Appendix 6-2

Bat Survey Report

Bat Survey Report

Timahoe North Project

McCarthy
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O'Sullivan

Planning & Environmental Consultants

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Table of Contents

Figures

Appendices

1 INTRODUCTION

McCarthy Keville O'Sullivan (MKO) was commissioned by Bord na Móna Powergen Ltd. and ESB Wind Development Ltd. to complete a comprehensive assessment of the potential effects on bats of a proposed large scale solar farm in Timahoe North, northwest Co. Kildare (Figure 1.1). The Proposed Project includes a solar photovoltaic (PV) array, inverters, access roads, a 110 kV electricity substation and grid connection, battery storage compound, amenity trails and landscaping, site drainage and all associated works.

This report provides details of the bat surveys undertaken, including survey 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 employed a combination of methods, including desktop study, habitat and landscape assessments, roost assessments, manual activity surveys and static detector surveys. The aim of these surveys was to determine how bats are using the Proposed Project site and surrounding landscape. Specifically, the survey aims were 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

All available data were used in the assessment of potential effects of the development on bats. INIS Environmental Consultants and Malachy Walsh and Partners (MWP) carried out bat surveys in 2013 and 2016 respectively. Previous reports and survey data were reviewed as part of the current assessment, and additional bat surveys were undertaken by MKO in 2017.

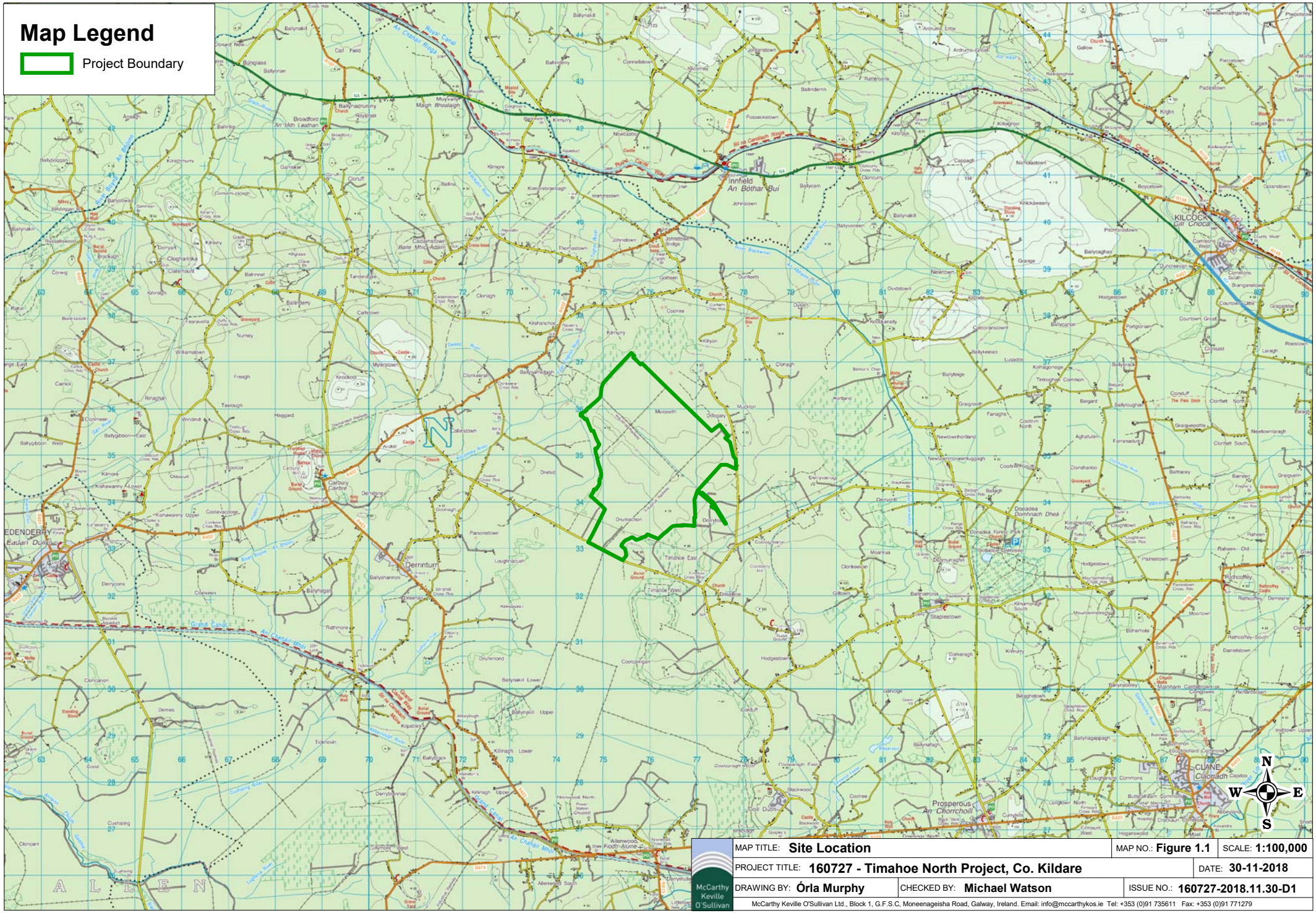
1.1 Statement of Authority

Bat surveys undertaken in 2017 were conducted by MKO ecologists James Owens (BSc, MSc), Laoise Kelly (BSc) and Úna Nealon (BSc, PhD). All staff have relevant academic qualifications and are experts in undertaking bat surveys to this level.

Scope development, data analyses, impact assessment and reporting was undertaken by Úna Nealon (BSc, PhD). Úna's primary expertise lies in bat ecology. She completed her PhD with the Centre for Irish Bat Research, examining the impacts of wind farms on Irish bat species.

This bat survey report was reviewed by Pat Roberts (BSc, MCIEEM). Pat has over 12 years' experience in management and ecological assessment.

Previous bat survey work also informed this impact assessment. INIS Environmental Consultants and Malachy Walsh and Partners carried out bat surveys at the site in 2013 and 2016 respectively. These ecological consultants have significant experience in undertaking survey work of this kind. Staff profiles are included in the individual bat survey reports included in Appendix 1 and 2 to this report.



MAP TITLE: **Site Location**		MAP NO.: **Figure 1.1**	SCALE: **1:100,000**
PROJECT TITLE: **160727 - Timahoe North Project, Co. Kildare**			DATE: **30-11-2018**
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1.2 Characteristics of the Proposed Project

1.2.1 Site Location

The Proposed Project is located in Timahoe North Bog in northwest Co. Kildare (Figure 1.1). The site lies approx. 6.5 km north of the village of Allenwood, 6 km east of Carbury and 3 km south of Johnstownbridge. The Grid Reference coordinates for the centre of the site are E275810 N235200. The Timahoe North site comprises the northern half of the Bord na Móna Timahoe bog unit, which forms part of the Derrygreenagh Bog Group.

The site is surrounded by private land on the north, east and west sides. To the south, the site is bordered by the Derrymahon-Drehid L5025 local road and the Timahoe South Bog. The site is accessed from the south via the L5025 local road, which adjoins the R402 Regional Road to the west of the site.

1.2.2 Proposed Project

The Proposed Project comprises a largescale solar PV farm with a capacity of approximately 70 Megawatts (MW). It will consist of a solar photovoltaic array and associated infrastructure, battery storage compound, inverters, access roads and parking, site compounds and security fencing, amenity trails and landscaping, peat and spoil storage areas, site drainage and all associated works (Figure 1.2).

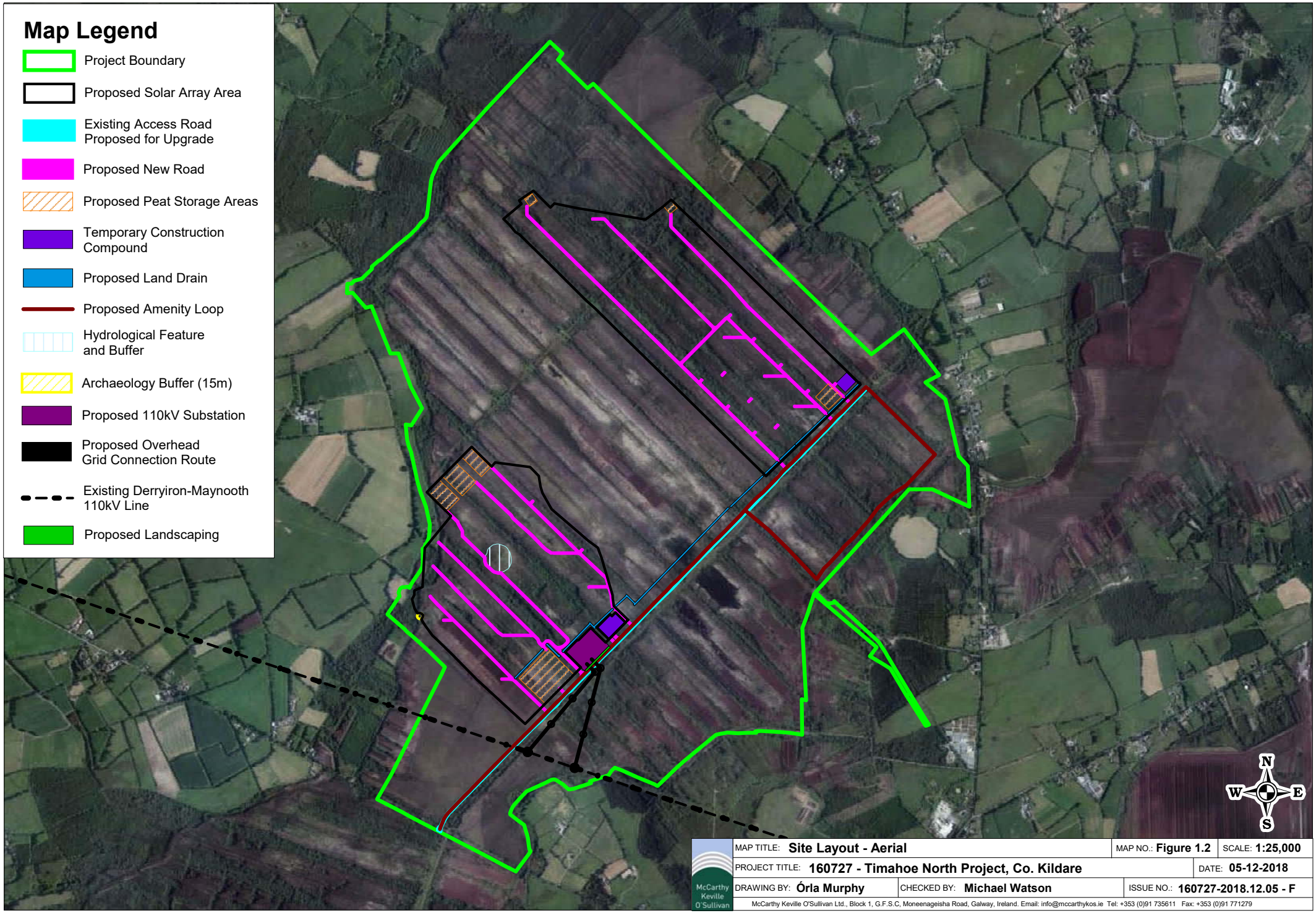
The Proposed Project will also include the construction of a 110 kV substation within the site. It is then envisaged to connect from this substation to the Derryiron-Maynooth 110 kV overhead line that traverses the southern section of the Timahoe North site.

Due to the nature of the project, two separate planning applications are required. One planning application will be submitted to An Bord Pleanála seeking permission for the 110 kV infrastructure and associated works, in accordance with Section 182A of the Planning & Development Act 2000 (as amended). The other planning application will be made to Kildare County Council under Section 34 of the same Act for the solar farm, battery storage compound and associated works. This approach has been confirmed following consultations with An Bord Pleanála under the provisions of section 182E of the Planning and Development Act, 2000 (as amended).

1.2.3 Existing Baseline Condition

The proposed site is currently a brownfield site (former commercial scale cutaway peatland). The site was formerly used for the production of sod peat for power generation and domestic heating purposes. Timahoe North is not currently in commercial use and has been out of large-scale commercial production for over 20 years. As a result, the dominant habitat type is scrub. In addition, sections of conifer plantation occur along the northern and southeastern boundaries. A low level of 'turf on the spread' peat extraction activity is undertaken within the site and this will cease prior to construction, should the project be consented.

There are no large watercourses within the study area. The site is darined by a network of drainage ditches and one unnamed stream which flows to the Clogheraun Stream.



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

2.1 Introduction

Renewable energy provides a clean, sustainable alternative to fossil fuels in generating electricity. However, renewable energy developments have potential to impact wildlife, directly through mortality and indirectly through disturbance and habitat loss.

There is currently no scientific literature on the effects of solar panels on bats (Harrison et al. 2017) and no guidelines available for assessing the impacts of solar developments on bats. There has been some concern that there is potential for collision fatalities due to bats mistaking solar panels for water. Research has shown bats can confuse smooth flat surfaces with water bodies (Grief and Siemers 2010, Russi 2012). However, these papers do not specifically mention solar panels and the results do not suggest that bats are negatively affected by the mistake (e.g. no fatalities when attempting to drink). Therefore, it is unlikely that solar energy developments have a direct effect on bat populations and our assessments focus on potential indirect effects of solar energy development (e.g. habitat loss).

2.2 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 1976-2017). 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	

2.3 Guidance

In the absence of guidelines specific to solar energy developments, this bat survey and assessment was chiefly informed by the Bat Conservation Trust's *'Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn)'* (Collins, 2016)

In addition, the following guidelines and documents were referred to:

- The Bat Worker's Manual, 3rd Edition (Mitchell-Jones and McLeish, 2004).
- 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 Tree Habitat Key (Andrews, 2013)
- British Bat Calls: A guide to species identification (Russ, 2012)
- Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring (Hill, 2005)
- Irish Bats in the 21st Century (Roche et al., 2014)
- 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)

3 METHODS

3.1 Consultation

A consultation exercise was undertaken as part of the EIAR for the Proposed Project. A Scoping Document, comprising a description of the site and the Proposed Project, was circulated to consultees in May 2018. As part of this exercise, prominent Irish conservation groups were contacted and BCI were specifically invited to comment on the potential of the Proposed Project to affect bats.

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 Previous Bat Surveys

Previous bat survey reports were reviewed as part of the desktop study. Bord na Móna previously commissioned two bat surveys within and surrounding the Study Area.

A baseline bat survey was carried out by INIS Environmental Consultants in 2013 within the Ballydermot/Timahoe and Derrygreenagh Bog Groups. The Study Area lies within the Derrygreenagh Bog Group. No formal bat surveys had been undertaken in the area prior to this study and the aim was to establish indicative levels of bat activity. Surveyors employed a combination of walked and driven transects, passive monitoring and roost surveys to examine bat activity across both Bog Groups and determine bat habitat use within 33 individual bogs, including Timahoe North Bog.

Site-specific baseline bat surveys were undertaken at Timahoe North in August/ September 2016 by Malachy Walsh and Partners. In this case, surveyors used a combination of methods within and adjacent to the site, including preliminary roost surveys, walked and driven transects, and static detector surveys.

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 2nd August 2018 and examined bat presence and roost records within a 10 km radius of a center point within the Study Area.

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 15 km radius of the Study Area. 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 (last searched 2nd August 2018). Furthermore, the archaeological database of national monuments was also reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (2nd August 2018).

3.3 Field Surveys 2017

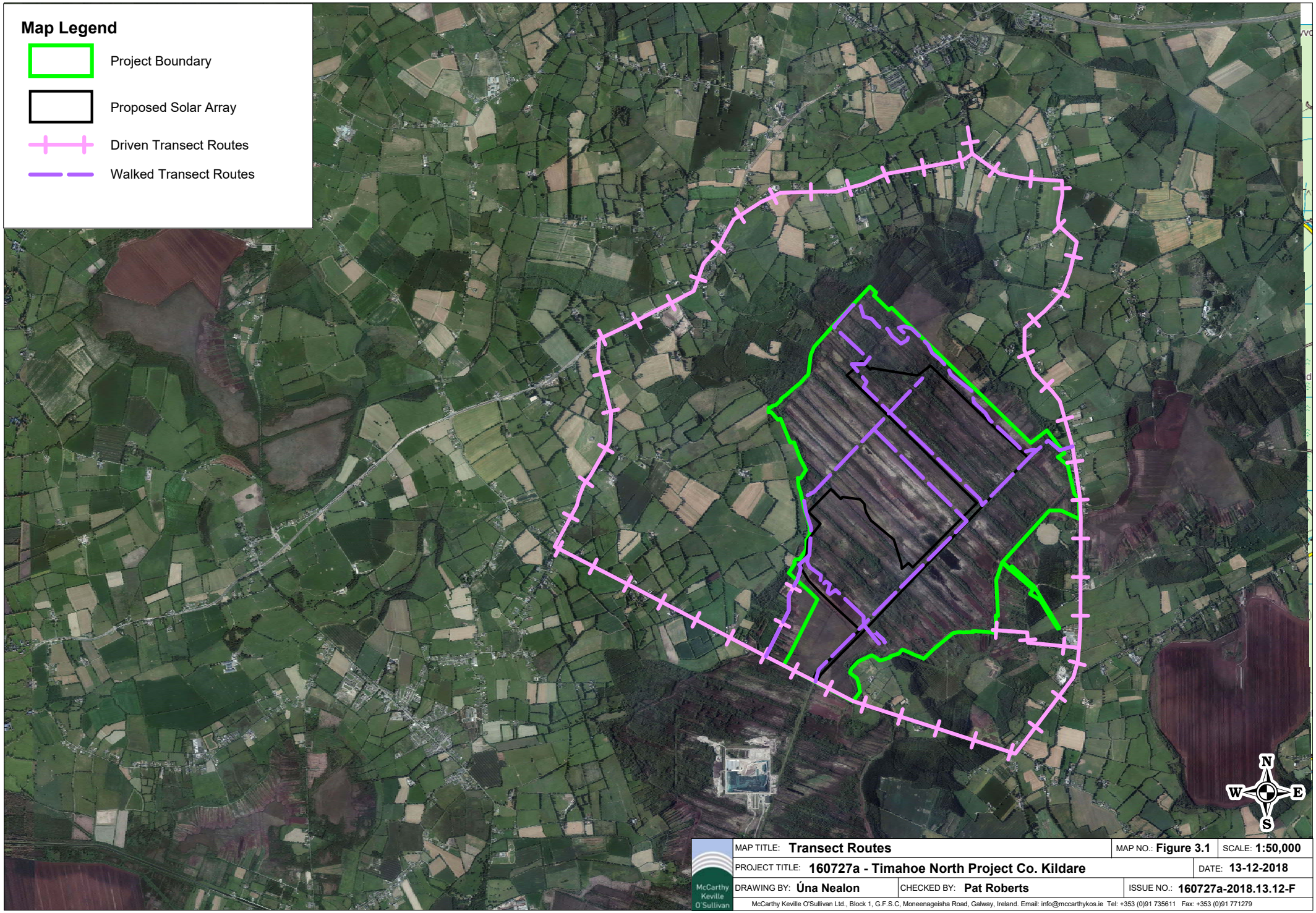
3.3.1 Habitat Suitability Assessment

Walkover surveys were carried out in April and July 2017. 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 3.

3.3.2 Manual Transects

Manual activity surveys comprised walked and driven transects at dusk and at 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.

Transects undertaken in 2017 followed the same routes as those conducted by MWP in August 2016. Transect routes covered over 37 km, including 14km within the Timahoe North Bog. Transects followed access tracks, unused railway lines, scrub, open cutover bog, conifer plantation edge and aquatic habitats. Outside the site, driven transects comprised public roads bound by hedgerows/treelines and individual trees. Transect routes are illustrated in Figure 3.1.



MAP TITLE: **Transect Routes**		MAP NO.: **Figure 3.1**	SCALE: **1:50,000**
PROJECT TITLE: **160727a - Timahoe North Project Co. Kildare**			DATE: **13-12-2018**
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During each manual survey, transects were walked or driven by two surveyors, recording bats in real time. Driven transects followed the methodology described by Roche et al. (2012). Each surveyor was equipped with a full spectrum bat detector, Batlogger M (Elekon AG, Lucerne, Switzerland). 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 for subsequent analysis to confirm species identifications.

Dusk surveys commenced 30 minutes before sunset and were completed within 3 hours after sunset. Dawn surveys commenced 1.5-2 hours before sunrise and were completed 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. Table 3.1 summarises manual transects completed in 2017.

Table 3.1: Summary of Manual Transects Surveys in 2017

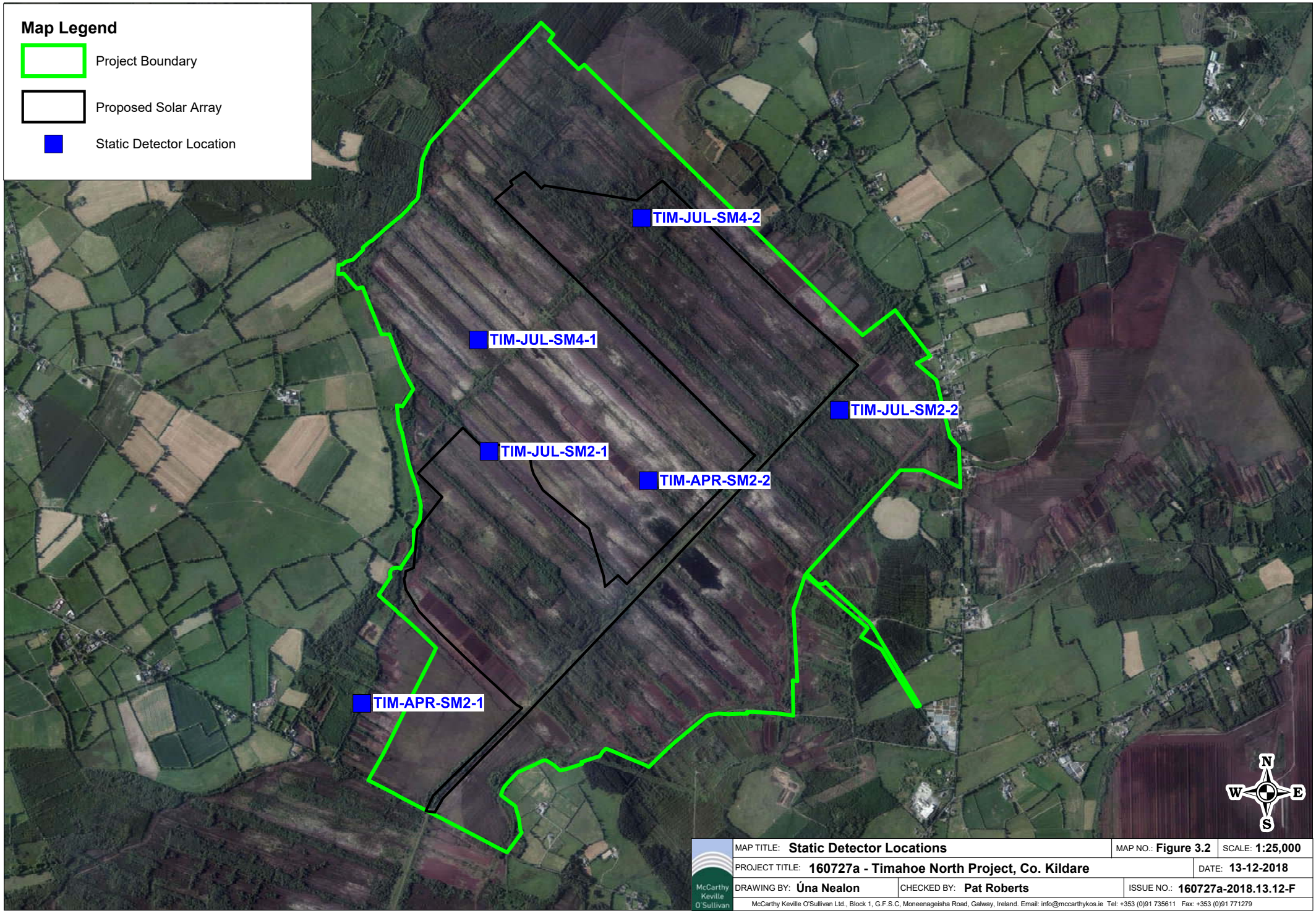
Date	Surveyor	Type	Sunset/ Sunrise (hh:mm)	Start-Finish (hh:mm)
18th/19th April 2017	James Owens	Dusk	20:33	20:00 - 22:30
		Dawn	06:19	04:44 – 06:11
18th/19th April 2017	Laoise Kelly	Dusk	20:33	20:03 – 23:33
		Dawn	06:19	04:22 – 05:25
11th/12th July 2017	James Owens	Dusk	21:53	21:50 – 00:35
		Dawn	05:13	03:45 – 05:02
11th/12th July 2017	Úna Nealon	Dusk	21:53	21:49 – 00:45
		Dawn	05:13	03:30 – 05:00

3.3.3 Static Detector Surveys

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. The aim of static detector surveys was to identify bat fidelity to particular foraging, commuting and roosting habitats.

Models employed included the Song Meter SM2BAT+ 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.

Locations of static detectors were selected to represent various habitats present within the proposed site. Detectors were deployed at 6 locations in April and July 2017. Table 3.2 describes all static deployments including the total number of nights surveyed and total number of hours surveyed (accounting for varying sunset and sunrise times). The locations of all static detectors are displayed in Figure 3.2.



MAP TITLE: **Static Detector Locations**		MAP NO.: **Figure 3.2**	SCALE: **1:25,000**
PROJECT TITLE: **160727a - Timahoe North Project, Co. Kildare**			DATE: **13-12-2018**
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Table 3.2: Description of Static Detector Locations

ID	Survey Period	Grid Reference	Habitat	No. Nights	No. Hours
APR-SM2-1	18th-30th Apr 2017	E274656 N233552	Willow by drain and forestry edge. Adj to open bog.	12	108.72
APR-SM2-2	18th-30th Apr 2017	E276188 N234743	Cutover bog with some scrub.	12	128.42
JUL-SM2-1	11th-17th Jul 2017	E275336 N234900	Drain in bare peat with recolonising heather.	6	45.63
JUL-SM2-2	11th-17th Jul 2017	E277209 N235120	Pine tree in willow scrub. Adj to bare peat with recolonising heather.	6	39.97
JUL-SM4-1	11th-17th Jul 2017	E275279 N235496	Bare peat with recolonising heather	6	45.33
JUL-SM4-2	11th-17th Jul 2017	E276152 N236148	Birch tree in willow wood patch. Borders grassy track.	6	44.53
Total Static Detector Survey Effort				**48**	**412.6**

3.3.4 Bat Call Analysis

All recordings were later analysed using bat call analysis software, Kaleidoscope Converter and Viewer, v.4.5.4 (Wildlife Acoustics, Maynard, MA, USA). Bat species were identified using established call parameters, to identify individual species or genera. In addition, any information on bat behavior 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' or 'bat contacts' was used as a measure of activity (Collins, 2016). For the purposes of this study, a bat pass is defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration.

4 SURVEY LIMITATIONS

Survey design and effort was created in accordance with the latest best practice guidelines for surveying bats (Collins, 2016). The survey design was continually assessed to determine its appropriateness to the bat species diversity and level of activity encountered at the proposed development site.

No seasonal limitations have been identified with this bat assessment. Activity monitoring concentrated on the main activity season. MWP undertook preliminary surveys in autumn 2016. MKO followed these with surveys in spring and summer 2017. In addition, habitats were assessed for their potential to support bats throughout all aspects of their yearly cycle, including during the winter months.

Spatial coverage replicated previous surveys and focused on the proposed solar array infrastructure, as well as the wider area. No limitations with regard to spatial coverage were identified.

In general, manual transects were undertaken in optimal survey conditions i.e. no heavy rain or strong winds with dusk temperatures above 7 ˚C (Collins, 2016). Where rain was encountered, bat surveys were paused and resumed when rain stopped. Therefore, no limitations with regard to weather conditions were identified.

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 by MKO in the course of this study was analysed by one ecologist, Úna Nealon (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.

5 SURVEY RESULTS

5.1 Consultation

A scoping and consultation exercise was undertaken as part of the EIA. These results are described fully in the main EIAR. No consultees provided recommendations specifically in relation to bats. No response was received from BCI as of 20th July 2018.

5.2 Desktop Study

5.2.1 Previous Bat Surveys

INIS Environmental Consultants' Report (2013)

A baseline bat survey was carried out by INIS Environmental Consultants in 2013. No formal bat surveys had been undertaken in the area prior to this study and the aim was to establish indicative levels of bat activity within the Ballydermot/ Timahoe and Derrygreenagh Bog Groups and determine bat habitat use within 33 individual bogs, including Timahoe North Bog.

Bat activity on bog groups were surveyed using three different methods:

- Walked/driven transects using handheld heterodyne bat detectors (Batbox Duet)
- Remote surveys using static recording detectors (Anabat SD1)
- Roost surveys within Bord na Móna land parcels and adjoining habitats

Three bat surveys were carried out at Timahoe North Bog between June and September 2013. These each comprised 5 transects, covering approx. 7 km.

In total, 21 bat contacts were recorded. These included Leisler's bat (n=8), common pipistrelle (n=8), soprano pipistrelle (n=3) and whiskered bat (n=2). These results accounted for 3.3% of all bat records recorded across both bog groups. Overall, the activity within Timahoe North Bog was rated as *Medium*.

Bats were recorded along linear features of the old railway lines running throughout the bog. One Leisler's bat and one common pipistrelle were found commuting and all other records were for foraging bats. Open peat areas were not surveyed.

No bat roosts were identified within the site. However, only one significant roost of soprano pipistrelles was identified during the bog group surveys. This roost was located in a private dwelling near Clonsast bog, approx. 27 km from Timahoe North Bog.

Relevant extracts from the INIS Environmental report are provided as Appendix 1.

Malachy Walsh and Partners Report (2016)

Baseline bat surveys were conducted by Malachy Walsh and Partners' in late August/September 2016. Three forms of survey were implemented, including:

- Walked and driven transects within and adjacent to the site (using a Frequency Division AnaBat detector and Batbox Duet).
- Automated bat surveys conducted at two separate locations (using a Song Meter SMZC detector).
- Preliminary roost surveys (daytime visual search) of structures and trees.

Walked and driven transects were undertaken on the 31st August/1st September 2016. Transect routes followed previously surveyed routes, with additional transects included and covered 37km in total.

Within the site, 14km of walked transects were completed during optimal conditions. Common (n=37) and soprano pipistrelles (n=16) were encountered most frequently. The majority of bat activity was encountered along the old railway lines and where the scrub areas formed more linear features towards the northern end of the site as well as the vegetated margin towards the western/south-western end of the site where hedgerow/treeline bound agricultural grassland further to the west. No bats were recorded in open bog habitats. Most activity recorded was attributed to foraging bats, followed by commuting bats and few social passes. Overall, activity was considered low.

Unmanned automated bat detectors were deployed at two locations wihin the site between 31st August – 14th September 2016.

At Site No. 1 (deployed along the railway line at the edge of willow/birch scrub), foraging and commuting bats were present in small numbers. Leisler's bat was recorded most frequently (n=105), followed by soprano (n=45) and common pipistrelle (n=42), and *Myotis* sp. (n=7). Overall, bat activity was considered low.

At Site No. 2 the detector was deployed in re-vegetating cutover bog in front of conifer plantation. Species recorded included common pipistrelle (n=195), soprano pipistrelle (163), Leisler's bat (186), and Myotis sp. (n=10). The results indicated that the habitats at this location provide good commuting/foraging routes for bats

No structures were identified within the site that might support roosting bats. In addition, trees within site were not considered suitable for roosting bats due to their type and age profile. Results of automated surveys support the absence of roosts within the site, and found bat activity commenced approx. 45 minutes after sunset and ceased approx. 1 hour before sunrise. However, there are numerous possible roosting opportunities within houses, bridges, farm buildings, etc. in the wider surroundings outside the bog site.

Overall, the results of this survey were in line with previous baseline surveys undertaken by INIS Environmental Consultants. The majority of records occurred along linear features of old railway lines. No large populations of bats were encountered and no bat roosts were recorded.

The full Malachy Walsh and Partners report is available as Appendix 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 a center point within the Study Area (IG Ref: E275883, N235082). A number of observations have been recorded including roosts (n=21), transects (n=6) and ad-hoc observations (n=5). At least five of Ireland's nine resident bat species were recorded within 10 km of the proposed works including common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat and brown long-eared bat. The results of the database search are provided in Table 5.1.

Table 5.1 BCI data within 10km radius of Study Area (IG Ref: E275883, N235082)

Survey Type	Location	Species	Survey	Designation
Roost	Donadea, Co. Kildare	**Roost type**: 12 No. Bat boxes **Species**: Leisler's bat, pipistrelle sp., brown long-eared bat, unidentified bat.	Bat Box Scheme	Annex IV
	Enfield, Co. Meath	**Roost type**: Building **Species**: Leisler's bat, pipistrelle sp.	EIS Surveys	Annex IV
	Kilcock, Co. Kildare	**Roost type**: Building **Species**: Pipistrelle sp.	Bats in Houses Project	Annex IV
	Clonsast, Co. Kildare	**Roost type**: Building **Species**:Brown long-eared bat	Bats in Churches Survey	Annex IV
	Carbury, Co. Kildare	**Roost type**: Building **Species**: Brown long-eared bat	Bat Group Surveys	Annex IV
	Longwood, Co. Meath	**Roost type**: Building **Species**: Pipistrelle sp.	Bats in Houses Project	Annex IV
	Donadea, Co. Kildare	**Roost type**: Building **Species**:Leisler's bat, common pipistrelle	EIS Surveys	Annex IV
	Summerhill, Co. Meath	**Roost type**: Building **Species**: Soprano pipistrelle	Bats in Houses Project	Annex IV
	Carbury, Co. Meath	**Roost type**: Building **Species**: Brown long-eared bat	EIS Surveys	Annex IV
	Donadea, Co. Kildare	**Roost type**: Building **Species**: Brown long-eared bat	BLE Survey	Annex IV
Transect	Bord na Mona Bridge, Lullymore	Daubenton's bat, unidentified bat	Waterways Survey	Annex IV
	Moyvalley Bridge	Daubenton's bat, unidentified bat	Waterways Survey	Annex IV
	N74	Leisler's bat, common pipistrelle, soprano pipistrelle, pipistrelle sp.	Car Based Bat Monitoring	Annex IV
	N74	Leisler's bat, common pipistrelle, soprano pipistrelle, pipistrelle sp.	Car Based Bat Monitoring	Annex IV
	Royal Canal, Enfield	Daubenton's bat, unidentified bat	Waterways Survey	Annex IV

Survey Type	Location	Species	Survey	Designation
Ad-hoc	Grand Canal, Allenwood, Co. Kildare	Daubenton's bat, leisler's bat, common pipistrelle, soprano pipistrelle	BCI Walk	Annex IV
	Ballynamullagh, Co. Kildare	Soprano pipistrelle	BATLAS 2010	Annex IV
	Carbury, Co. Kildare	Leisler's bat, common pipistrelle, soprano pipistrelle	Bat Group Surveys	Annex IV
	Carbury, Co. Kildare	Common pipistrelle, soprano pipstrelle	EIS Surveys	Annex IV
	Derrinturn, Co. Kildare	Common pipistrelle, Soprano pipistrelle	EIS Surveys	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 (SAC) and the Study Area is situated more than 15 km outside the known range of this species.

Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA) may be designated for any bat species. A search of NHAs and pNHAs within a 15 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 and photography provided insight into the habitats and landscape features present at the Proposed Project site.

In summary, peat harvesting has ceased within the Study Area for some time. As a result, the dominant habitat type is now scrub (WS1). Some low level peat extraction activity is undertaken within the site and cutover bog (PB4) is evident in these places. Drainage ditches (FW4) and one unnamed stream (FW2) drain the site. Some bog pools and areas of standing water also occur towards the center of the site.

The site is well connected to the wider landscape. Sections of conferous forestry (WD4) occur along northern and southeastern boundaries. In addition, hedgerows (WL1) and treelines (WL2) bordering the site may provide good linear features for foraging/commuting bats.

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

5.3 Field Survey 2017

5.3.1 Habitat Suitability Assessment

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 3.

With regard to foraging and commuting bats, areas of scrub (particularly linear areas along railways) and vegetated drainage ditches are connected to the wider landscape by adjacent forestry and connecting field boundaries. As such, they were assessed as *Moderate* suitability, i.e. habitat connected to the wider landscape that could be used by bats for foraging and commuting (Collins, 2016). Areas of cutover bog were considered *Negligible* suitability, i.e. negligible habitat features on site likely to be used by commuting or foraging bats (Collins, 2016).

Consistent with previous bat surveys within the site, no structures with potential for roosting bats were identified. In addition, trees within the site were assessed for roosting potential. Trees were dominated by scrub vegetation and were not of sufficient size or age to contain roost features. Coniferous trees within the site were not of sufficient age to offer good roosting opportunities and were assessed as *Negligible – Low* suitability.

5.3.2 Manual Transects

Following transect surveys undertaken by MWP in autumn 2016, MKO ecologists completed a series of walked and driven transects in spring and summer 2017.

Table 5.2 presents weather conditions recorded during manual transects. Conditions were favourable for bat survey 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.

Table 5.2: Conditions during Manual Transects in 2017

Date	Type	Temp *Start – End*	Rain	Wind	Cloud *%*
18th – 19th April 2017	Dusk	11–11˚C	Dry (short periods of light rain)*	Calm – Light breeze	Cloudy (100%)
	Dawn	8–9˚C	Dry (short periods of light rain)*	Calm – Light breeze	Cloudy (80-90%)
11th – 12th July 2017	Dusk	13.3 – 7˚C	Dry	Calm	Clear (5-15%)
	Dawn	7 – 8˚C	Dry	Calm	Clear (0-5%)

*Surveys were paused during periods of rain and resumed once stopped.

In total, 75 bat contacts were recorded during manual transect surveys in 2017. Soprano pipistrelle was encountered most frequently (43% of all bat records), followed by common pipistrelle (35% of all bat records). Pipistrelle sp., Lesler's bat, *Myotis* sp. and brown long-eared bat were also recorded but in very low numbers.

Figure 5.1 presents species composition across both surveys. Table 5.3 presents total bat contacts for individual bat species per survey period (i.e. per month).

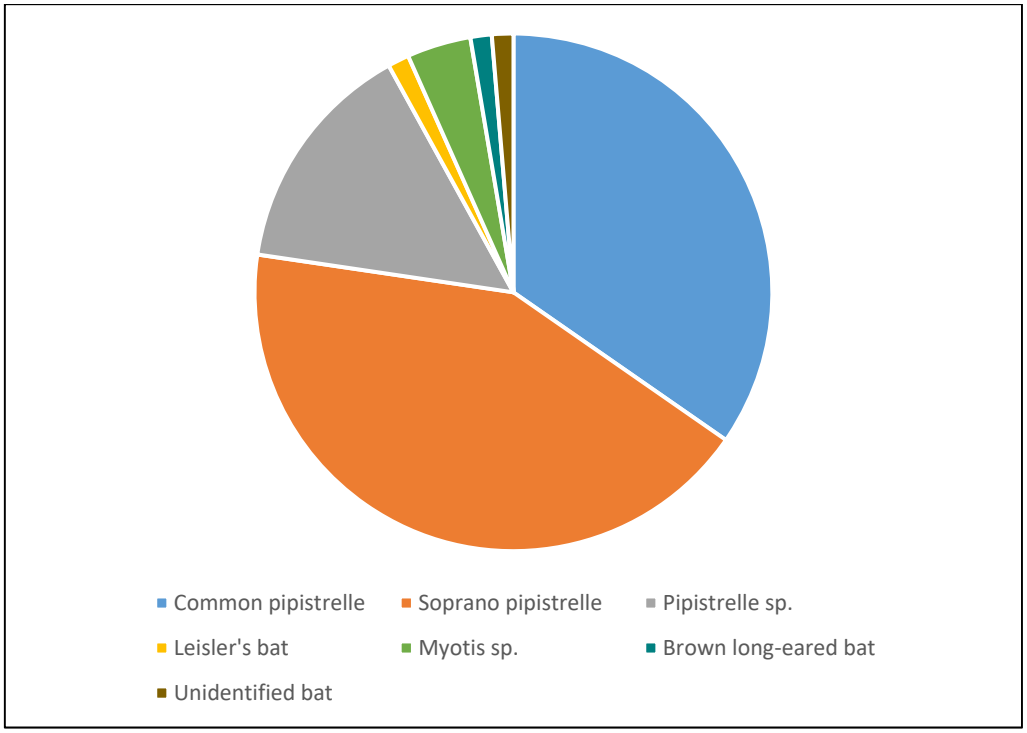


Figure 5.1: Manual transect results: Species composition (total bat contacts)

Table 5.3: Summary of Manual Transect Results in 2017 (total bat contacts)

	April 2017	July 2017	Total
Common pipistrelle	5	19	26
Soprano pipistrelle	5	27	32
Pipistrelle sp.	3	8	11
Leisler's bat	0	1	1
Myotis sp.	2	1	3
Brown long-eared bat	0	1	1
Unidentified bat	1	0	1
Total	**18**	**57**	**75**

Transect survey results were also calculated as bat passes per km surveyed. Figure 5.2 and Table 5.4 present these results for individual species per survey period. Bat activity was assessed as low overall. However, activity was higher in July compared to April.

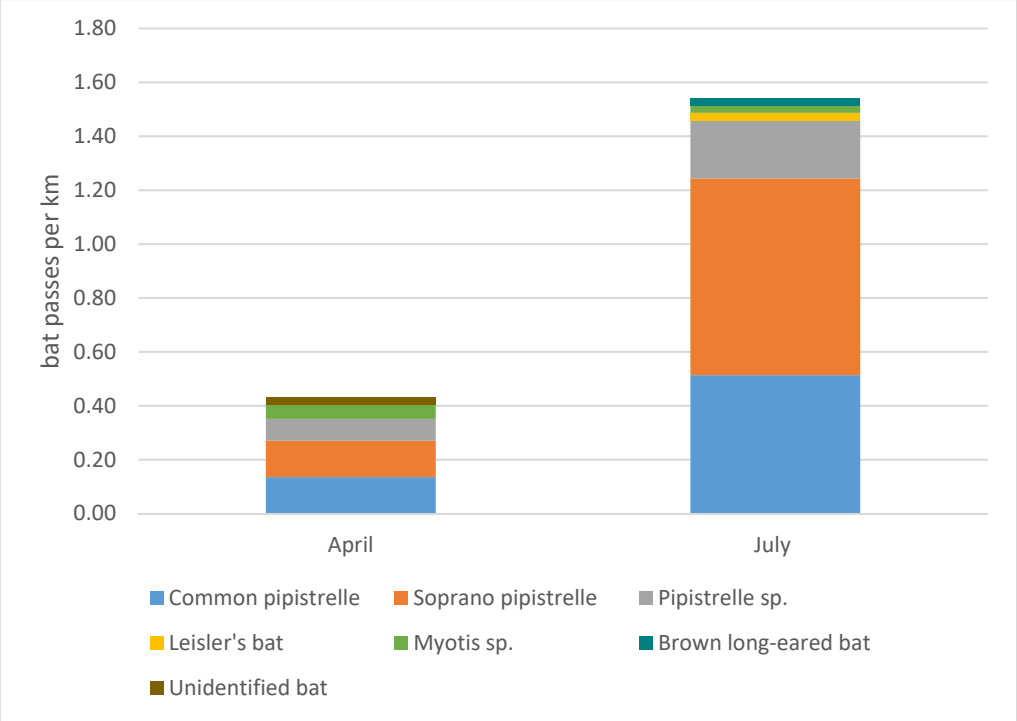


Figure 5.2: Manual transect results: Bat species contacts per km surveyed in 2017

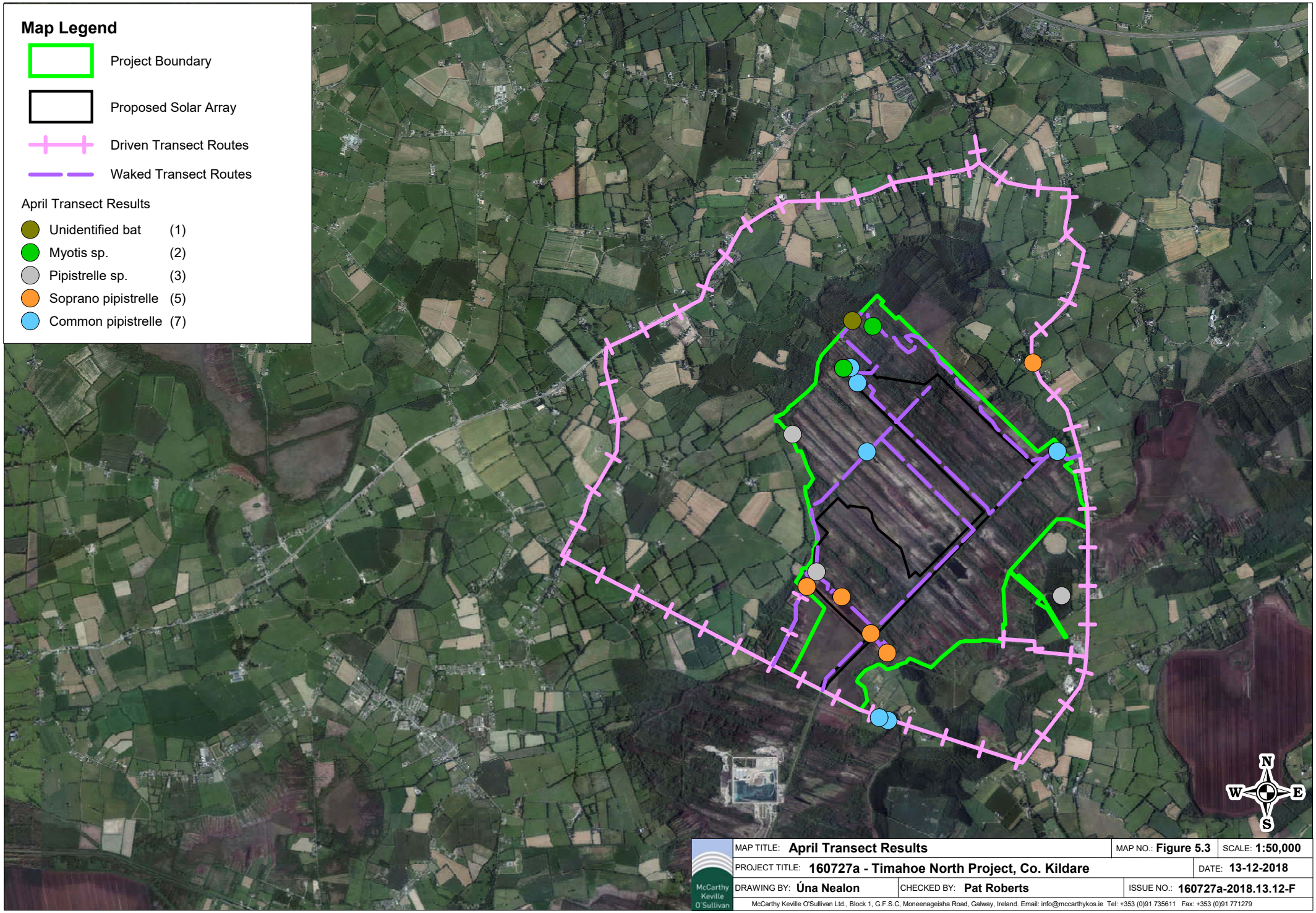
Table 5.4: Manual transect results in 2017 (bat contacts per survey km)

	April 2017	July 2017	Total
Common pipistrelle	0.14	0.51	0.35
Soprano pipistrelle	0.14	0.73	0.43
Pipistrelle sp.	0.08	0.22	0.15
Leisler's bat	0.00	0.03	0.01
Myotis sp.	0.05	0.03	0.04
Brown long-eared bat	0.00	0.03	0.01
Unidentified bat	0.03	0.00	0.01
Total	0.49	1.54	1.01

Figures 5.3 and 5.4 present the spatial distribution of bat activity across all survey months. Similar to previous bat survey results, bats were recorded most frequenty along railway lines and access tracks with tall scrub. Bats avoided open areas of cutover bog.

5.3.3 Static Detector Surveys

In total, 1,906 bat passes were recorded over 48 nights of static detector monitoring, comprising 412.6 survey hours. Most of this activity was attributed to soprano pipstrelle followed by common pipistrelle and pipistrelle sp. Very low numbers of Leisler's bat and *Myotis* sp. were also recorded (Figure 5.5). Table 5.5 provides a summary of these results.



MAP TITLE: **April Transect Results**		MAP NO.: **Figure 5.3**	SCALE: **1:50,000**
PROJECT TITLE: **160727a - Timahoe North Project, Co. Kildare**			DATE: **13-12-2018**
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160727a-2018.13.12-F**	

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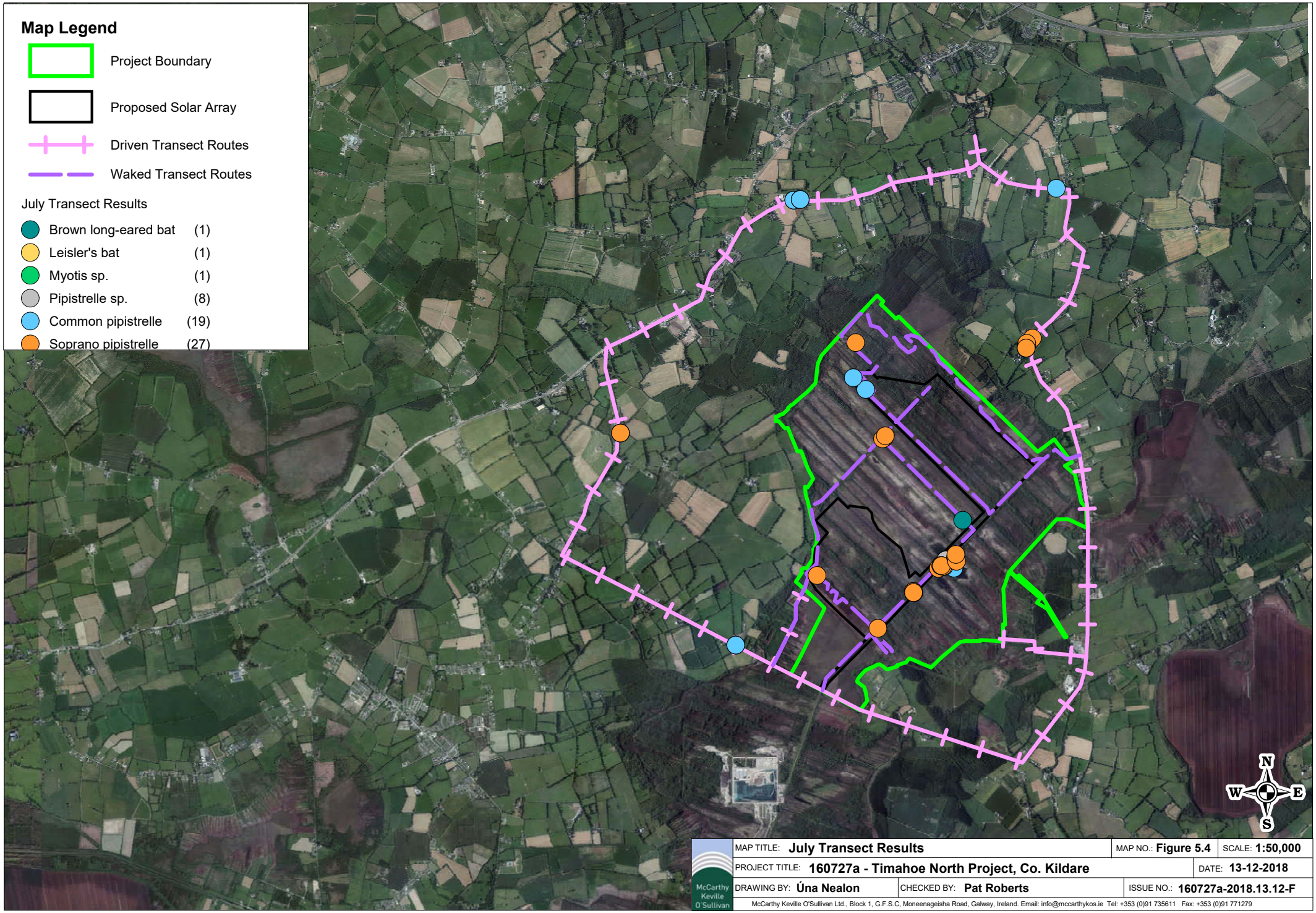

MAP TITLE: **July Transect Results**		MAP NO.: **Figure 5.4**	SCALE: **1:50,000**
PROJECT TITLE: **160727a - Timahoe North Project, Co. Kildare**			DATE: **13-12-2018**
DRAWING BY: **Úna Nealon**	CHECKED BY: **Pat Roberts**	ISSUE NO.: **160727a-2018.13.12-F**	

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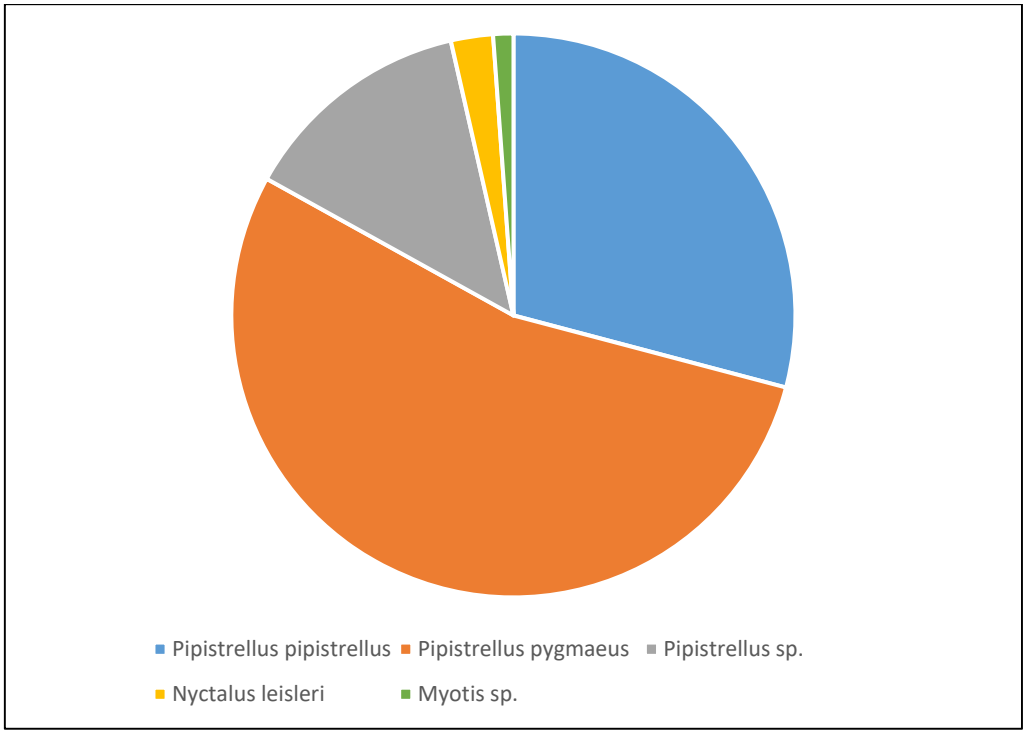

Figure 5.5: Static detector survey results: Species composition (total bat passes)

Table 5.5: Static detector results in 2017 (total bat passes)

	APR SM2-1	APR SM2-2	JUL SM2-1	JUL SM2-2	JUL SM4-1	JUL SM4-2	Total
Common pipistrelle	138	43	0	122	20	232	555
Soprano pipistrelle	330	156	0	114	89	339	1028
Pipistrelle	83	166	0	1	5	0	255
Leisler's	10	4	0	4	15	13	46
Myotis	6	5	0	0	0	11	22
Total	**567**	**374**	**0**	**241**	**129**	**595**	**1906**

Bat activity was also calculated as total bat passes per survey hour (bpph) to account for any bias in survey effort, resulting from varying night lengths throughout the survey season. Table 5.6 presents these results for each static detector location. Bat activity was low and totaled 4.62 bat passes per survey hour.

Differences were observed between different survey locations (Figure 5.6). On average, bat activity was greater in July compared to April. However, the majority of July activity was recorded on a single detector (JUL-SM4-2) located in a patch of willow. During the same deployment, a detector located in bare peat (JUL-SM2-1) did not record any bats, demonstrating habitat preferences within the site.

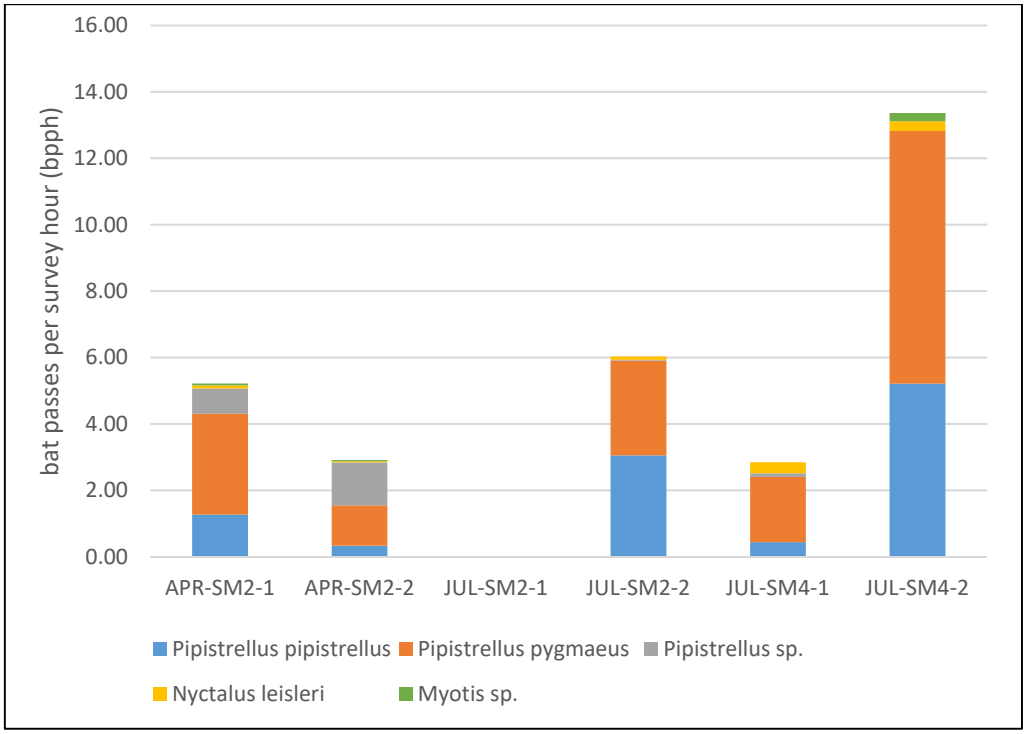

Figure 5.6: Static detector survey results: Species composition (bpph)

Table 5.6: Static detector results in 2017 (bpph)

	APR SM2-1	APR SM2-2	JUL SM2-1	JUL SM2-2	JUL SM4-1	JUL SM4-2	Total
Common pipistrelle	1.27	0.33	0.00	3.05	0.44	5.21	1.35
Soprano pipistrelle	3.04	1.21	0.00	2.85	1.96	7.61	2.49
Pipistrelle	0.76	1.29	0.00	0.03	0.11	0.00	0.62
Leisler's	0.09	0.03	0.00	0.10	0.33	0.29	0.11
Myotis	0.06	0.04	0.00	0.00	0.00	0.25	0.05
Total	**5.22**	**2.91**	**0.00**	**6.03**	**2.85**	**13.36**	**4.62**

5.4 Discussion of Results

5.4.1 Habitat Suitability

Foraging & Commuting

Habitats within the Study Area are dominated by scrub and re-vegetating cutover bog. The remainder includes cutover bog, drainage ditches and some areas of standing water. The site is well connected to the wider landscape through hedgerows, treelines and conifer edge habitats bordering the site.

A habitat suitability assessment for foraging and commuting bats was carried out in 2017.

- Scrub (particularly linear features) and vegetated drainage ditches were assessed as *Moderate* suitability
- Areas of cutover bog were considered *Negligible* suitability

The results of bat activity surveys confirmed a preference for railway lines and access tracks with scrub and avoidance of open areas of cutover bog. These results are consistent with the findings of INIS and MWP in 2013 and 2016.

Roosts

A search for roosts was undertaken within the Study Area in 2017, using a four-season approach.

- There were no suitable structures for roosting within the Study Area.
- Trees were not of sufficient type, size or age for roosting bats.

Habitat assessments and roost surveys undertaken in 2013, 2016 and 2017 did not find any suitable roosting sites for bats within the Study Area. This included no suitable sites for maternity colonies, swarming activity or hibernation.

5.4.2 Species Composition & Activity Levels

Manual transects and static detector surveys were undertaken in April and July 2017. Throughout these surveys, bat activity was assessed as low. The majority of activity encountered during transects and static detector surveys in 2017 was attributed to soprano pipistrelle followed by common pipistrelle. These species are common and widespread across Ireland. Other species, including Leisler's bat, *Myotis* sp. and brown long-eared bat, were recorded in much lower numbers.

Species composition and activity levels in 2017 were consistent with previous baseline surveys undertaken by INIS and MWP. No large populations of bats were encountered and no bat roosts were recorded. Most activity recorded was attributed to foraging pipistrelle bats, followed by commuting bats and a few social passes.

5.4.3 Seasonality

MWP undertook transect surveys during autumn 2016. These surveys were replicated by MKO in spring and summer 2017. Figure 5.7 illustrates these combined transect survey results.

Bat activity peaked in autumn 2016, was lowest in spring 2017 and increased in summer 2017. This is consistent with typical irish bat ecology. In general, activity is low in spring as bats emerge from hibernation and temperatures are still relatively low. Activity increases throughout the summer as food is abundant and breeding is

underway. Activity then often peaks in late summer or autumn as young bats are also on the wing.

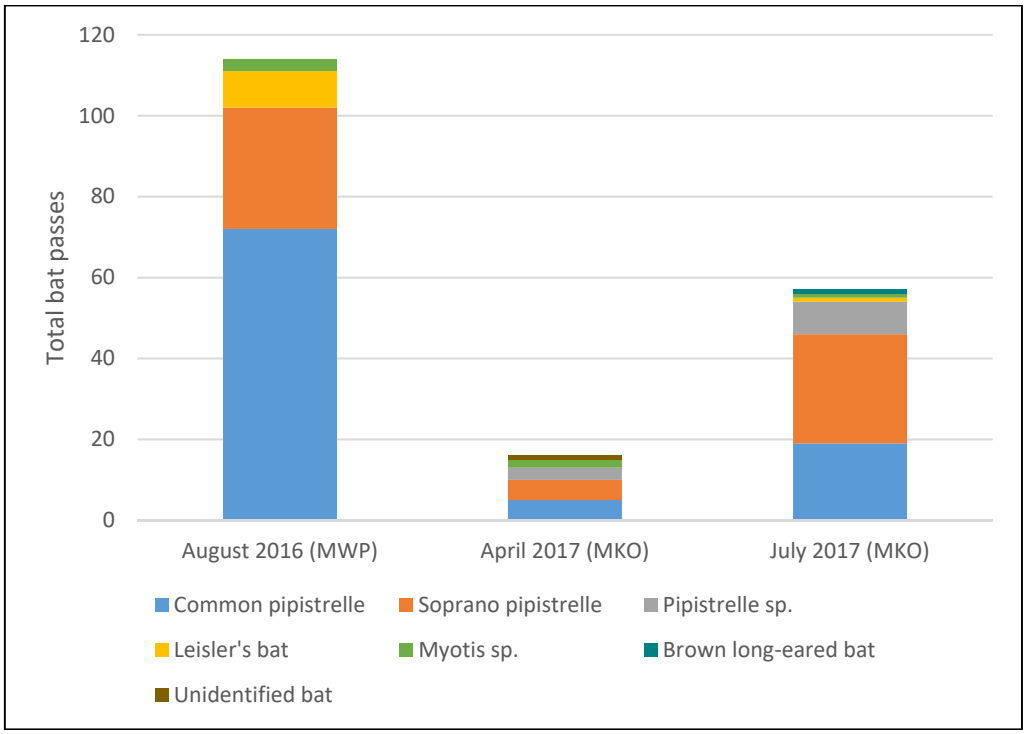

Figure 5.7: Transect survey results 2016 & 2017: Seasonality in bat activity

6 LIKELY AND SIGNIFICANT EFFECTS ON BATS

6.1 Assessment of Potential Effects

Potential effects on bats of the Proposed Project at Timahoe North is presented in Table 6.1.

Analysis of potential effects during construction, operation and decommissioning phases of the Proposed Project		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. Inside the development footprint, scrub habitats will be cleared to facilitate the solar array and associated infrastructure. However, vegetation within the multiple drains travesing these areas will be retained and managed. Therefore, habitat connectivity throughout these areas will be maintained. Outside the proposed solar array areas, foraging and commuting habitats will be retained and enhanced through additional planting.	**Long-term Neutral Effect**
	Loss or degradation of roosting habitat has potential to displace bat populations and/ or impact breeding success. No roosting sites were identified within the proposed site during any surveys undertaken in 2013, 2016 and 2017.	**No Effect**
Disturbance/ Displacement	Bats may be disturbed by increased human presence and increased noise during construction, leading to avoidance of the area. The proposed site is not utilised by large populations of bats. No bat roosts were identified during extensive survey work. In addition, construction works will be temporary.	**Short-term Slight Negative Effect**

Analysis of potential effects during construction, operation and decommissioning phases of the Proposed Project		Unmitigated significance of potential effect (EPA 2002)
Operational Phase		
Disturbance/ Displacement	Bats may be disturbed by increased human presence and increased noise during operation, leading to avoidance of the area. The proposed site is not utilised by large populations of bats. No bat roosts were identified during extensive survey work, including no sites suitable for maternity colonies, swarming activity or hibernation. It is unlikely there will be any significant disturbance or displacement during the operational phase.	**Long-term Imperceptible 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**
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**

7 MITIGATION MEASURES

7.1 Derogation Licence

It is illegal to damage or destroy a bat roost in Ireland. No roosts in trees, buildings or other structures were identified within the proposed site. Therefore, there is no requirement for a derogation licence.

7.2 Habitat Management

The linear landscape throughout the site will be retained throughout the development. Proposed planting schemes will connect to existing wildlife corridors to provide continuity and facilitate foraging and commuting bats.

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 Residual Impacts

Taking into consideration the proposed mitigation measures; significant residual effects on bats are not anticipated.

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Appendix 1

INIS Environmental Consultants' Report (Extract)

Bord na Mona Energy Ltd

Energy Hub Project

Baseline Bat Survey 2013




10th January 2013

INIS Environmental Consultants Ltd
Planning and Environmental Consultants

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1. INTRODUCTION

Bord na Mona Plc and specifically Bord na Mona Energy Ltd have completed a high level feasibility study examining the potential for developing a large area of cutaway peat land and other adjacent areas as a single interconnected large scale wind farm. The energy generated by the development will be sent through one or two proposed interconnectors across the Irish Sea into the UK.

In order to inform the proposed development, a set of targeted baseline environmental surveys are required and have now been initiated. As part of these baseline environmental surveys, Bord na Mona (BnM) commissioned INIS Environmental Consultants Ltd to complete a baseline assessment of bat populations at two bog groups in the Midlands, namely Derrygreenagh and Ballydermot/Timahoe Bog Groups. These bog groups have never been surveyed for bats before and as such no background information exists on bat populations in these areas. The survey had to be designed taking many varied different site specifics into account most notably multiple survey sites over a very large geographical area, large areas of peat extraction and myriad different habitat types with access issues. There are 33 separate bogs located within these two Bog Groups and each of these was surveyed as part of this baseline assessment.

All surveys were carried out between the months of June and September 2013 with a total of 139 separate transects surveyed within the two bog groups; each of these transects were surveyed for bat activity three times. Remote monitoring using an Anabat SD1 device was carried out at all 33 bog locations. In addition to the Anabat, a GML1 Remote Download (GML) system was installed at one bog (Clonsast) to survey for bats over the entire survey period (69 days) on a constant basis, 7 days per week. The use of this GML technology is a first for Ireland and heralds the arrival of the most modern technology for surveying bats quantitatively in the world today.

Due to the prevalence of old buildings and other potential roost sites proximal to the bog groups a bat roost survey was completed at selected potential roost sites within and adjacent to the bog groups.

This report provides the results of the extensive baseline bat monitoring survey which was carried out and provides an insight into bat populations, foraging/commuting activity patterns and roost preferences. In conjunction with best practice methods used, the Chartered Institute of Ecology and

Environmental Management's (CIEEM) Code of Professional Conduct was adhered to throughout the consultation, surveying and report writing stages of this project.

2. METHODOLOGY

2.1. Guidelines and legislative context

This current survey constitutes a baseline assessment of the areas in question and has been prepared taking cognisance of the Environmental Protection Agency's (EPA) 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2002) and 'Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements)' (EPA, 2003) and the 'Guidelines for Ecological Impact Assessment' (Chartered Institute of Ecology and Environmental Management. 2006).

In addition the European Communities (Environmental Impact Assessment) Regulations, 1989 (S.I. No. 349 of 1989) and subsequent amendments have been reviewed and taken into account when preparing the surveys and resultant report.

The Habitats Directive 92/43/EEC was transposed into national law through the European Communities (Natural Habitats) Regulations 1997 (S.I. 94/97) and amended in 1998 and 2005. The EU Habitats Directive requires Member States to maintain or restore the favourable conservation status of the habitats and species listed in its annexes. The Directive specifies that the habitats of 25 species listed in Annex 2 must be designated as SACs. Thus designation of a site as an SAC has wide-ranging implications. Land use practices that may be affected include farming, aquaculture, grazing, sporting and turf-cutting rights. A further 33 species, requiring strict protection, are listed on Annex 4 (plant species listed on Annex 2 are also listed on Annex 4). Some species while not requiring a high level of protection need to be safeguarded against exploitation. These species are listed in Annex 5 of the Directive. The Habitat Regulations have been updated in 2011 as the European Communities (Birds and Natural Habitats) Regulations 2011 to bring the Irish transposition of these regulations into line with the requirements of the EU Habitats Directive (1992). Article 6 paragraphs 3 and 4 of the EU Habitats Directive (1992) state that:

- Article 6 Paragraph 3

  Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, whether individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the sites conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned, and if appropriate, after having obtained the opinion of the general public.

- Article 6 Paragraph 4

  If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary important for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interests.

The Third Schedule to the Wildlife Act 1976, was amended on the 6th December 1985, when the minister, in compliance with the European Communities Council Directive of 2 April, 1979 (No. 79/409/EEC), made regulations entitled the European Communities (Wildlife Act, 1976)(Amendment) Regulations, 1985 (No. 397 of 1985) removing the remaining twelve unprotected species from that schedule. As a consequence all wild birds are now protected throughout the state and careful assessment of their habitats must take place before any development is allowed. The Wildlife Act, 1976, is the principal national legislation providing for the protection of wildlife and the control of some activities, which may adversely affect wildlife. The Wildlife Act, 1976, came into operation on 1 June 1977. The aims of the Wildlife Act, 1976, are to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources

and to regulate their exploitation, and to provide the services necessary to accomplish such aims. As a consequence of the Wildlife Act all wild birds are now protected throughout the state and careful assessment of their habitats must take place before any development is allowed.

This act broadened the scope of the Wildlife Acts to include most species, including the majority of fish and aquatic invertebrate species, which were excluded from the 1976 Act. It also strengthened the provisions relating to the cutting of hedgerows during the critical bird-nesting period. It also strengthened the protective regime for Special Areas of Conservation (SACs) by removing any doubt that protection will in all cases apply from the time of notification of proposed sites. The act also gave specific statutory recognition to the Minister's responsibilities in regard to promoting the conservation of biological diversity, in light of Ireland's commitment to the UN Convention on Biological Diversity.

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982) ensures that governments take into account the conservation needs of species during the formulation of planning and development policies. It also seeks the protection of endangered species and in relation to bats, it stipulates that all bat species and their habitats are conserved.

Department of Environment, Heritage and Local Government Planning Guidelines for Wind Development (2006) (DoEHLG) state that *"the designation of an area for protection of natural or built heritage or as an amenity area does not automatically preclude wind energy development. However, consideration of any wind energy development in or near these areas must be subject to Ireland's obligations under the Habitats Directive (92/43/EEC), the EU (Birds) Directive (97/409/EEC) and the Environmental Impact Assessment Directive. Planning authorities must ensure that a proposal which is likely to have a significant effect on an SAC or other designated area, is authorised only to the extent that the planning authority is satisfied will not adversely affect the integrity of the area. If necessary, they can seek changes to the development proposed or attach appropriate planning conditions."*

2.2. Desktop review

A desktop review was completed to identify features of ecological importance within the study area and surrounding region. This review included all designated areas and sensitive areas within the zone of potential around the study area. Important bat roost sites around the Bog Groups were

identified from information supplied by the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht. Prior to field surveys taking place, other potential sites of ecological importance and conservation interest were identified using orthophoto maps provided by Bord na Mona and also by examination of Ordnance Survey (OS) aerial photography and OS maps (1:50000, 1:10560 (6'') and 1:2500 scale).

Various literature sources, guidance documents and mapping tools were also consulted. These will be referenced in the text.

The list of literature used in all our bat surveys includes (list not exhaustive):

- **Hundt, L (2012) Bat Surveys: Good Practice Guidelines, 2nd Edition, Bat conservation Trust. Natural England Technical Information Note TIN051.** Bats and onshore wind turbines. 2nd Edition, February 2012.
- **Eurobats Publication No.3:** Guidelines for consideration of bats in wind farm projects.
- **Bat Survey Guidelines: Traditional Farm Buildings Scheme** (2008) Tina Aughney, Conor Kelleher & Donna Mullen. The Heritage Council, Áras na hOidhreachta, Church Lane, Kilkenny.
- **NRA Guidelines for treatment of Bats During Construction of National Road Schemes** (2005) NPWS, Natura, Tina Aughney.
- **A Conservation Plan for Irish Vesper Bats** (2006) Irish Wildlife Manuals, no. 20 McAney, K. NPWS, DoEHLG, Dublin.
- **Irish Bat Monitoring Programme** (2006) Tina Aughney, Steve Langton, Niamh Roche, Jon Russ and Phillip Briggs.
- **Identification of Bats in Flight** (1990) by Ingemar Ahlén. Swedish Society for Conservation of Nature, Stockholm, Sweden.
- **The World of Bats** (1996) by Michel Barataud. Sitelle, Alpha Copie, 38000 Grenoble, France.
- **Bat Detector Manual** (1994) by Colin Catto. The Bat Conservation Trust, 15 Cloisters House, 8 Battersea Park Road, London SW8 4BG, England.
- **Conservation status assessment for Species: S1303 - Rhinolophus hipposideros – Lesser horseshoe bat.** (2006) Second Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2001 to December 2006.
- **Animal tracks and signs.** (2007) Preben Bang and Preben Dahlstrom. Oxford

Press.

- **How to find and identify mammals** (1997) by Gillie Sargent and Pat Morris. ISBN 0-906-282-34-9. The Mammal Society, 15 Cloisters House, 8 Battersea Park Road, London SW8 4BG, England.
- **Mammals of Britain and Europe** (1993) by David Macdonald & Priscilla Barrett. Collins Field Guide ISBN 0-00-219779-0. HarperCollins Publishers, 77-85 Fulham Palace Road, Hammersmith, London W6 8JB, England.
- **Observing British and European mammals** (1989) by Christian Bouchardy and François Moutou. ISBN 0-565-01095-6. British Museum (Natural History), Cromwell Road, London SW7 5 BD.

2.3. Field Survey Work

2.3.1. Health and Safety considerations

The bog groups include large expansive areas with soft ground conditions and many deep water filled trenches which presented significant health and safety issues. In order to carry out the surveys efficiently and safely, surveyors became familiar with all sites in daylight i.e. all planned locations of transects and timed searches. Surveys were conducted using pairs of surveyors or alternatively a buddy system was initiated. This Health and Safety methodology was followed at all times. A full risk assessment was prepared and followed by all INIS ecologists prior to surveys initiating.

2.4. Methods

Bat activity on the Bog Groups was surveyed using three different methods:

- Hand held heterodyne bat detectors (Batbox Duet) used for walked and driven **bat activity transects**;
- **Remote surveys**:
    1. ANABAT SD1 was used as a remote recording device throughout the different bogs (used as a static device but also during driven transects);
    2. GML system (ANABAT SD2) was installed in Clonsast bog;
- Bat **roost surveys**, both within Bord na Mona land parcels and adjoining lands (where necessary, permission was requested from private landowners before surveys).

These methods are recognised as being the most up to date, Best Practice methods for surveying bats. INIS ecologists obtained accurate results and species identification throughout all survey periods.

2.4.1. Bat activity surveys (transects)

Regarding transect surveys for bats there are a number of guidelines (Mitchell-Jones and McLeish 2004, Kelleher and Marnell 2006, Rodrigues *et al.* 2008, Bat Conservation Ireland 2012, Natural England 2012, Hundt 2012) that give detailed accounts of the best practice methods for surveying bats in large areas while incorporating the highest health and safety standards. These were all assessed and used to formulate our survey strategy.

Hundt (2012) suggests that when carrying out activity surveys, broadband bat detectors (frequency division or full spectrum) should be used with the guidelines also suggesting that all detectors should have the capacity to record or to be connected to a recorder; this should be considered a standard for bat surveys by professional ecologists, for the purposes of planning applications and impact assessment. This methodology ensures that all bat calls are recorded and can subsequently be analysed for identification to species or species group level.

Manual activity transect surveys were conducted with hand held bat detectors (Batbox duet) in addition to all calls being recorded on an Anabat SD1 device. Manual activity surveys were carried out at all 33 bogs within the two Bog Groups using walked and driven transects methodologies. The emphasis of these surveys was detecting important flight paths across the different bog sites and those likely to intersect with the turbine areas, as well as in depth surveys in the autumn time (September in this case) to account for migrating/swarming species (Mitchell-Jones and McLeish 2004).

As mentioned surveys focused on potential turbine areas but also habitat features that are close to these locations. Habitat features that required in depth surveys were those that had a medium/high foraging/commuting/connectivity factor for bats within the wider landscape (e.g. linear corridors, hedgerows, tree lines, watercourses/bodies, woodland) Hundt (2012).

Since there are numerous access roads to each of the bogs, driven transects were conducted to improve efficiency of this baseline survey allowing for more ground to be covered, increasing our

information base. As per the guidelines, driven transects were conducted at a speed of no more than 15 km per hour (Bat Conservation Ireland 2012).

Table 1. Description of best practice methods for surveying bats outlined in relevant guidelines (Rodrigues *et al.* 2008, Bat Conservation Ireland 2012, Hundt 2012)

Survey Type	Description of best practice
Dusk activity survey	Manual detector surveys should be designed to ensure that all areas and main features of the site are sampled within the time period. This survey can be used to determine the spatial distribution or abundance of bats, which features they are using and perhaps the extent to which activity changes over time. Environmental conditions should be recorded at regular intervals to determine if there is a change in bat activity attributable to temperature/rainfall/wind speed *etc*. This survey can be done through point counts or through walked/driven/boat transects.
Dawn activity survey	Pre-dawn surveys can be carried out in a similar fashion with similar results. However, they are particularly useful for locating roosts on or within a 200 meter radius of the site., and can be used in combination with dusk transect surveys

When conducting all bat activity surveys INIS ecologists conducted them in optimal weather conditions allowing the results to accurately reflect bat activity at all locations. Bat activity surveys were only carried out when the temperature was above 10 degrees Celsius (Kelleher and Marnell, 2006), no heavy rain and no strong winds (> Beaufort Force 5) (Bat Conservation Ireland 2012). (For static surveys it is impossible to say that these conditions can be met all the time but this information can be used to examine how environmental variables affect bat activity on site). Weather conditions this year were absolutely perfect with optimal temperatures being recorded throughout all surveys.

In accordance with best practice it is also important to survey for bats at the appropriate time of year and time of night/day. The times of all surveys adhered to the timing reflected in Tables 2 and 3. Another important factor in ensuring accurate results was surveying transects at different times i.e. that the three surveys of each bog didn't take place within the same time window on each survey date. We designed different survey times to confirm the correct bat activity patterns at each location.

Table 2: Best practice times to conduct bat surveys (Hundt 2012, Bat Conservation Ireland 2012)

Survey Type	Time Start	Time Finish
Bat Activity (Dusk surveys, all species)	½ hour before sunset	2-3 hours after sunset
Bat Activity (Dawn surveys, all species)	2 hours before sunrise	1/2 hour after sunrise
Swarming activity (all species)	Sunset	4 hours after sunset

Table 3: Shows best practice time of year is the most appropriate to survey for bat activity

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hibernation roost survey			*	Summer roost emergence and activity surveys					*	Hibernation roost survey	
Potential roost and internal surveys. Tree roost Surveys are best conducted in Winter											

* Limited activity

Results of the transect surveys are presented in tabulated format within Appendix 4 and include a 10 figure grid coordinate for every bat contact recorded throughout the survey season.

2.4.2. Remote surveys

The most modern remote survey technology available in the world today was used to assess bats at the Bord na Mona sites and immediate surrounding areas. Developed by Titley Scientific, Anabat technology is the most advanced system to remotely record bat activity and is now used on every continent in the world by bat ecologists to survey bats.

2.4.2.1. AnaBat SD1

The AnaBat SD1/2 compact flash (CF) was launched by an Australian company and heralds a system that is extremely sensitive and accurate for identifying any different species present. It is currently difficult to separate out the *Myotis* group of bats using any of the bat detector types (time expansion and heterodyne) currently available however using field notes and observer experience in conjunction with Anabat graphs specific *Myotis* species can be identified. This is crucial to any bat survey for accuracy of results and identifying correct mitigation.

The Anabat SD1/2 CF incorporates the AnaBat II detector used in conjunction with the CF Storage ZCAIM and makes a powerful remote recording system for bats. Timer facilities are incorporated into the ZCAIM so it can be programmed to switch on and off at selected times.

The ZCAIM controls the power to the detector. Because of this and the systems use of compact flash memory cards, the system can be left remotely in the field for a week or more without changing batteries or CF cards. The Analook software for programming the ZCAIM, reading the memory card and extracting AnaBat files will now work on computers using any version of Windows. The software is supplied with the system. A CF memory card and CF reader/writer are required.

An AnaBat SD1 was used to survey for extended periods in all 33 different bogs throughout both Derrygreenagh and Ballydermot bog groups. The AnaBat was used to survey for either a dusk or dawn survey in each location. The dusk surveying periods comprise of leaving the device out for half an hour before dusk until 3 hours after. The dawn survey period comprised of leaving the device out for three hours before dawn until a half an hour after. In addition to the device being left out in each of the 33 bogs for the standard survey, we also completed an extra 12 hours of Anabat surveys in open peat habitat (includes both bare peat areas and active open peat extraction areas) in order to gain more comprehensive and robust bat activity data regarding this habitat type.

Throughout the surveys the AnaBat was left out in a variety of different habitats including mineral banks, hedgerows, open peat and adjacent to water bodies. This data can be used to quantify the relative importance of features and locations, and how bat activity changes over time within each bog group.

Results of the AnaBat SD1 surveys are presented in tabulated format within Section 8.3.1.

2.4.2.2. GML system

INIS installed a GML system on a building in the Clonsast factory complex on the 10/07/2013 and disconnected it on the 16/09/2013. This is the first time this state of the art system has been used in Ireland and heralds the most modern surveying technique ever used for surveying bats in Ireland. This system was used for the first time in Europe (Scotland) in July 2013.

INIS sees this GML system as being the one of the most efficient and cost effective means of mitigation for bats on large scale wind farms in the future.

There were a number of different habitats covered by the GML system including a water body, hedgerows and open areas of scrub vegetation. The system was programmed to turn on at 19.30 pm and switch off at 07.30 am, every day.

There are two types of division ratios used on AnaBat devices, 8 and 16; these represent the amount of data that is stored on the CF memory card. If division ratio 8 is used, a greater range of sound frequency is stored on the memory card within the device; it is important to stress that there is no impact on the quality of data being recorded. Division 8 is suitable for short term studies i.e. single nights etc. However for long term studies (e.g. one month) division ratio 16 is better to use as it means data can be collected over the long term and this is why a division ratio of 16 was used for this study. The use of division ratio 16 had no impact on the quantity or quality of the data for the purpose of this study. As the AnaBat also detects other ultrasonic sounds, such as those sounds made by insects, rain, and other sources the sensitivity of the device was remotely altered during the first few days of surveys in order to obtain the best results. In the end a sensitivity setting of 40 was used for this study. The calls were then recorded onto a CF memory card with large storage capacity.

In order to make the GML system waterproof they were placed inside a special metal case. All bat activity was recorded by the GML system and later downloaded through the internet. This data was then analysed using AnalookW software.

Results of the GML survey is presented in tabulated format within Section 8.3.2.

2.4.3. Roost surveys

For roost surveys it is important that surveys be undertaken by appropriately trained and experienced bat specialists to prevent roost abandonment and accidental injury or death to bats. All ecologists involved with this survey have extensive experience with bat surveys and have an advanced knowledge of bat ecology and roost survey techniques. Bat roost surveys were completed at 20 potential bat roosts within and adjacent to the bog groups including bridges, trees, buildings (inhabited and uninhabited) and workshops (derelict and active).

During this survey, potential roost locations were identified using both OS maps and field observations during the bat activity surveys. All of these locations were visited during daylight for an

initial inspection for roost potential and possible bat presence. The bat roost surveys were undertaken before September 15th because bats are most active in the months May - August.

The reason for daylight inspections was twofold:

1. To ascertain if there were any obvious signs of bat activity at the structure/potential roosting areas associated with the structure and
2. To ascertain if there were any health and safety hazards associated with the structure.

The initial daytime search involved a methodical search where the structure was examined using best practice techniques to locate droppings beneath gable ends, on windowsills, under hanging tiles, fascia's, on windows or on walls. In addition, the structure was examined for urine and oily residue stains, scratch marks and the remains of insect prey (moth wings etc.).

Following the external search we moved into the buildings where we searched all first floor areas for bat signs in the form of bat droppings and urine and oily residue stains. Following this investigation we moved into the second floor spaces and then attic spaces of all buildings, if it was required. This necessitated us entering through the attic doors with head torches and inspecting all floor space within the attic for bat droppings. We used head torches and a large hand held torch for this search.

The aims of the bat roost surveys at trees/buildings/ bridge structures were to:

- Determine if bats are currently present or have been present in the past
- Determine the bat species
- Determine the number of bats
- Determine the roost category or categories e.g. the purpose and therefore the importance of the structure/tree
- Determine the bats' entry and exit points within the structure(s)
- Determine the bats' roosting locations within the structure
- Determine the commuting corridors used by bats to and from their roost(s) with a description of any vegetation or other linear features of importance to bats (this will be especially important for these Bord na Mona surveys to assess linear features being used by bats to enter the bog groups)

Using the evidence gathered during the initial daylight site inspections at each potential roost, dawn/dusk roost surveys were then conducted. The dawn/dusk surveys were carried out in optimal weather conditions e.g. mild temperatures, light winds and no rainfall to maximise the results of the roost surveys.

These roost surveys, along with the National Parks and Wildlife Service roost data have allowed an excellent indicative baseline assessment of bat roosts in the study area to be made.

Results of the bat roost surveys are presented in tabulated format within Section 8.4.

3. CONSULTATION

The preparation of this section included consultation either directly or through publically-available information with:

- National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht
- Bord na Mona (BnM)
- Offaly County Council
- National Biodiversity Data Centre (NBDC)
- Bat Conservation Ireland (BCI)
- Environmental Protection Agency (EPA)

A formal consultation response was received from NPWS regarding the distribution of bat roosts in the study area and within the region of the study area. This information was reviewed and assimilated into our report.

4. STAFF PROFILES

4.1. Howard Williams (Principal ecologist)

Mr Howard Williams is a senior ecologist with 17 years professional ecological management experience. He was the principal ecologist on the current assessment, designed all surveys and was responsible for the production of the final report. Mr. Williams is principal ecologist with INIS

Environmental Consultants Ltd and currently project manager on all INIS projects in the Republic of Ireland and the UK.

Mr Williams has formal training and CPD on bat surveying that is relevant to the current assessment. He is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and is a Chartered Environmentalist (CEnv) with the Society for the Environment (Soc Env) and a Chartered Biologist (CBiol) with the Society of Biology. He completed his B.Sc. in Biological Sciences, National University of Ireland Cork, in June 1997. Following his degree he worked as a senior ecologist with ESB Fisheries Conservation until 1999 and has been working as a private consultant since 2000. Mr. Williams has extensive experience of ecological surveys and ecological survey techniques. He has acted as lead ecologist on 34 wind farm developments in Ireland and the UK since 2000; in addition to this he has acted as lead ecologist on two major road infrastructure projects, one Combined Cycle Gas Turbine (CCGT) project and numerous other renewable energy projects. Howard has extensive expertise in managing Environmental Impact Statements and Appropriate Assessment work on major renewables projects for both private and public clients. Last year he was responsible for the management and production of the entire EIS for a wind farm in West County Clare from design phase right through to planning submission.

Mr Williams is considered by his peers and clients alike to be one of Irelands leading ecological site assessors and has been requested to complete in excess of 400 separate full ecology surveys in Ireland and the UK in the past 15 years. While birds are his primary expertise he has vast experience with surveying bats and non-volant mammals over the past 15 years and has held licenses to disturb bats and lesser horseshoe bats (Annex II) in particular. In relation to bats he has attended formal training in England with Bat Conservation Trust UK and is proficient in the use of all Anabat technology including Analook software.

4.2. Domhnall Finch (Ecologist)

Mr. Domhnall Finch, M.Sc., B.Sc., GradCIEEM, is an ecologist with INIS Environmental Consultants Ltd. Mr. Finch was awarded a first class honours M.Sc. in Biodiversity and Conservation from the University of Leeds completing his thesis on bats and an honours B.Sc. in Environmental Science from University College Dublin.

Mr. Finch is a bat specialist and has vast experience surveying bats in both Ireland and the UK working for private consultancies and universities on both large scale bat surveys for wind farm projects and private developments. Mr. Finch is capable of operating the advanced bat identification device i.e. the Anabat bat identification module. He has a license to capture bats using mist nets for scientific study and has vast experience catching and processing bats in the UK and Poland for scientific research.

Along with bats, Mr. Finch has excellent experience in conducting large scale bird surveys for wind farm projects and scientific research, including both terrestrial and marine species. Since leaving university Mr. Finch has also gained invaluable experience in surveying non-volant mammals and cetaceans. Mr. Finch is has completed an ArcView GIS course and is fully proficient in using ArcView GIS to analyses, model and digitise large data sets to create both current and predictive maps.

4.3. Anne Mullen (Ecologist)

Ms. Mullen received her primary degree in Environmental Science in the National University of Ireland, Galway in 2004 and completed a Masters in Ecological Assessment from University College Cork in 2012. She has worked in the scientific sector for a number of years including laboratory work in a number of industries. She has substantial experience with habitats surveying and mapping, species rich grasslands surveying, water quality assessment, site auditing. Anne completed all the GIS mapping for the current survey. Anne is an ecologist with INIS Environmental Consultants Ltd.

4.4. Andrew Dobson (Titley Scientific – principal ecologist)

In addition to the involvement of INIS staff, outside assistance was provided by experts from Titley Scientific in England and the United States of America. Titley Scientific manufacture the Anabat technology that is recognised around the world as the most advanced system for monitoring bats. This is the technology that INIS ecologists decided to use on the Bord na Mona project.

With reference to the Bord na Mona sites, ecologists from Titley Scientific travelled to Ireland to discuss the best survey products to suit onsite habitats, project scale and bat species. Titley provided the GML system to remotely record bat species at Clonsast and they also recommended different monitoring strategies for the expansive areas of peat.

banks are evident throughout the bog with some of these associated with BnM railway lines. Approximately 5% of the overall land cover throughout the bog is covered in mineral banks. Well-developed hedgerows and mature deciduous trees exist around the periphery of this bog (ca. 5% of the land cover).

7.3.1.8. Lullymore

Lullymore is in the centre of all the bogs in the Ballydermot/Timahoe Bog Groups and it is bordered by three BnM bogs as well as the Lullymore Heritage Park on its eastern border. To the south of Lullymore bog and to the north of Barnaran bog there is a large agricultural field, with a well-defined linear hedgerow along its borders. Approximately 9 km^2 in area the majority of this bog (ca. 50% of the land cover) consists of scrub vegetation, with 30% of the land consisting of open peat extraction and conifer plantation/hedgerows cover in 20% of the land.

7.3.1.9. Ticknevin

Within Ticknevin bog there are several different types of habitats. The main habitat is predominantly open peat extraction (ca. 95% of the land cover). However, along all of the edges around this bog there are well developed hedgerows with isolated mature trees within them. For this particular bog all transects except one took place along the edge of the bog. With one transect being conducted through an area of open peat extraction. This bog is situated in the northern section of Ballydermot/Timahoe Bog Group and it has bordered by the Grand Canal on the North and Glashabaun North on the south. It is approximately 2 kilometres south east from the town of Edenderry.

7.3.1.10. Timahoe North

The boundaries of Timahoe North bog are surrounded largely by agricultural fields. As Timahoe North is the most north easterly BnM bog in the Ballydermot/Timahoe Bog Group, it is only bordered by Timahoe South bog. The bog is 2 km North West of Timahoe village and 5 kilometres east of Derrinturn. The site is approximately 7 km^2, with scrub vegetation covering approximately 90% of the land cover and 10% open peat. Along the edges of Timahoe North bog there are well defined linear hedgerows and within the boundaries of the bog there are patches of open peat that are not being extracted and have started to be re-colonised by scrub species.

within open peat habitat in the northern section of this bog. All of these Leisler's bats were commuting through the bog.

8.1.1.8. Lullymore

Three transects were designed at Lullymore bog and these covered approximately 9 kilometres in distance. Five bat contacts were recorded throughout the survey season with two species present: common pipistrelle *Pipistrellus pipistrellus* (n=3), soprano pipistrelle *Pipistrellus pygmaeus* (n=2). These results accounted for 0.8% of all bat records for this survey in both Bog Groups. Most of the bat records were recorded along the hedgerow bordering the agricultural field on the southern section of this bog and no bat species were recorded within open peat habitat. All bats were noted to be commuting.

8.1.1.9. Ticknevin

Five transects were conducted in this bog, which have a combined length of approximately 5 kilometres. Thirty six individual bat records were recorded along these transects; accounting for three species; common pipistrelle *Pipistrellus pipistrellus* (n=23), soprano pipistrelle *Pipistrellus pygmaeus* (n=10) and the myotis whiskered/Brandt's *Myotis mystacinus/brandtii* (n=3). These results accounted for 5.7% of all bat records for this survey in both Bog Groups. All of the records were along the well-developed hedgerows around the periphery of the bog. Not a single bat species was recorded within open peat habitats for the entire survey season within this bog. Eight records were noted to be commuting; 5 common pipistrelles, 2 soprano pipistrelles and 1 myotis spp. The bats that were recorded as commuting mainly occurred along the hedgerows along the southern side of this bog.

8.1.1.10. Timahoe North

Five transects were designed at Timahoe North bog and these covered approximately 7 kilometres in distance. Twenty one bat contacts were recorded throughout the survey season with four species present: leisler's *Nyctalus leisleri* (n=8), common pipistrelle *Pipistrellus pipistrellus* (n=8), soprano pipistrelle *Pipistrellus pygmaeus* (n=3), myotis whiskered/Brandt's *Myotis mystacinus/brandtii* (n=2). These results accounted for 3.3% of all bat records for this survey in both Bog Groups. The majority of bat records were recorded along the linear features of the old BnM railway lines situated throughout the bog. The open peat areas were not surveyed within this bog. Only one Leisler's bat

and one common pipistrelle were recorded commuting along these open linear features created by the old BnM railway lines, all other records were of foraging bats.

8.1.1.11. Timahoe South

Five transects were designed at Timahoe South bog and these covered approximately 12 kilometres in distance. Thirty nine bat contacts were recorded throughout the survey season with five species present: common pipistrelle *Pipistrellus pipistrellus* (n=14), Leisler's *Nyctalus leisleri* (n=11), soprano pipistrelle *Pipistrellus pygmaeus* (n=6), daubenton's *Myotis duabentonii* (n=5), myotis whiskered/Brandt's *Myotis mystacinus/brandtii* (n=3). These results accounted for 6.2% of all bat records for this survey in both Bog Groups. Most bat records were from the edge of the large water body and the riparian habitat within the scrub vegetation and no bat species were recorded within areas of open peat. Four common pipistrelles, three leisler's and two soprano pipistrelles were recorded commuting along linear features such as old BnM railway lines or tree lines surrounding both the riparian habitat and the large water body.

8.1.2. Derrygreenagh Bog Group

8.1.2.1. Ballybeg

Six transects were designed at Ballybeg bog and these covered approximately 6 kilometres in distance. Twelve bat contacts were recorded throughout the survey season with three species present: soprano pipistrelle *Pipistrellus pygmaeus* (n=6), common pipistrelle *Pipistrellus pipistrellus* (n=5), Leisler's *Nyctalus leisleri* (n=1). These results accounted for 1.9% of all bat records for this survey in both Bog Groups. Most bat records were recorded along scrub vegetation and water body and no bat species were recorded within open peat habitat. Three common pipistrelles and three soprano pipistrelles were recorded commuting along the edge of this bog in scrub vegetation; all other records were of feeding bats.

8.1.2.2. Ballycon

A single transect was conducted in this bog; which had a length of approximately 1 kilometre. This transect ran through the scrub/aquatic habitat. One individual bat record was recorded along this transect; common pipistrelle *Pipistrellus pipistrellus* (n=1). These results accounted for 0.2% of all bat records for this survey in both Bog Groups. This bat was noted foraging along the water's edge between the scrub vegetation and the large water body. No open peat extraction occurs on this site.

Table 7. Tabulated results of the total number of bats recorded in each bog during all bat activity transect surveys

Name of Bog	Soprano pipistrelle	Common pipistrelle	Leisler's	Daubenton's	Myotis whiskered/Brandt's	Natterer's	Brown long-eared	Total number of species present	Total number of bat records	% of total bat activity
Ballydermot	10	13	1	2	1	-	-	5	30	4.8
Barnaran	8	11	-	-	-	-	-	2	19	3.0
Blackriver	27	33	12	3	7	1	2	7	85	13.5
Codd	10	6	4	-	2	-	-	4	22	3.5
Glashabaun North	-	-	-	-	-	-	-	0	0	0.0
Glashabaun South	14	19	2	2	1	-	-	5	38	6.0
Lodge	-	1	8	-	1	-	1	4	11	1.7
Lullymore	2	3	-	-	-	-	-	2	5	0.8
Ticknevin	10	23	-	-	3	-	-	3	36	5.7
Timahoe North	3	8	8	-	2	-	-	4	21	3.3
Timahoe South	6	14	11	5	3	-	-	5	39	6.2
Ballybeg	6	5	1	-	-	-	-	3	12	1.9
Ballycon	-	1	-	-	-	-	-	1	1	0.2
Ballykeane	-	2	1	-	-	-	-	2	3	0.5
Cavemount	4	2	1	1	-	-	-	4	8	1.3
Clonad	7	9	1	-	2	-	-	4	19	3.0

Cloncreen	-	5	1	-	2	-	-	3	8	1.3
Clonsast	7	4	3	1	1	-	-	5	16	2.5
Clonsast North	2	1	2	-	1	1	-	5	7	1.1
Croghan	7	4	-	-	-	-	-	2	11	1.7
Daingean Derries		2	-	-	-	-	-	1	2	0.3
Daingean Rathdrum	7	10	-	3	2	-	-	4	22	3.5
Derryarkin	9	12	-	6	3	-	1	5	31	4.9
Derrycricket	1	1	-	-	-	-	-	2	2	0.3
Derryhinch	3	2	1	-	-	-	-	3	6	1.0
Derrylea	4	10	1	-	1	1	-	5	17	2.7
Derryounce	23	16	6	9	5	-	-	5	54	8.6
Drumman	2	8	1	3	1	-	-	5	15	2.4
Esker	2	8	2	2	8	-	-	5	22	3.5
Garryhinch	7	16	10	4	-	-	-	4	37	5.9
Garrymore	3	1	-	-	-	-	-	2	4	0.6
Kinnegad	6	7	4	1	3	-	-	5	21	3.3
Torr	2	5	-	-	-	-	-	2	7	1.1

9. RESULTS OVERVIEW

The following table (Table 13) gives a simplified overall activity rating (high/medium/low) to each of the 33 individual bogs based on our baseline survey results (bat numbers/species) from transect and remote surveying. This information refers to the results of a baseline survey only.

Table 13. Overall bat activity for each of the 33 individual bogs based on numbers of bats recorded.

Site	High	Medium	Low
Ballydermot	X		
Barnaran		X	
Blackriver	X		
Codd		X	
Glashabaun North			X
Glashabaun South	X		
Lodge		X	
Lullymore			X
Ticknevin	X		
Timahoe North		X	
Timahoe South	X		
Ballybeg		X	
Ballycon			X
Ballykeane			X
Cavemount			X
Clonad		X	
Cloncreen			X
Clonsast		X	
Clonsast North			X
Croghan		X	
Daingean Derries			X
Daingean Rathdrum		X	
Derryarkin	X		
Derrycricket			X
Derryhinch			X
Derrylea		X	
Derryounce	X		
Drumman		X	
Esker		X	
Garryhinch	X		
Garrymore			X
Kinnegad		X	
Torr			X

Appendix 2

Malachy Walsh and Partners Report

Malachy Walsh and Partners
Engineering and Environmental Consultants

Bord na Móna Bat Survey
Timahoe North Bog

ISSUE FORM	
Project number	17759
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Table of contents

TABLE OF TABLES

FIGURES

LIST OF APPENDICES

1 INTRODUCTION

Malachy Walsh and Partners were commissioned by Bord na Móna to carry out bat surveys at Timahoe North Bog. This report provides the details of the bat surveys carried out at the study area and the results of the same.

Bat surveys were previously carried at the Timahoe North Bog site as part of bat surveys within the Derrygreenagh and Ballydermot/Timahoe Bog Groups. These surveys were reported in 2013 (INIS, 2013), and 2016 (MWP, 2016).

The bat surveys described in report were conducted August and September 2016.

1.1 SCOPE OF TIMAHOE NORTH BAT SURVEYS

Bat surveys involved the following:

- Desktop study undertaken to gain an understanding of bat activity within the area and the suitability of the site for certain species,
- Preliminary bat roost survey (visual daytime search),
- Bat activity surveys conducted to determine the behaviour of bats/bat activity at the Timahoe North Bog site, and included:
    - A Frequency Division AnaBat Detector System (AnaBat SD2 Flash Card Bat Detector) utilised to assess the bat activity during walked and driven transect within and adjacent to the site.
    - An automated monitoring of bat activity conducted at two separate locations within the site, where the SMZC units were deployed in late August/September, for a period of fifteen consecutive nights.
    - Along with visual observations, results of the bat activity monitoring at the Timahoe North Bog site were analysed to describe the bat activity at the site during time of survey.

This report provides the results of the baseline bat monitoring surveys conducted at the Timahoe North Bog in late August/September 2016, and provides an insight into bat activity at the study area.

2 STUDY AREA

The study area includes Timahoe North Bog located in North County Kildare, approximately 2km to the northwest of Timahoe village, and approximately 5km to the east of Derrinturn. Timahoe North Bog covers approximately 700 hectares, situated on low ground, varying from approximately 70m to 90m OD.

Peat harvesting has ceased at the majority of the Timahoe North Bog for some time. As a result of the cessation of peat harvesting the dominant habitat type within the bog is scrub, which covers the vast amount of cutover bog at the site. Small sections of peat harvesting are currently ongoing within the bog site, towards the north eastern and south western extremity of the bog. Sections of conifer plantation occur along the northern and south eastern boundary of the site.

Watercourses draining the site include a network of large drainage ditches, and the slow moving un-named stream (more like drainage ditch/canal), a tributary of the Clogheraun Stream.

Figure 1 below shows the location of the Timahoe North Bog site.

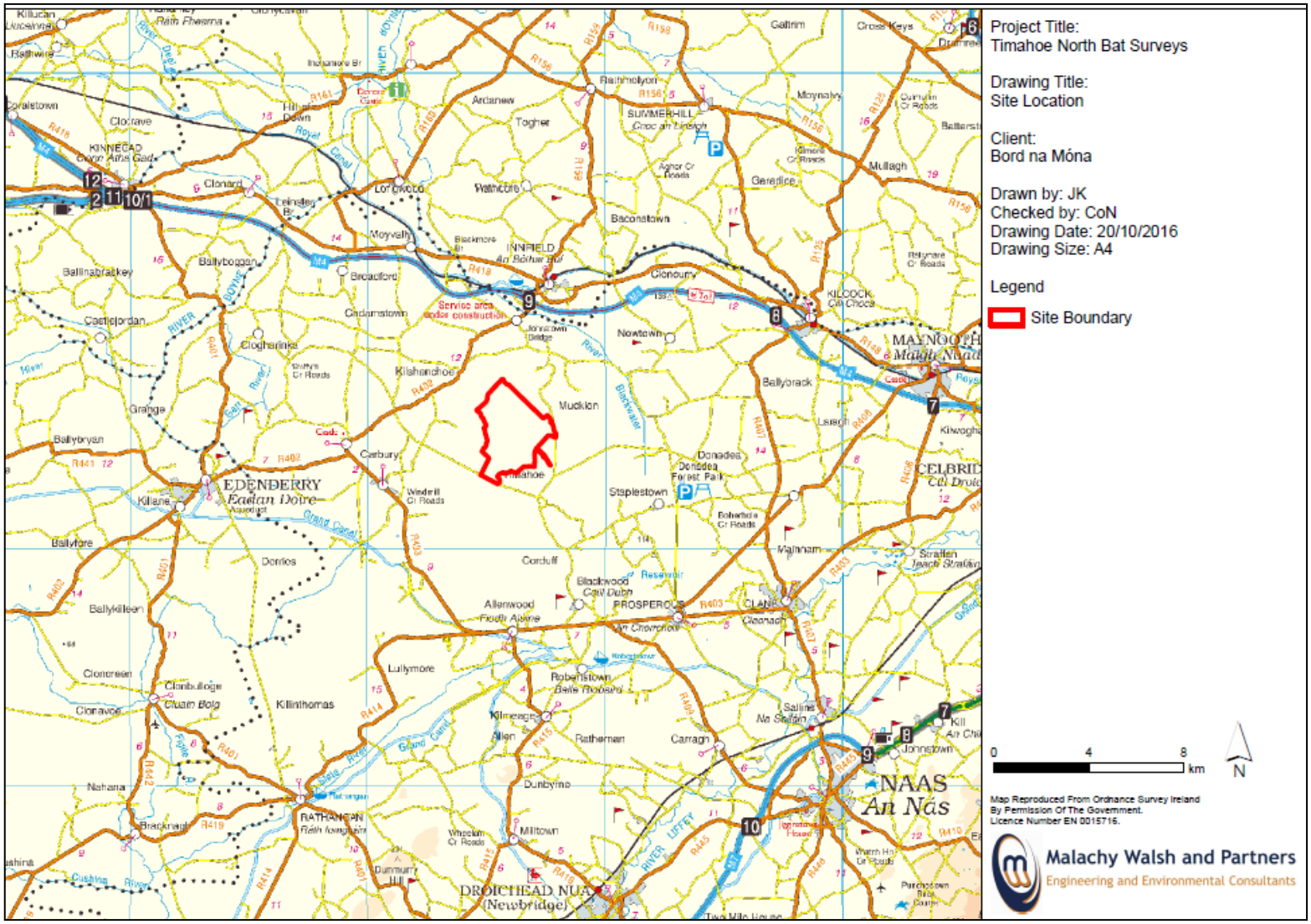

Figure 1: Site location

3 METHODOLOGY

3.1 DESK STUDY

A desk study was carried out to collate available information on the bat species to be surveyed and on the site's natural environment and to identify features of ecological importance within the study area and surrounding region.

This desk study comprised a review of the following publications and datasets:

- Collins, J. (ed) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines, 3rd Edition, Bat conservation Trust, London.
- Bat Survey Guidelines: Traditional Farm Buildings Scheme (2008) Tina Aughney, Conor Kelleher & Donna Mullen. The Heritage Council, Áras na hOidhreachta, Church Lane, Kilkenny.
- Eurobats Publication No. 6: Guidelines for consideration of bats in wind farm projects Revision 2014.
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* (National Road Authority (NRA, 2006a).
- Bat Mitigation Guidelines for Ireland. *Irish Wildlife Manuals*, No. 25 (National Parks and Wildlife Service 2006).
- NRA Guidelines for treatment of Bats During Construction of National Road Schemes (2005) NPWS, Natura, Tina Aughney.
- Previous Report/Baseline Bat Surveys, completed by INIS Environmental Consultants Ltd, conducted in 2013, and Malachy Walsh and Partners conducted in 2015/16.
- OSI Aerial photography and 1:50000 mapping.
- National Parks and Wildlife Service (NPWS).
- Bat Conservation Ireland publications and website.
- National Biodiversity Centre (NBDC) (on-line map-viewer).

3.1.1 National Biodiversity Data Centre (NBDC)

The NBDC online map viewer includes an interactive layer which displays geographical areas in terms of a 'habitat suitability' index for bats. The bat suitability index ranges from 0 to 100, with 0 indicating areas considered least favourable for bats and 100 indicating areas considered most favourable for bats, in terms of habitats present. Several factors are incorporated into the model to give an overall estimate of the suitability of an area for bats, including landcover, topography, climate, soil pH and riparian habitat (Lundy, et al., 2011). The suitability index is presented for all bat species overall, as well as by individual species. As part of the desk-top review, this online mapping tool was used to identify areas of Bord na Móna lands, within the Timahoe North Bog and the surrounding area, which may be considered suitable bat habitat.

3.1.2 Designated sites

This desk study included the identification of all designated and/or sensitive areas within a 15km radius of the study area.

3.1.3 Previous surveys

Two baseline bat surveys were carried out on two Bord na Móna bog groups by INIS Environmental in 2013, and Malachy Walsh and Partners in 2015/16, namely the Ballydermot/Timahoe Bog group, and the Derrygreenagh Bog group. The goal of these surveys was to establish indicative levels of bat activity within the two bog groups. No formal bat survey had been carried out within these bog sites, prior to the preliminary study (apart from some project specific studies in a limited number of locations). Therefore the levels of bat activity within these areas were relatively unknown prior to these surveys.

3.2 FIELD SURVEYS

3.2.1 Introduction

Bats in Ireland feed exclusively on insects, and in the summer they generally emerge from their roosts at dusk to feed. The distances covered while foraging varies considerably between species. They are known to use a number of different foraging sites in the same night, and move between them to locate areas of high insect density. They are also known to exhibit a level of site loyalty and will frequently return to the same foraging sites night after night (JNCC, 2001).

Information on bat activity at the study area was collated from a comprehensive set of field surveys, conducted between in August and September 2016, which are described in the following sections. Bat surveys included;

- Bat Roost Surveys (daytime visual search, within the study area),
- Bat Activity Surveys (bat transects), and
- Automated Bat Surveys (from ground level).

3.2.2 Baseline Environment (Habitat Study)

While conducting the daytime surveys, other habitats within the study area and the immediate surroundings were noted. This was done to assess bat foraging/commuting habitat availability, and to record the presence of significant landscape features, particularly linear features that provide wildlife corridors for commuting bats.

Timahoe North Bog was visited during daytime, prior to night time transect surveys, in order to ensure that transect routes comprehensively transacted through, and intersected with foraging and commuting habitats present within the bog site. This part of the survey included;

- Identifying the habitat types at each of the bog sites according to the Heritage Council's 'A Guide to Habitats in Ireland' to level 3 (Fossitt, 2000).
- Ensuring transects included linear features such as roadside margins, woodland edges and treelines, occurring within, bounding and adjacent to the bog sites.

3.2.3 Bat Roost Survey (Visual Daytime Search)

3.2.3.1 Structure/tree survey (Visual daytime searching)

The bat roost survey conducted at the site included the following;

The Timahoe Bog and immediate adjacent lands were searched for potential bat roost sites. No structures such as buildings occur within the site. Trees within and adjacent to the bog site were

checked for holes, cracks, crevices and openings in both living, and dead trees. Trees were inspected from ground level using binoculars, for external signs of damage, or evidence of the presence of holes or cavities. Where/if required, an endoscope was on hand, to investigate cracks and crevices present on trees, checking for evidence of bats.

Transect routes were driven/walked in daylight hours to determine if suitable roost habitat sites such as old farmyard buildings or derelict houses were available or present within/adjacent to the Timahoe North Bog. The bat roost survey was conducted according to roost identification guidelines 'Bat Survey Guidelines: Traditional Farm Buildings Scheme', Aughney, T., Kelleher, C. & Mullen, D. (2008).

3.2.4 Bat Activity Surveys (Transects)

Bat activity surveys (transect surveys) conducted at the study area consisted of walked and driven transects. Surveys included previous transect routes carried out at the site (for a continuation of preliminary baseline surveys), with additional transects also included. The transect routes were designed to comprehensively survey the Timahoe North bog site and adjacent lands. The transect routes intersected/followed the foraging and commuting habitats present within it, particularly those associated with linear features such as watercourses, roadside margins, vegetated linear strips, scrub, woodland edges, and hedgerows.

The activity survey was conducted using the Frequency Division AnaBat Detector System (AnaBat SD2 Flash Card Bat Detector) in conjunction with the BatNav KML Generator, which generates GPS co ordinates for each bat pass recorded. The AnaBat detector records bat ultrasonic calls on a continuous basis, and stores the information onto an internal CF card. Frequency Division is a technique used to convert the inaudible bat echolocation calls, to audible sounds. The AnaBat unit also uses Zero-Crossing Analysis (ZCA), to make the real-time recorded calls visible for display purposes. It is these sonograms (2-d sound pictures) that are digitally stored on the CF card, and downloaded for analysis. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded. The GPS location of each call is also recorded.

A hand-held heterodyne bat detector (the Batbox Duet) was also utilised, to enable identification of individual species in the field in real time. The frequency detection dials were rotated so that there was frequent scanning of the frequencies between 20 kHz and 120 kHz. Bat species identified on the basis of the heterodyne evidence alone is a highly skilled and somewhat subjective technique, and is based on the surveyors' field experience of the 'jizz' of the individual bat species (Ahlen, 1990). For this reason a number of authorities will only accept species specific identification in the field, if a record is either confirmed in the hand, or accompanied by detailed sonogram evidence.

Levels of bat activity are strongly correlated to climatic conditions, and due to the influence that these factors have on abundance of prey items, the surveyor noted temperature, the prevailing weather conditions, and the level of insect/moth activity during each survey session.

Walked transects were conducted within the study area, which were not suitable for vehicle access. Driven transects were carried out with the use of a four by four vehicle. The AnaBat detector was connected to a specially adapted microphone, mounted to the roof of the vehicle.

Post survey, the species of each individual bat pass is identified, and the recording is labelled. If sufficient calls are recorded, the GPS location is appended to each call and the distribution mapping of bat activity along the survey route can be generated on GIS platforms, and on Google Earth. These formats provide easy and quick access to detailed distribution mapping of any activity recorded. Repeated surveys can be overlaid, or multiple surveyors' results can be plotted to visualise a large site.

Bat activity surveys were carried out, where weather conditions met the requirement set out in standard survey methodology guidance documents (Bat conservation Ireland 2012[1]; Hundt, 2012[2]; Mitchell-Jones and Mcleish 2004[3]). Recommended guidelines state that surveys are appropriate, when nocturnal temperatures are greater than 7°C, avoiding prolonged or heavy precipitation.

Prior to survey, transect routes were walked during daylight hours, to make note, and to be avoid potential hazards during surveys.

A hand held 'Sat Map' navigational device, which incorporated aerial photography of the study area transect routes, further aided in the navigation during darkness.

Transect routes can be viewed in Figure 2 below.

3.2.5 Automated Bat Survey

An unmanned automated bat survey was completed at two locations, within the Timahoe North Bog. The Song Meter SMZC Bat Recorder was deployed at the two locations that were selected for their proximity to habitats, or features potentially valuable to bats, at strategic locations within the bog site. The bat detectors were deployed between the 31st of August and the 14th of September, 2016.

The SMZC bat detectors were set from half an hour before sun set, to half an hour after sunrise.

Calls emitted by bats that passed in the proximity to the SMZC detectors were recorded and their calls stored for later analysis. The SMZC detector system records bat ultrasonic calls on a continuous basis, and stores the information onto internal SD cards. The bat detector is effectively used as a bat activity data logger.

The locations of the automated bat surveys at ground level can be viewed in Figure 2 below.

[1] Bat Conservation Ireland (2012) Wind turbine / windfarm development bat guidelines, Version 2.8, December 2012.

[2] Bat Surveys: Good Practice Guidelines, 2nd Edition, Bat conservation Trust.

[3] The Bat Workers' Manual, 3rd Edition. JNCC, Peterborough.

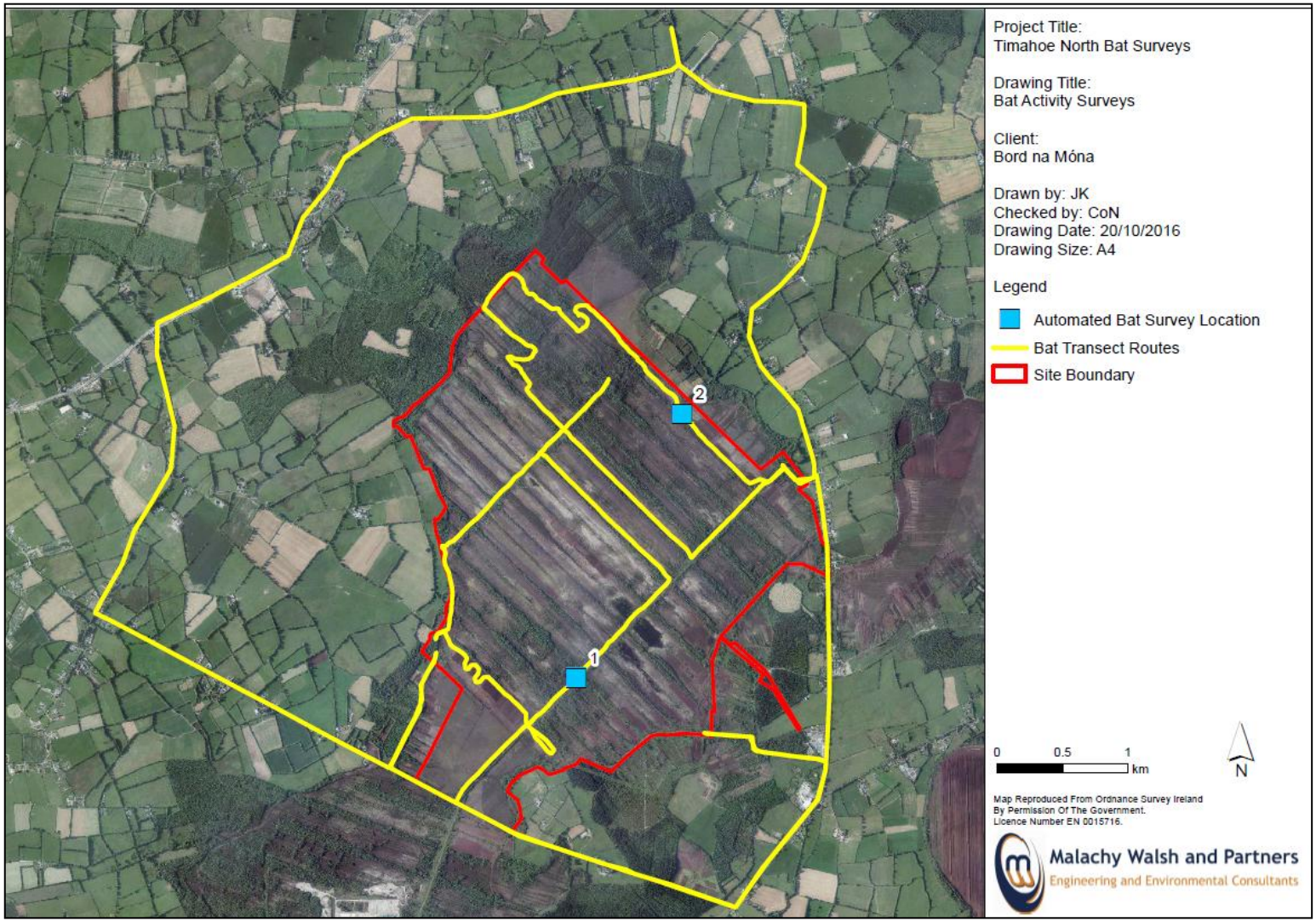

Figure 2: Bat activity surveys conducted at Timahoe North Bog (2016)

3.2.6 Survey Data Collation and Analysis

All data collected during bat activity surveys (transect, passive surveys from ground level and passive surveys from height) was downloaded and analysed using Kaleidascope and Analook software. Each time-stamped bat file was analysed. A single sound file can have bat passes from more than one species as well as calls from more than one bat of the same species. Where this occurs a bat pass was noted for each species. (e.g. two species identified in a time-stamped file).

Each bat sequence (series of echolocation pulses starting with a search phase, and ending with the catch phase) is noted as a bat pass. Each bat pass does not correlate to an individual bat, but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat, and therefore, it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass, is more likely to be indicative of individual bats.

The sound files collected were converted from .wac format to .wav, and zero crossing for sound analysis within Kaleidoscope software. This software can automatically sort sound files that contain only non-bat 'noise' from sound files that contain bat passes. The software can also 'tag' each call with a potential identification, according to similarities in call shape to archetypal call clusters within the database. This approach allows identification of bats to genus level for *Myotis* species, and to species level for other bats found in Ireland. Separation of *Myotis* species is complicated by the high degree of overlap between call characteristics.

Following Kaleidascope download, the bat tags were then checked using Analook software, and confirmed or corrected manually, since automatic classification is not yet accurate enough to rely upon in isolation for most species (Waters & Barlow, 2013). The manual identification was carried out by comparison with call parameters as set out in Russ (2012) and Barataud (2015).

Species identification of recordings was determined independently, by a minimum of two observers, if calls were not characteristic, and easily identifiable.

From analysing the sonograms produced during surveys, and habitats present at the location of bat activity, in combination with communications with Tina Aughney (BCI), made it was possible to separate Natterer's bat, from other *Myotis* species.

The following species abbreviations are used in this report:

- PIPI: Common pipistrelle (*Pipistrellus pipistrellus*)
- PIPY: Soprano pipistrelle (*Pipistrellus pygmaeus*)
- NYLE: Leisler's bat (*Nyctalus leisleri*)
- MYsp: A bat of the genus *Myotis*

3.3 BAT SURVEY CONSTRAINTS/LIMITATIONS

Bat surveys conducted were carried out within the optimal bat survey period, therefore were no constraints regarding the bat survey period.

Ecological surveys are limited by a variety of factors which affect the presence of flora and fauna such as season, climate, migration patterns and species behaviour. Even if evidence of bats is not discovered during tree inspections, this does not mean that bats are not present, or that they will not be present in the future.

As previously noted, this survey was undertaken inside the preferred summer months of May to September. However, the temperatures recorded during this survey were too low at late night/dawn to record any bat activity. Therefore, there were some survey constraints with regards to weather. However historical weather data available for the location conditions indicated that the weather conditions during time of survey were broadly typical for the location, and therefore did not pose a significant constraint to the survey.

4 BATS

4.1 BACKGROUND

In Ireland there are 10 known bat species of two families (*Rhinolophidae* and *Vespertilionidae*). These species are:

- ***Rhinolophidae*:**
  - Lesser Horseshoe bat (*Rhinolophus hipposideros*)
- ***Vespertilionidae*:**
  - Daubenton's bat (*Myotis daubentoni*)
  - Whiskered bat (*Myotis mystacinus*)
  - Natterer's bat (*Myotis nattereri*)
  - Nathusius' Pipistrelle (*Pipistrellus nathusii*)
  - Common Pipistrelle (*Pipistrellus pipistrellus*)
  - Soprano Pipistrelle (*Pipistrellus pygmaeus*)
  - Leisler's bat (*Nyctalus leisleri*)
  - Brown long-eared bat (*Plecotus auritus*)
  - Brandt's bat (*Myotis brandtii*)

4.2 LEGISLATIVE CONTEXT

4.2.1 The Wildlife Acts 1976 and 2000

All bat species are protected under the Wildlife Act (1976) and Wildlife [Amendment] Act (2000) which make it an offence to wilfully interfere with or destroy the breeding or resting place of these species; however, the Acts permit limited exemptions for certain kinds of development.

All species of bats in Ireland are listed on Schedule 5 of the 1976 Act, and are therefore subject to the provisions of Section 23, which make it an offence to:

- Intentionally kill, injure or take a bat;
- Possess or control any live or dead specimen or anything derived from a bat;
- Wilfully interfere with any structure or place used for breeding or resting by a bat;
- Wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose

4.2.2 The Habitats Regulations 1997-2005

The EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 92/43/EEC) seeks to protect rare and vulnerable species, including all species of bats and their habitats and requires that appropriate monitoring of populations be undertaken. All species of bat found in Ireland are listed on Annex IV of the Directive, while the lesser horseshoe bat is further protected under Annex II. The latter Annex relates to the designation of Special Areas of Conservation (SACs). Inclusion on Annex IV ('European protected species') means that member states are required to put in place a system of strict protection as outlined in Article 12. The Habitats Directive is transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011. These Regulations substantially strengthen the protection provided by the Wildlife

Acts, and in particular they remove all of the exemptions provided in Section 23(7) of the Wildlife Act insofar as they relate to Annex IV species, including all species of bats. All bat species are listed on the First Schedule and Section 23 of the Regulations making it an offence to:

- Deliberately capture or kill a bat;
- Deliberately disturb a bat;
- Damage or destroy a breeding site or resting place of a bat.

4.2.3 International Conventions

Across Europe, bats are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both conventions.

4.3 CONSERVATION STATUS

The overall conservation status for all resident bat species in Ireland, except Nathusius' Pipistrelle (*P. nathusii*) is 'Favourable' as is the evaluation of the individual attributes assessed, namely, Range, Population, Suitable Habitat and Future Prospects (NPWS, 2013). For Nathusius' Pipistrelle the overall conservation status is 'Unknown' due to data deficiencies regarding Range and Population attributes (NPWS, 2013).

4.3.1 Criteria for Bat Roosts of National or International Importance

There are no clear guidelines as to the nature of a bat roost of international importance. All of the largest roosts of lesser horseshoe bats in Ireland would be of international importance and it is expected that all large Leisler's bat roosts (in excess of 100) would also have international significance. The following table (Table 1) shows the working guidelines developed by the Bat Expert Panel of the Heritage Council in 2003 to provide a basis for comparing the importance of different building roosts nationally and international.

Table 1: Level of importance of different buildings roosts for bat species

Species	Indicator	Significance
Lesser Horseshoe Bat	Special Areas of Conservation (SACs) have been created for this species, throughout its European range.	Very significant
	If present	Significant
Whiskered	>10	Very significant
	If present	Significant
Natterer's	>10	Very significant
	If present	Significant
Daubenton's	Maternity roost	Very significant
Leisler's	Maternity roost	Very significant
Common Pipistrelle	Maternity roost	Significant
Soprano Pipistrelle	Maternity roost	Significant
Brown Long-eared	Maternity roost	Significant

Adapted from (NRA, 2005): Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes

5 RESULTS OF DESK STUDY

The presence of bats in an area is dependent upon a range of species habitat requirements being met which encompasses broad landscape patterns and local roosting conditions/characteristics as well as a sufficient prey resource. Factors such as habitat quality, including availability of prey items may significantly influence bat density within an area and can result in highly localised variation in abundance.

Studies have shown that bat activity has a positive correlation with insect abundance but, in addition, depends on the spatial heterogeneity of the available habitat (Kusch *et al*, 2004). The occurrence of bats in an area may be influenced by the presence of relatively smaller fragments of more favourable habitat within the greater landscape. These micro-habitats, or habitat patches, by their very nature, may be more vulnerable to environmental change. Therefore, it is important that individual ecological features within the broader landscape are assessed for their potential value as bat habitat.

5.1 HABITATS ASSOCIATIONS OF IRISH BATS

Bats can use a variety of landscapes or habitats throughout the year for foraging, roosting and commuting. They use hunting grounds or foraging habitats to find food and commuting habitats to travel between roosts and foraging habitats. Bats are the only mammal that is capable of true flight. In Europe there are 47 species, with 10 species of bats currently known to exist in Ireland. Irish bats are classified into two families, namely *Rhinolophidae,* (Horseshoe bats) and the *Vespertilionidae* (Common bats). Bats can use a variety of roosts, including resting sites, mating sites, giving birth and hibernation. The following table, Table 2 summarises the foraging and roost habitat associations of Irish bats.

Table 2: Summary of foraging and roost habitat associations of Irish bat species

Species	Foraging habitat	Roost habitat	Emergence times	Flying range
Brown long eared bat	Foraging habitat includes broad-leaved woodlands, tree lines, scrub, conifer plantations, gardens with mature trees, parkland, and orchards	Roosts in close association with foraging habitats, but avoids roosting in mixed agricultural areas, bog, marsh, heath and natural grassland. In Ireland, large open attics, tree holes, ruins, houses, churches and farm buildings.	Approx.1 hour after sunset	1/2km from roosts generally
Common pipistrelle/Soprano pipistrelle	Broad foraging niches (Russ 1999) which reflect their widespread occurrence in Ireland. Highly adaptive to changing landscape conditions and can occupy a range of different habitat types from urban areas to woodlands.	Houses, although they also roost in other locations such as tree holes, can be found in most habitat types except for very exposed areas. Confined areas in houses, behind hanging tiles, soffit boards or between roofing felt and roof tiles, rather than the main attic space.	Approx. 30 minutes after sunset	3/4km from roosts
Nathusius' Pipistrelle	The Nathusius' pipistrelle often forages over water or along forest tracks Mainly forest dwelling bat species. Forests including deciduous woodlands to dry coniferous forests. Use parks, farmland and woodland edges, rarely seen in urban settlements than other bat species. Prefer lowland areas.	Nursery roosts for their young can be found in tree cracks, crevices in building's walls and in caves, they sometimes share these roosts with common pipistrelle. Males tend to remain alone or may form small groups in the summer months. Winter hibernation roosts are established in more covered areas of cliff crevices, caves and tree hollows.	Approx. 30 minutes after sunset	Poorly known
Lesser horseshoe bat	Sheltered valleys near wooded countryside. Distribution in the west is strongly linked with broadleaved and mixed woodland and it usually forages in woodland and scrub.	Mainly in roofs of old houses or in outhouses, stables or old cottages. In winter this species hibernates in caves, disused cellars, mines and underground structures.	Approx 30-50 minutes after sunset	Typically feeds within 2km of roosts
Leisler's bat	Forages over a range of habitat types including over pasture, rivers, lakes, canals and forestry. It also hunts around streetlights and floodlights.	In Ireland, nursery roosts are chiefly located in attic spaces of buildings. There are also a few records of nursery roosts in trees.	Approx 15 minutes after sunset	Can feed up to 14 km of roots
Daubenton's bat	Surface of lakes, slow-moving rivers and canals.	Usual roost sites are under stone bridges, in ruins, canal tunnels, trees and damp caves.	40-60 minutes after sunset	6-10km form roosts
Natterer's bat	Can be found in woodland, mature hedgerows and pasture habitats.	Usual roost sites are in tree holes, old stone buildings such as churches and barns, and under bridges.	40-70 minutes after sunset	Generally 3km from roosts

Species	Foraging habitat	Roost habitat	Emergence times	Flying range
Brandt's bat/Whiskered bat	Typically forages along forest tracks, over mixed woodland, along hedgerows or over fresh water bodies.	Can be found roosting in attics of old buildings. Very few confirmed roosts in Ireland. It is also sometimes found roosting in crevices under stone bridges and in trees.	Approx.30 minutes after sunset	Poorly known

5.2 NBDC BAT HABITAT SUITABILITY INDEX

The National Biodiversity Data Centre (NBDC) online bat habitat suitability index layer was viewed on the 30th of August, 2016.

The results, outlined in Table 3 below, indicate that the habitats within the majority of the overall site are of relatively low value to bats in general, with an index of 24.22 towards the northern part of the site, and 18.89 towards the southern part of the site.

The highest rating for bat species at the Timahoe Bog, in terms of the habitat suitability index, was found to be Common Pipistrelle (*P. pipistrellus*), with a maximum index of 43. The lowest rating species across the site in terms of the habitat suitability index was Nathusius' Pipistrelle (*P. nathusii*), with an index of 2. Lesser horseshoe was the only species which was found to have a bat habitat suitability index of 0.

Figure 3 below shows the study area and the bat Habitat Suitability Index for the study area.

Table 3: Bat habitat suitability index rating for the Timahoe North Bog

Species	Bat Suitability Index	
	Southern part of site	Northern part of site
All bats	18.89	24.22
Common Pipistrelle	34	43
Soprano Pipistrelle	28	37
Leisler's bat	27	36
Brown long-eared bat	24	29
Natterer's bat	20	28
Daubenton's bat	17	27
Whiskered bat	18	18
Nathusius' Pipistrelle	2	2
Lesser Horseshoe bat	0	0

It must be noted, that the NBDC online bat habitat suitability index layers crossed over other habitats grassland bounded by hedgerows/treelines/woodland habitats etc., as well as the open cutover bogland and the re-vegetating cutover bog habitat, which by far was the most dominant habitat within the Timahoe North Bog.

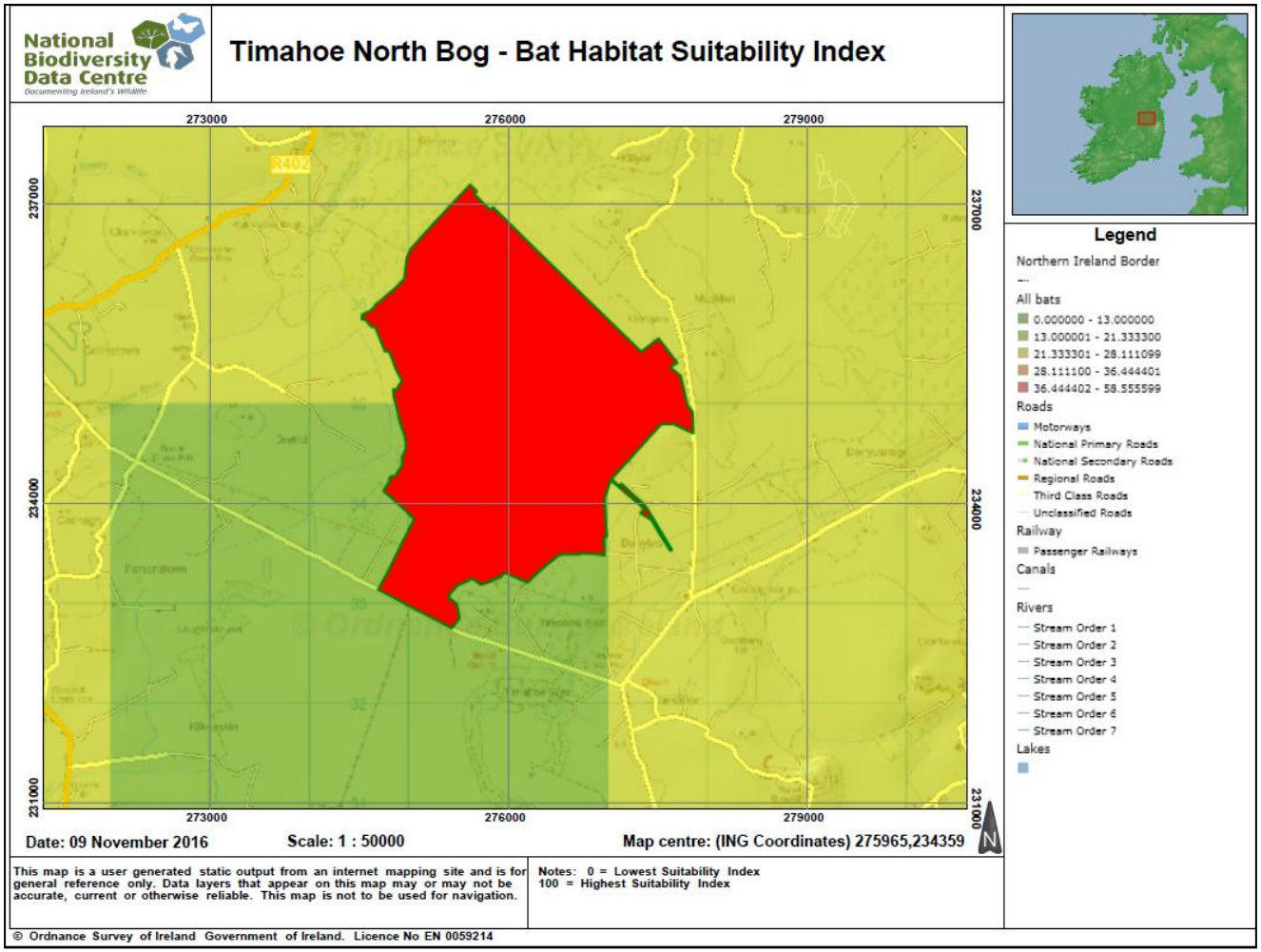

Figure 3: Bat Habitat Suitability Index for all bats at the Study area[4]

[4] http://maps.biodiversityireland.ie/#/Map

5.3 CURRENT SPECIES DISTRIBUTIONS

Current species distribution mapping is included in the Department of the Environment, Heritage and Local Government's most recently published report to the European Commission on the Conservation Status in Ireland of Habitats and Species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC (NPWS, 2013).

The following tables (Table 5 and Table 6), show the current known, or estimated distribution and range for bat species, within the 10km OSI grid squares that includes the Timahoe North Bog site (N73).

Table 4: Current species distributions within the relevant 10km grid squares, encompassing the Timahoe North Bog (NPWS, 2013[5])

Species	Current Distribution includes Grid Square N73	Current Range includes Grid Square 73
Common pipistrelle	No	Yes
Soprano pipistrelle[6]	-	-
Leisler's bat	No	Yes
Brown long eared bat	No	Yes
Natterer's bat	No	No
Daubenton's bat	No	Yes
Whiskered bat	No	No
Nathusius' pipistrelle	No	No
Lesser horseshoe bat	No	No

5.4 NATIONAL BIODIVERSITY DATA CENTER BAT RECORDS

The on-line mapping resource of the NBDC[7], allows users to search almost 2 million records available across 80 datasets. Data analysis tools enable users to refine data base searches by selecting 1km, 2km or 10km grid squares on the interactive map. All species records for the selected grid square are then available for download. The overall study area, encompassing the Timahoe North Bog is situated within the N73, 10km OSI grid square. The results of a search of the area within 10km squares N73 is outlined in Table 5 below.

[5] http://www.npws.ie/sites/default/files/publications/pdf/Article_17_Print_Vol_3_report_species_v1_1_0.pdf
[6] Based on the known or best estimate of distribution (NPWS, 2008)
[7] Available at : http://maps.biodiversityireland.ie/#/Map [accessed 24/03/2016]

Table 5: National Biodiversity Data Centre bat records (OSI 10km grid square N73)

Timahoe North Bog	
Species	**Grid Square (10km)**
	N73
Common Pipistrelle	Yes
Soprano Pipistrelle	Yes
Leisler's Bat	Yes
Brown Long-eared Bat	Yes
Natterer's Bat	No
Daubenton's Bat	No
Lesser horseshoe bat	No
Whiskered/Brandt's bat	No

5.4.1 Summary of Current Bat Species Distribution

The following table summarises the data from Tables 3 through to Table 5 above, in order to indicate the potential for presence, or absence of a species within the various parts of the site. Species are colour coded on the basis of the extent to which overlap occurs between the records retained by the NBDC, the current known distribution/range of the species, based on NPWS data, and the bat habitat suitability Index for bat species. The following assessment is an indicator of the likelihood of a species occurring within the site based solely on the information obtained during the desk study.

Table 6: Likelihood of species occurrence at the study area based on past records, known species distribution

Species	Ballydermot/Timahoe Bog Group		
	Record Retained by NBDC	Area Included in Current Known Distribution	Likelihood of Occurrence
Lesser Horseshoe Bat	No	No	Less Likely
Brandt's Bat	No	No	
Whiskered bat	No	No	
Nathusius' Pipistrelle	No	No	
Natterer's bat	No	No	
Daubenton's Bat	No	No	
Brown Long-eared Bat	Yes	No	More Likely
Leisler's Bat	Yes	No	
Soprano Pipistrelle	Yes	No	
Common Pipistrelle	Yes	No	

5.5 DESIGNATED SITES

5.5.1 Special Areas of Conservation (SAC)

The European Union Habitats Directive (Directive 92/43/EEC) requires Member States to designate areas for the protection of certain habitats and species, considered to be of Community importance and as listed in Annex I and Annex II of the Directive. These areas are known as Special Areas of Conservation (SACs) and are afforded strict legal protection. The Habitats Directive established the

Natura 2000 network which is a network of nature conservation areas extending throughout Europe. There are five SACs within 15km of the project site, as outlined in Table 7 below.

5.5.2 Special Protection Areas (SPA)

The European Union Directive on the Conservation of Wild Birds, known as the Birds Directive (Directive 2009/147/EC) requires Member States to designate legally-protected areas for the conservation of endangered or migratory species of birds, as listed on Annex I of the Directive. These areas are called Special Protection Areas (SPAs) and since 1994 all SPAs also form part of the Natura 2000 network of protected sites along with SACs. There is one SPA site within 15km of the Timahoe North Bog.

Both the EU Birds and Habitats Directives are implemented in Irish law under the European Communities (Birds and Natural Habitats) Regulations 2011.

5.5.3 Nationally Designated Sites

Under Irish legislation, sites considered to be of national importance in terms of nature conservation are designated as Natural Heritage Areas (NHAs) under the Wildlife Act (1976) and the Wildlife Amendment Act (2000). There are currently many additional sites throughout the country which are proposed as Natural Heritage Areas (pNHAs). However a consultative process with affected landowners is currently ongoing and until this is completed these pNHA sites are not subject to legal protection. There are three NHAs within 15 km of the Timahoe North Bog. Two of the pNHA sites overlap with SACs, as outlined in Table 7 below.

5.5.4 Nature Reserves

A Nature Reserve is an area of importance to wildlife, which is protected under Ministerial order. Most are owned by the State. However, some are owned by organisations or private landowners, and persons interested in acquiring statutory protection for their lands can seek advice on this matter from the Department[8]. There are no nature reserves within 15km of the Timahoe North Bog site.

[8] http://www.npws.ie/nature-reserves

Table 7: Designated sites within 15km of the overall study area

Site Name	Site Code	Proximity to the study area at its closest point	Descriptions
SAC Sites			
Ballynafagh Lake SAC	(001387)	Approx. 1.7 to the southeast	Shallow alkaline lake with alkaline fens, emergent vegetation, acid grassland, bog and heath. Supports many associated floral species, as well as Marsh Fritillary [1065] and Desmoulin's Whorl Snail [1016].
Ballynafagh Bog SAC and pNHA	(000391)	Approx. 6.6km to the southeast.	Raised bog underlain by low permeability subsoil and bedrock. Composed of a small core of high bog (70ha), surrounded by 90ha of cutover bog. The high bog has a core of active bog of 23ha. Supports Rhynchospora.
The Long Derries, Edenderry SAC	000925	Approx. 8km to the southwest.	[6210] Orchid-rich Calcareous Grassland*
River Boyne and River Blackwater SAC	(002299)	Approx. 10.3 km to the north/northwest	Comprises the freshwater element of the River Boyne and the Blackwater, as well as some of its tributaries. Supported habitats are Alkaline Fens, Alluvial Forrest, freshwater marsh and wet grassland. Otter, Salmon and River Lamprey are found here.
Mouds Bog SAC and pNHA	(002331)	Approx. 12.9km to the south.	Two basins of active raised bog separated by a central ridge, with areas of quaking bog with developed pools. Cutover bog occurs on the margins of the site. Red Grouse has been recorded on site. Margins are actively cut.
SPA Sites			
River Boyne and River Blackwater SPA	(004232)	Approx. 10.3km to the north	19 pairs of Kingfisher recorded in 2010, as well as Mute Swan, Teal, Grey Heron, Cormorant and Sand Martin.
NHA Sites			
Hodgestown Bog NHA	(001393)	Approx. 4km to the southeast.	odgestown Bog NHA is a site of considerable conservation significance comprising as it does a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. This site supports a good diversity of raised bog microhabitats, including hummocks. Ireland has a high proportion of the total E.U. resource of raised bog (over 50%) and so has a special responsibility for its conservation at an international level.
Carbury Bog NHA	(001388)	Approx. 4.5km to the west.	Carbury Bog NHA is a site of considerable conservation significance comprising of raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. This site supports a good diversity of raised bog microhabitats including some hummock/hollow complexes, scrub and marginal deciduous woodland which add to the diversity and scientific value of the site. The Red Data Book species, Round-leaved Wintergreen has been recorded on this site. This site is only one of a few remaining raised bog habitats in Co Kildare
Molerick Bog NHA	001582	Approx. 12.5km to the northwest.	The site consists of a small basin bog with a dry surface. Cutover is found all around the site, there is broadleaved woodland located to the south-west, wet woodland is located to the north-west, scrub to the east, humid grassland to the south, a flush/fen area to the west and humid grassland on mineral soil to the north-west.

5.5.4.1 Summary of designated sites

The qualifying interests for each of the nearby designated sites include peatlands, woodlands, 'bird species', including wildfowl and waders, aquatic and semi aquatic habitats and species. Bat species are not included in the conservation objectives of any of the designated site listed in Table 7 above. The qualifying interests of these designated sites can be viewed in Appendix 1.

5.6 PREVIOUS BAT SURVEYS

Preliminary baseline bat surveys were carried out in thirty three bog sites, within the Ballydermot/Timahoe Bog group and the Derrygreenagh Bog group in 2013 (Inis Environmental, 2013), and 2015/16 (Malachy Walsh and Partners, 2016). The following summarises the surveys conducted, and the conclusions of surveys at Timahoe North Bog.

- Surveys included bat activity surveys (transects (approx. 7km), and automated remote surveys at selected locations within the Timahoe North bog site.
- Four species of bat were encountered, namely Common pipistrelle, Soprano pipistrelle, Leislers bat, and *Myotis* species.
- The majority of the bat activity was encountered along the vegetated linear banks, along the old railway line, and the slow flowing stream (more like drainage ditch), a tributary of the Clogheraun Stream. Foraging and commuting bats were encountered.
- No large populations were observed/encountered during surveys. The site was mainly used by foraging and commuting bats.
- No bat roost sites were identified within the Timahoe North Bog.

6 RESULTS OF FIELD SURVEYS

6.1 STUDY AREA HABITAT DESCRIPTIONS (BASELINE ENVIRONMENT)

The study area includes Timahoe North Bog located in North County Kildare, approximately 2km to the northwest of Timahoe village, and approximately 5km to the east of Derrinturn. Timahoe North Bog covers approximately 700 hectares, situated on low ground, varying from approximately 70m to 90m OD.

Peat harvesting has ceased at the majority of the Timahoe North Bog for some time. As a result of the cessation of peat harvesting the dominant habitat type within the bog is scrub (WS1), which covers the vast amount of cutover bog at the site. Dominant species include birch, and willow. Gorse and bramble are present to a lesser degree. The extent of the scrub at the site has resulted in sections of the site becoming impenetrable, more over towards the northern and south central parts of the site.

Where peat harvesting is currently ongoing within the bog site (sections of cutover bog (PB4) in the north eastern and south western extremity), the vegetation is limited to vegetated banks/linear strips, separating the open bog fields, often connected to vegetated fringes of the site.

Towards the northern extremity of the site the land area has extensively re-vegetated with bog land species, with drainage ditches consumed with vegetation.

Watercourses draining the site include a network of large drainage ditches (FW4), and the slow moving un-named stream (FW2) (more like drainage ditch), a tributary of the Clogheraun Stream. The majority of the flow is to the southeast. Large bog pools and standing water (FL) occurs towards the northern and north central part of the site. At these locations, sometimes reed beds/sedge swamps (FS1) occurs at the transitional zone between the open water, and the terrestrial habitats.

Sections of conifer plantation (WD4) occur along the northern and south eastern boundary of the site. The dominant species by far is lodgepole pine. The Timahoe North Bog site is encircled mainly by agricultural grassland (GA1), bounded by a network of hedgerows (WL1), and treelines (WL2). The vegetated fringes of the sites, are often scrub and hedgerows, with the latter, often extending to scrub.

6.2 ACTIVITY SURVEYS (TRANSECTS)

On the night of the 31st of August walked and driven bat transects were carried out at the within and around the Timahoe North Bog site. A summary of the results can be viewed in Table 8 below. Figure 4 below shows the bat activity encountered along transect routes.

Table 8: Results of bat activity surveys (transects)

Timahoe North Bat Transect Survey								
Date	**Time**	**Temp**	**Rain**	**Cloud**	**wind**	**Bat activity (passes)**		**Other comments**
31/08/2016 01/09/2016	20.44 - 02.48	13°C - 9°C	No	4/8	No	PIPI within site	37	Moderate moth activity Barn owl call towards northern end of the site. MYsp encountered were tentatively identified as Natters bat.
						PIPI outside site	35	
						PIPY within site	16	
						PIPY outside site	14	
						NYLE within site	9	
						MYsp within site	2	
						MYsp outside site	1	
Totals						**Within site**	**64**	
						Outside site	**50**	

Transect route descriptions/approx. distance	
Access track with hedgerows/treeline	3.30km
Re-vegetating cutover bog	1.70km
Re-vegetating cutover bog/extending to scrub	1.90km
Conifer plantation edge	0.5km
Liner vegetated bank extending to extensive scrub through cutover bog	1.40km
Railway line with semi natural grassland/scrub/hedgerow	4km
Ripararian (drains/river/stream canal like) adjacent to cutover	1.30km
Open cutover bog	2.0km
Public road with hedgerow/treeline/stream/river crossings (outside/bordering site)	21km
Total transect length within site	**14km**
Total overall	**37km**

Transects conducted at study area had a combined length of approximately 37km. Of this approximately 14km were conducted within the Timahoe North Bog, of which 11km were walked transects. Transect routes followed Bord na Móna access tracks, unused railway tracks, scrub, open cutover bog, conifer plantation edge, and aquatic habitats at the site. Bat transects routes conducted outside the site mainly followed public road bounded by hedgerow individual trees, and treeline. The surveys were designed to include the spread of habitats throughout the study area, with scrub and cutover bog being by far, the dominant habitat type at the bog site. Bat transect surveys were designed to include potentially suitable foraging and commuting habitats far bat species. Transects, also extended out into open cutover bog. Habitats surveyed included scrub, cutover bog, drainage ditches, and vegetated linear strips, conifer plantation, treeline/hedgerow, and woodland edges.

Species encountered included Common pipistrelle (total bat passes: n=72) (63%), Soprano pipistrelle (total bat passes: n=30) (27%), Leisler' bat (total bat passes: n=9) (8%), and *Myotis* spp. (total bat passes: n=3) (2%). The *Myotis* passes encountered were tentatively identified as Natterers bat. Figure 4 below further illustrates the percentage breakdown of bat species activity encountered during bat transect surveys at the study area.

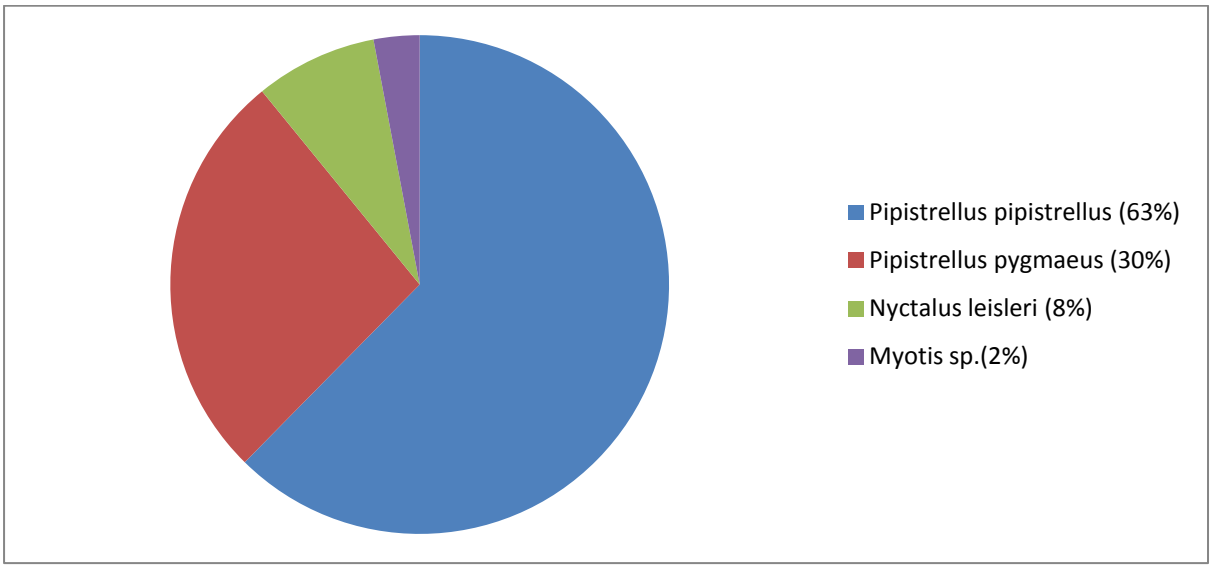

Figure 4: Percentage breakdown of bat species activity encountered during transect surveys at the study area

Within the Timahoe North Bog site the majority of the bat activity was encountered along the old unused railway line, particularly the more westerly line which runs southwest to northeast. Increased bat activity (foraging) was also encountered along dense scrub towards the northern end of the site. During time of survey it was noted that little to no human activity would occur at these locations. No bat activity was recorded on the open cutover bog habitats surveyed towards the north eastern end and south western ends of the site. The majority of the bat activity encountered was of foraging bats, followed by commuting bats, with little social passes recorded.

During bat activity surveys outside the site along the public road, bat activity was encountered along all the survey routes taken, with increased activity to the south and east of the bog site.

Figure 5 below shows bat activity encountered at Timahoe North Bog during bat transect surveys in 2016.

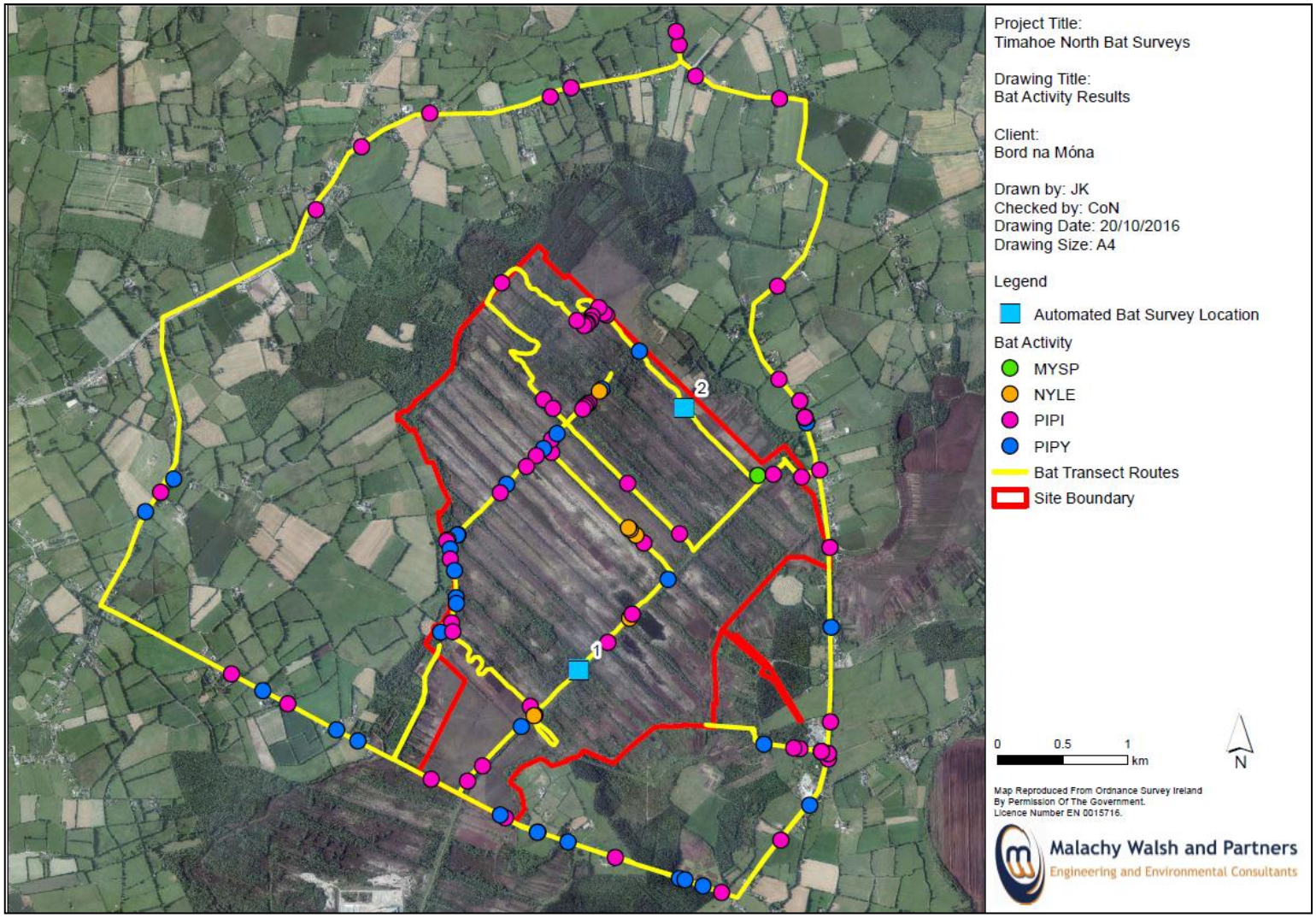

Figure 5: Bat activity encountered during bat transect surveys at Timahoe North Bog

6.2.1 Automated Bat Activity Survey

An unmanned passive bat activity survey was completed at two different locations within the Timahoe Bog site. This data supplements the information collected during transect surveys. Site No.1, is located towards the south western part of Timahoe North Bog, and site No.2 is located towards the northern part of the bog site. Figure 6 below shows the locations of the automated bat surveys. The SMZC bat detectors were deployed on the 31st of August 2016, and recorded for 15 consecutive nights. Habitats chosen within the site were those considered as suitable bat foraging and commuting habitat.

Table 9 and Table 10 below, summarises the results of the automated bat surveys, they include the locations where the SMZC bat detectors were placed, and the durations of the deployment at each location. A summary table is included in Appendix 2 showing dates and times of bat activity data recorded.

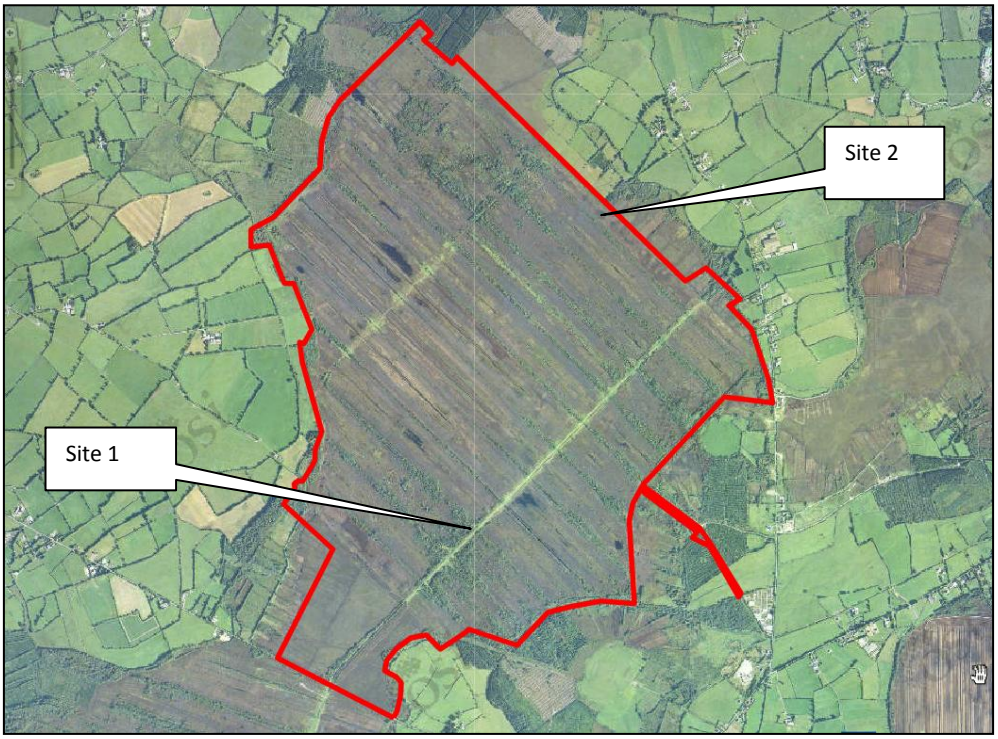

Figure 6: Location of automated bat surveys

Table 9: Summary of automated bat survey at Site No.1

Timahoe North Bog Passive Bat Survey (Site 1)			
SMZC Grid Ref.	Dates surveyed	Habitats	Summary of results (Bat passes)
N75759, 33786	31st August - 14th of Sept	Bat unit was deployed along the old unused BnM railway line. Semi-natural grassland occurs along the route, with willow/birch scrub, extending to semi natural woodland. Cutover bog to west and east has become scrubby.	PIPI: 42 PIPY: 45 NYLE: 105 MYsp: 7
Total bat passes			**199**

Bat acoustic survey session dates and weather						
31/08/2016	03/09/2016	05/09/2016	08/09/2016	10/09/2016	13/09/2016	14/09/2016
19˚C - 13˚C	19˚C -12˚C	23˚C -13˚C	18˚C -13˚C	17˚C -12˚C	16˚C -11˚C	18˚C -12˚C
Sunset: 20.19 Sunrise: 06.38	Sunset: 20.12 Sunrise:06.43	Sunset: 20.07 Sunrise: 06.46	Sunset: 20.00 Sunrise:06.52	Sunset: 19.55 Sunrise:06.55	Sunset: 19.47 Sunrise:07.00	Sunset: 19.45 Sunrise:07.02

The weather during the survey period was broadly typical for the location[9]. Therefore the weather did not pose a significant constraint to the survey.

Site 1: Looking west/northwest

Looking northeast along railway line towards location of Site 1

[9]http://www.accuweather.com/en/ie/timahoe/1078929/julyweather/1078929?monyr=7/1/2015&view=table

Table 10: Summary of automated bat survey at Site No.2

Timahoe North Bog Passive Bat Survey (Site 2)			
SMZC Grid Ref.	**Dates surveyed**	**Habitats**	**Summary of results (Bat passes)**
N76780, 36026	31st August - 14th of Sept	SMZC bat unit deployed in birch scrub in front of conifer plantation, to the north. Lodge pole pine dominates in woodland. Cutover bog to the south, which has re-vegetated greatly. Species include purple Moor grass, ling heather, some crossed leaved heath and cotton grass. Cutover bog (current peat harvesting) further to south and southeast.	PIPI: 195
			PIPY: 163
			NYLE: 186
			MYsp: 10
Total bat passes			**554**

Bat acoustic survey session dates and weather						
31/08/2016	03/09/2016	05/09/2016	08/09/2016	10/09/2016	13/09/2016	14/09/2016
19˚C - 13˚C	19˚C -12˚C	23˚C -13˚C	18˚C -13˚C	17˚C -12˚C	16˚C -11˚C	18˚C -12˚C
Sunset: 20.19 Sunrise: 06.38	Sunset: 20.12 Sunrise:06.43	Sunset: 20.07 Sunrise: 06.46	Sunset: 20.00 Sunrise:06.52	Sunset: 19.55 Sunrise:06.55	Sunset: 19.47 Sunrise:07.00	Sunset: 19.45 Sunrise:07.02

The weather during the survey period was broadly typical for the location[10]. Therefore the weather did not pose a significant constraint to the survey.

Looking north

Looking west

[10]http://www.accuweather.com/en/ie/timahoe/1078929/julyweather/1078929?monyr=7/1/2015&view=table

The SMZC bat detectors at the Timahoe North Bog site recorded the following species: Soprano pipistrelle, Common pipistrelle, Leisler's bat, and *Myotis* species. Bat activity was recorded at both sites. Fifteen consecutive nights of automated bat surveys were carried out at each location, which resulted in 753 bat passes. Leisler's bat was the most common recorded species, with 291 bat passes (39%), followed by common pipistrelle, with 237 passes (31%). Soprano pipistrelle had 208 passes (28%), while 17 bat passes were identified as *Myotis* species (2%). These passes were identified as Natterer's bat and Daubenton's bat.

The following figure (Figure 7) is a summary chart to further illustrate the results of the automated bat surveys at Timahoe North Bog.

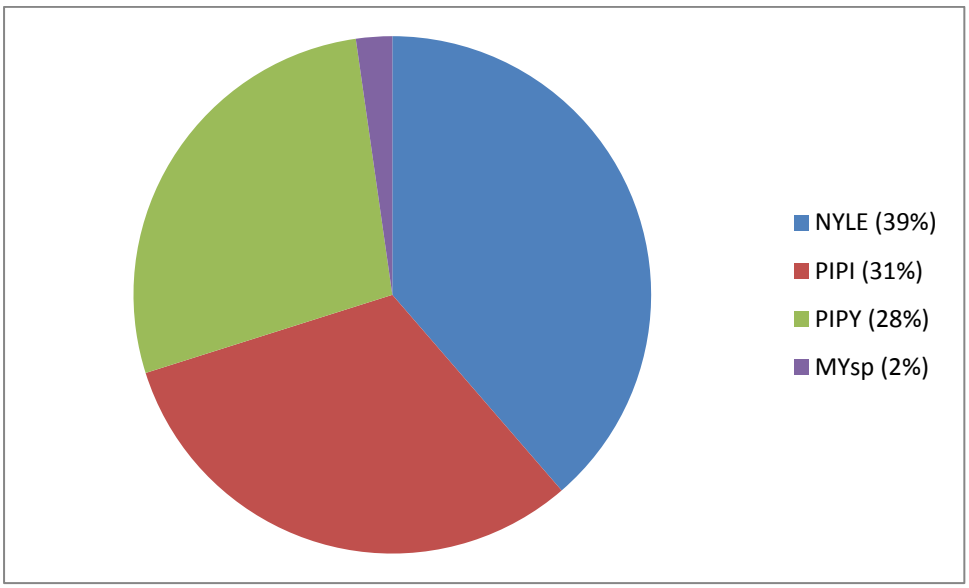

Figure 7: Percentage breakdown of bat activity during automated surveys at both sites surveyed at Timahoe North Bog

6.3 DAYTIME VISUAL ROOST SURVEY

Within the Timahoe North Bog there are no obvious structures that would support roosting bats. No buildings/unused/derelict buildings occur within the site. Watercourses within the site are culverted/piped crossings, and do not provide optimum roosting habitat for bats. The majority of the site is best described as scrub, with some open areas currently used for peat harvesting. These habitat types are not optimal for roosting bats.

The trees/sections of conifer plantation that occur within the Timahoe North Bog site are not mature enough to support optimal bat roost habitat. During the daytime survey on the 31st of August 2016 some individual trees/conifer plantation trees were investigated, with no signs of roosting bats.

Tress less than 80 years old are less likely to be selected as roosting sites by bats (FCEW, 2005), and conifers are less likely to be selected as roosting sites than broadleaf varieties (Kelleher et al., 2006). It is considered therefore that given the age profile and the type of trees within the site boundary, the woodland within the Timahoe North Bog site boundary has a low potential value as roosting habitat for bat species (See also Table 2, above), and is therefore primarily used as foraging/commuting habitat, rather than for roosting.

The roost potential within the greater surroundings outside the site, are excellent and numerous; roosting may occur in the dwelling houses, masonry bridges/structures, farm buildings or derelict buildings that occur in the greater area, outside the Timahoe North Bog site.

7 DISCUSSION

Baseline bat surveys were carried out at the study area to identify the level of bat activity using the Timahoe North Bog site, and how the bat species encountered are using the habitat types present at the study area. The dominant habitats at the site include scrub and re-vegetating cutover bog.

During transect surveys within the Timahoe North Bog the majority of the bat activity was encountered along the old railway lines that occur within the site, and where the scrub areas form more linear features, more over towards the northern end of the site, and the vegetated margin towards the western/south western end of the site where hedgerow/treeline bound agricultural grassland further to the west. In total 64 bat passes were encountered during the 14km of bat transects within the site. The amount of bat activity can be considered relatively low considering the distance of surveys routes travelled, conducted during optimal weather conditions for bats.

During transect surveys conducted within the bog site, Common pipistrelles, and Soprano pipistrelles were the most frequent species encountered, with 37 passes, and 16 passes respectively.

The results of the automated monitoring system yielded the highest amount of bat passes, due to the greater survey effort using this system. The automated monitoring allowed for surveys to be carried out over extended periods of time, and results gave a more complete level of bat usage at the locations surveyed. The results of the automated bat surveys are discussed in the following paragraphs without any visual observations during the night's surveys. These are extrapolated opinions, referring to likely behaviour, in relation to commuting/foraging bats.

During the automated survey period, sunset for the survey dates ranged from 20.19hrs - 19.45hrs, while sunrise ranged from 06.38hrs – 07.02hrs.

The automated bat survey at site No.1 located towards the south western part of the site recorded passes of Common pipistrelle, Soprano pipistrelle, and Leisler's bat on most nights, with the highest number of passes in one night being 38.

Site No. 1 is situated towards the southern end of the Timahoe North Bog site. The SMZC bat detector unit was deployed along the old unused Bord na Móna railway line at the edge of willow and birch dominated scrub to the west/northwest and the semi-natural grassland occurring along the old rail line. Further to the west/northwest and east/southeast, the willow scrub extends out into sections of semi-natural woodland. The scrub has taken over on the onetime cutover bog.

Bat activity was recorded eleven of the fifteen nights of survey. Overall bat activity was relatively low (considering the survey effort of 15 consecutive nights) during the fifteen nights of survey effort at Site No.1, with a total of 199 bat passes recorded.

For the most part bat activity began approximately one hour after sunset (commuting bats), with some scattered clusters of calls (foraging and commuting bats), throughout the middle of the survey nights. Where bat activity ran through the entire night, passes usually ceased at approximately 06.00

hrs. During the nights of survey, Leisler's bats were usually the first to emerge and the last to be recorded. The latest bat pass recorded at this site was of a commuting Leisler's bat at 06.11 hrs on the 3rd of September 2016. For the remaining survey nights, bat activity ceased over an hour prior to sunrise. Leisler's bat was recorded on all nights where bat activity was recorded and was the most recorded species with a total of 105 passes. The remaining species recorded included Soprano pipistrelle (n=45), Common pipistrelle (n=42), and *Myotis* spp. (n=7).

The results of the automated bat survey at Site No.1 indicated that bat species used the location in small numbers, mainly foraging and commuting bats. The results did not indicate the presence of a nearby bat roost for the bat species detected during time of survey.

Site No.2 is situated towards the northern part of the site, in re-vegetating cutover bog, in front of conifer plantation, dominated by lodge pole pine. At the location of the bat unit some saplings of lodge pole pine, birch and willow are growing in the re-vegetating cutover bog. Species include purple moor-grass, ling heather, some crossed leaved heath and cotton grass. Further to the south and southeast extending to the site access, a linear strip of the bogland was being used for peat harvesting.

Bat activity was recorded on 13 of the 15 nights surveyed (no bat activity recorded on the 9th and 11th of September), with a total of 554 bat passes recorded at Site No.2. Species recorded included Common pipistrelle (n=195), Soprano PIpistrelle (163), Leisler's bat (186), and *Myotis* spp (n=10). The highest numbers of bat passes recorded in one night was 97 passes on the 1st of September. Only 2 bat passes were recorded on the night of the 7th of September, which was likely due to poor weather conditions. The recordings started on most nights approximately 45 minutes after sunset, and bat activity usually ceased approximately 50 minutes before sunrise.

The results of the automated bat survey at Site No.2 indicated that the habitats at this location provide good commuting/foraging routes for bats.

Overall Common pipistrelle, Soprano pipistrelle, and Leisler's bat were the most commonly species recorded at the site.

The relatively recent discovery that the species formerly known as the pipistrelle (*Pipistrellus pipistrellus*) was in fact two separate but cryptic species, the Common pipistrelle and the Soprano pipistrelle, has been well documented (Barratt et al., 1997). O'Sullivan (1994) found 584 pipistrelle bat roosts during the National Bat Survey, the highest number for any species, and described it as the most abundant in Ireland and widely distributed. It is worth noting however that both species were considered to be the same at that time. It has been established following their separation that the common and soprano pipistrelles were the most common and second most common species encountered respectively (Roche et al., 2007).

Ireland's two smallest bat species (Common pipistrelle and Soprano pipistrelle), are the bats most likely to be seen flying around soon after dusk in both urban and rural areas. Both have a rapid, twisting flight as they pursue tiny prey of midges, mosquitoes and small moths. A single pipistrelle (weighing approximately 5-6g) may consume as many as 3,500 of these insects in one night (BCI, 2012). Summer roosts of soprano and common pipistrelles are normally in buildings (NPWS, 2009).

Pipistrelles are frequently found roosting in houses, although they also roost in other locations such as tree holes. In houses they prefer to occupy confined spaces such as behind hanging tiles and soffit boards or between roofing felt and roof tiles, rather than the main attic space (BCI, 2012, McGuire, 1998 and Allen et al., 2000).

Leisler's bat is the only member of the Genus *Nyctalus* in Ireland. In Europe, Leisler's bat is considered to be mainly a forest bat, roosting in tree holes (such as woodpecker holes) and bat boxes. However, in Ireland, nursery roosts for this species are primarily located in attic spaces of buildings. There are also a few records of nursery roosts in trees (McAney 2006).

No bat roosting sites were found within the Timahoe North Bog during surveys at the site, but it is possible that bat roosts are present within such a large area (the Timahoe North Bog itself), and potential bat roots sites are plentiful in the greater area extending away from the site.

It must be noted that no suitable bat roosting structures were observed during extensive bat surveys throughout the site, and the trees examined/observed were not mature enough to provide optimal roosting habitat for bats. Results of the automated bat monitoring surveys indicated that it is likely that bats were not roosting at the immediate locations of the monitors, considering that bat activity commenced approximately 45 minutes after sunset, and ceased approximately 1 hour before sunrise.

Table 11 below lists the recorded species at the site, associations with different roost types.

Table 11: Species associations with roost types (adapted from Kelleher et al., 2006)

Species	Trees		Buildings		Underground	
	Maternity	Hibernation	Maternity	Hibernation	Maternity	Hibernation
Common pipistrelle	M	M	H	H	N	L
Soprano pipistrelle	M	M	H	H	N	L
Leisler's bat	M	M	H	L	N	N
Natterers' bat	M?	M?	H	L	L	H
Daubenton's bat	M?	L?	M	L	M?	H

Trees- includes all types of crevice and hollow as well as bat-boxes attached to trees.
Buildings – above-ground areas, with an emphasis on roof voids and other areas warmed by the sun.
Underground – anywhere that provides cool humid conditions buffered against rapid temperature change. Includes caves, mines, tunnels, souterrains, fortifications, cellars, ice-houses, lime-kilns etc.

N – not recorded in recent times
L – low dependence; unusual, but has been recorded
M – some usage recorded, though perhaps not the most important type of site
H – the most frequently recorded type of site for this species/activity

Weak association with tree selection as roost site

Medium strength association with tree selection as roost site

Overall bat activity recorded during surveys described in this report had similar results to the previous baseline bat surveys conducted at the Timahoe North Bog. No bat roosts were identified at the Timahoe North Bog site during surveys conducted in 2013 and 2015. No large populations of bats were encountered during previoius surveys at the site. Species encountered during previous surveys included Soprano Pipistrelle, Common pipistrelle, Leisler's bat, and *Myotis* species. The majority of bat records during these surveys were recorded along the linear features of the old Bord

na Móna railway lines situated throughout the bog. Automated bat surveys conducted towards the southern end of the site during surveys in 2015 (in close proximity to automated survey at Site No. 1 described in this report) recorded similar species, however the activity of Leisler's bat during the previous surveys at this location were somewhat higher than results described in this report.

8 CONCLUSIONS

The following are conclusions of bat surveys outlined in this report.

- During bat surveys conducted at the site in 2016, the following species were identified using the Timahoe North Bog, and adjacent lands; Common pipistrelle, Soprano pipistrelle, Leisler's bat, *Myotis* spp. (including Natterer's bats and Daubenton's bat).
- Common pipistrelle, Soprano pipistrelle, and Leisler's bat were the most frequently encountered species.
- Surveys indicate that the habitats present provide good foraging, and commuting habitats for bats, but no large populations of bats were identified.
- During bat transect surveys within the Timahoe Bog site, the majority of the bat activity was recorded along the linear features of the old Bord na Móna railway lines located throughout the bog.
- During time of survey no bat roosts were identified within the Timahoe North Bog site.
- It is considered that for the most part, the trees occurring within the bog site are not mature enough to provide optimal roosting habitat for bats.
- The bat survey results described in this report are similar to previous baseline bat survey carried at the Timahoe North Bog site.

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Appendix 1

Qualifying Interests of nearby designated sites

Qualifying Interests of Nearby Designated Sites

Site Name (Site Code)	Qualifying Interests
Ballynafagh Lake SAC (001387)	• Alkaline fens [7230] • *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] • *Euphydryas aurinia* (Marsh Fritillary) [1065]
Ballynafagh Bog SAC and pNHA (000391)	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150]
The Long Derries, Edenderry SAC and pNHA (000925)	• Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]
River Boyne and River Blackwater SAC (002299)	• Alkaline fens [7230] • Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] • *Lampetra fluviatilis* (River Lamprey) [1099] • *Salmo salar* (Salmon) [1106] • *Lutra lutra* (Otter) [1355]
Mouds Bog SAC and pNHA (002331)	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150]
River Boyne and River Blackwater SPA (004232)	• Kingfisher (*Alcedo atthis*) [A229]
Hodgestown Bog NHA (001393)	• Peatlands [4]
Carbury Bog NHA (001388)	• Peatlands [4]
Molerick Bog NHA (001582)	• Peatlands [4]

Appendix 2

Bat activity data recorded during automated bat surveys

Timahoe North Automated Bat survey: Site 1	
Date	**Sound analysis details (Number of passes and species recorded)**
31/08/2016	**PIPI: 7 passes**; mostly foraging spread through early part of night, earliest was at 21.46.22, and no passes were recorded after 22.09. **PIPY: 4 passes;** all single passes, 2 feeding buzzes, earliest pass at 21.17.56, and last pass at 1.03.49. **NYLE: 27 passes;** practically all single passes spread throughout the night, earliest pass at 20.52.17, and last pass at 06.01.53.
01/09/2016	**PIPI: 1 pass;** single pass at 00.08.21. **PIPY: 3 passes;** 3 single passes, earliest at 0.035.59, and the last pas was at 05.55.54. **NYLE: 12 passes;** all passes spread through the night, earliest was at 21.03.24, and last pass was at 05.59.45.
02/09/2016	**PIPI: 3 passes;** earliest at 22.04.20, and latest at 22.29.57. 1 social pass. **PIPY: 10 passes**; spread through the night, earliest at 21.04.01, and last pass at 02.33.24. **NYLE: 4 passes;** earliest at 20.53.31, and latest at 06.03.02
03/09/2016	**PIPI: 4 passes;** earliest at 21.31.54, and latest at 22.03.30. **PIPY: 3 passes;** two foraging/feeding buzzes, earliest at 21.43.04, latest at 22.56.06. **NYLE: 12 passes**, all single passes, earliest at 20.47, and last pass at 06.11.40.
04/09/2016	**NYLE: 1 pass;** single pass at 05.25.14.
05/09/2016	**PIPI: 1 pass;** single commuting pass at 00.00.08. **PIPY: 3 passes;** earliest at 21.13.49, latest at 22.01.19. **NYLE: 11 passes**; earliest at 20.40.46, and latest at 05.25.17.
06/09/2016	**PIPI: 2 passes;** single pass at 22.41.18, and 23.18.20. **PIPY: 2 passes**; single pass at 20.45.03, and single pass at 22.18.07. **NYLE: 8 passes**; mostly early part of the night, earliest pass at 21.09.02, and last pass at 06.02.57.

Timahoe North Automated Bat survey: Site 1	
Date	**Sound analysis details (Number of passes and species recorded)**
08/09/2016	**PIPI: 4 passes**; all early in the night, earliest at 20.48.45, latest at 21.47.11. **PIPY: 3 passes;** earliest at 20.48.30, latest at 21.04.43. **NYLE: 9 passes;** all single passes spread through the night, earliest at 20.32.40, latest at 05.36.43. **MYsp: 4 passes;** earliest at 00.41.21, last at 02.07.00.
10/09/2016	**PIPI: 1 pass;** at 21.47.11. **PIPY: 1 pass;** at 21.04.03. **NYLE: 3 passes;** earliest at 21.32.01, latest at 05.36.43 **MYsp: 3 passes,** earliest at 23.19.31, last pass at 02.07.00
13/09/2016	**PIPI: 15 passes;** earliest at 20.39.55, and last pass at 02.53.23. **PIPY: 8 passes;** earliest at 20.44.59, last pass at 04.11.36. **NYLE: 8 passes**; earliest at 2.018.03, last pass at 02.48.51.
14/09/2016	**PIPI: 4 passes**; earliest at 22.15.10, last pas at 04.40.23. **PIPY: 8 passes;** earliest at 21.01.27, last pass at 23.25.03. **NYLE: 10 passes;** earliest at 21.06.17, last pass at 01.44.53.

Timahoe North Automated Bat survey: Site 2	
Date	**Sound analysis details (Number of passes and species recorded)**
31/08/2016	**PIPI: 48** passes; mostly foraging early in night, earliest pass was at 20.50.00, last pass was at 22.20.48. **PIPY: 3 passes;** single passes, earliest at 20.54, and last pass at 06.04.20. **NYLE: 26 passes;** single passes mostly early part of night and towards end of the activity, earlieat pass at 20.29.46, last pass at 06.12.45. **MYsp: 1 pass;** single pass at 22.46.27, this was likely a Natterer's bat.
01/09/2016	**PIPI: 10 passes;** earliest at 20.48.59, last pass at 6.03.37. Majority of activity early in the night. **PIPY: 62 passes;** majority of activity early in the night lull period until after 04.00hrs. Earliest pass at 20.34.04, and last pass 06.03.05. **NYLE: 24 passes,** earliest pass at 20.36.58, last pas at 05.52.17. **MYsp: 1 pass;** Identified as Natter's bat at 00.48.11.
02/09/2016	**PIPI: 45 passes;** earliest at 20.52, latest at 22.56.42. **PIPY: 2 passes,** earliest at 23.201.6, last pass at 05.57.11. **NYLE: 33 passes;** earliest at 20.34.11, last pass at 06.11.33. **MYspp.2 passes,** single pass at 01.06.57, and pass at 01.44.39.
03/09/2016	**PIPI: 1 pass;** single pass at 21.37.50. **PIPY: 1 pass;** single pass at 20.56.26. **NYLE: 3 passes,** earliest pass at 20.24.41, last pass at 00.40.23.
04/09/2016	**PIPI: 1 pass;** single pass at 21.00.49. **PIPy: 6 passes;** earliest at 20.48.32, last pass at 20.49.46. All fedding early in the night. **NYLE: 2 passes;** 2 single passes towards end of the night, first pas at 05.38.13,

Timahoe North Automated Bat survey: Site 2	
Date	**Sound analysis details (Number of passes and species recorded)**
	followed by pass at 05.45.55.
05/09/2016	**PIPI: 16 passes**; earliest at 20.44.25, last pass at 21.30.41. **PIPY: 2 passes;** earliest at 20.34.56, last pass at 20.49.46. **NYLE: 30 passes;** earliest at 20.20.55, and last pass at 02.34.07.
06/09/2016	**PIPI: 14 passes;** earliest at 20.34.36, last pass at 04.01.46. **PIPY: 11 passes;** earliest at 20.34.22, last pass at 23.12.35. **NYLE: 6 pases;** earliest at 20.30.48, last pass at 05.06.13. **MYsp: 2 passes,** single pass at 23.05.14, and single pass at 00.12.05.
07/09/2016	**NYLE: 2 passes;** single pass at 20.41.43, and single pass at 05.45.08.
08/09/2016	**PIPI: 2 passes;** single pass at 20.38, immediately followed by single pass at 20.38.57. **PIPY: 2 passes,** single p[ass at 20.33.57, and pass at 04.26.08. **NYLE: 11 passes,** earliest pass at 20.33.57, last pass at 05.08.56.
10/09/2016	PIPI: 12 passes; earliest at 20.30.11, last pass at 20.57.46. PIPY: 2 passes; single pass at 20.35.37, and single pass at 02.22.06. NYLE: 3 passes; earliest pass at 20.42.23, and last pass at 02.55.06.
12/09/2016	PIPY: 60 passes; a lot of foraging activity early in night between 20.30, and 22.00; earliest pass at 20.21.36, last pass at 06.21.43. NYLE: 19 passes; earliest pass at 19.44.56, last pass at 06.21.43. Majority of activity early in the night. MYsp: 1 pass; single pass at 00.46.30.
13/09/2016	PIPI: 36 passes; earliest at 20.23.30, and last pass at 0..36.58. PIPY: 10 passes; earliest pass at 20.22.01, last pass at 04.19.35. NYLE: 18 passes, earliest pass at 20.32.12, last pass at 02.27.11.

Timahoe North Automated Bat survey: Site 2	
Date	**Sound analysis details (Number of passes and species recorded)**
14/09/2016	PIPI: 10 passes; earliest at 20.27.24, last pass at 02.38.54. PIPY: 2 passes, single pass at 21.01.52, and single pass at 23.26.28. NYLE: 11 passes, earliest at 20.30.48, and last pass at 06.37.09. MYsp: 3 passes; earlieat pass at 22.14.21, and last pass at 22.43.01.

Appendix 3

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).