bat
MAST-07	Low	01/08/2017	22:52	Leisler's bat
MAST-07	Low	01/08/2017	23:34	Leisler's bat
MAST-07	Low	01/08/2017	23:43	Leisler's bat
MAST-07	High	01/08/2017	23:43	Leisler's bat
MAST-07	Low	01/08/2017	23:43	Leisler's bat
MAST-07	Low	01/08/2017	23:46	Leisler's bat
MAST-08	Low	27/08/2017	21:44	Leisler's bat
MAST-07	High	01/08/2017	23:46	Common pipistrelle
MAST-08	Low	29/08/2017	01:50	Unidentified pipistrelle
MAST-08	Low	31/08/2017	03:37	Brown long-eared bat
MAST-08	Low	06/09/2017	03:19	Brown long-eared bat