FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BALLINAGREE WIND FARM

VOLUME 2 – MAIN EIAR

CHAPTER 8 PART A – BIODIVERSITY

Prepared for: Ballinagree Wind DAC

Ballinagree Wind farm

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8A. BIODIVERSITY – TERRESTRIAL ECOLOGY

8A.1 Introduction

8A.1.1 Overview of the Project

This chapter of the EIAR describes the flora and terrestrial fauna in the receiving environment and assesses the potential impacts of the proposed wind farm development upon terrestrial ecology. The proposed project as described in detail in Chapter 3 of the EIAR will consist of a wind farm of 20 no. wind turbine generators (WTG's), 2no. permanent meteorological masts (PMM's), and 1 no. substation compound along with ancillary civil and electrical infrastructure. The project also includes infrastructure for community use in the form of walking trails.

The total Maximum Export Capacity (MEC) of the wind farm is between 118MW and 132MW. The exact MEC will be dependent on the output power of the models available at procurement stage. The proposed turbines will have a blade tip height of between 179m and 185m, a hub height range of between 102.5 and 110.5m and a rotor diameter range of between 149m and 155m as illustrated in the plans and particulars submitted with this application for consent. The plans and particulars submitted with this application for consent are precise and provide specific dimensions for the turbine structures which incorporates a small range in dimensions.

The exact make and model of the turbine will be dictated by a competitive tender process, but it will be within the range shown on the plans and particulars.

The associated grid connection route (GCR) will consist entirely of underground 110kV cable and will connect the on-site substation to the existing 110/220kV substation at Clashavoon, within the townland of Aughinida, Co. Cork. The GCR will be ca. 11.37 km in length, with ca. 9.35 km to be constructed primarily within the existing road corridor. The grid connection is shown in Figure 3-4 of the EIAR and described in detail in Section 3.3.4. A Grid Connection Constructability Report with provides a detailed description of the proposed grid connection infrastructure and construction methodologies associated with same is located in Appendix 3.3.

The Turbine Delivery Route (TDR) begins at the port of Foynes, County Limerick and approaches the wind farm site via the following roads: N69, M7, M20, N20, N72, R583 and L2758. Temporary accommodation works to facilitate turbine deliveries are proposed at lands contained within the following townlands: Dromagh, Dromskehy, Drishane More, Lackbane, Tullig, Drominahilla and Ballinagree East, Co. Cork.

Temporary accommodation works will be required at selected locations along the TDR to facilitate the delivery of large components to the site. The TDR and location of temporary accommodation works are shown in Figure 3.3 and described in detail in Section 3.3.5 (see Chapter 3 and Chapter 13 of the EIAR).

The project includes the opening of 3 no. borrow pits on site. The locations of the proposed borrow pits are shown in Figure 3.2 in Chapter 3 of the EIAR. The proposed borrow pits will provide site-won stone that will significantly reduce the amount of construction aggregates that will need to be delivered to site. The proposed borrow pits will also be reinstated with excavated soil material which will avoid the need to export excess spoil to off-site facilities.

The construction of the project in its entirety is expected to take between 18-24 months.

Further details including a construction programme used as a basis of assessments in this EIAR can be found in Chapter 3 of the EIAR. A Biodiversity Enhancement Management Plan (BEMP) that provides a commitment to conserve and enhance the biodiversity value of well over 300 hectares, over the lifetime of the wind farm, is presented in Appendix 3.4.

8A.1.2 Overview of Biodiversity in the Local Environment

The dominant habitats present within the proposed development works footprint are largely modified habitats; which include commercial conifer plantation, agricultural grassland and buildings and artificial surfaces (e.g. forestry tracks, local roads). The terrestrial flora, fauna and habitats in the vicinity of the proposed development, including along the GCR and TDR is assessed in this chapter of the EIAR. A Biodiversity Enhancement Management Plan (BEMP) with commitments to conserve and enhance the biodiversity value of well over 300 hectares of lands in the vicinity of Ballinagree, over the lifetime of the wind farm, is presented in Appendix 3.4.

The proposed wind farm is located close to a designated European conservation site, Mullaghanish to Musheramore Mountains Special Protection Area (SPA). The SPA is designated for the protection of Hen Harrier, *Circus cyaneus*, a bird of prey often associated with uplands and moorland. The northern part of the wind farm study area overlaps with part of the Boggeragh Mountains Natural Heritage Area (NHA), the qualifying interests of which relate to peatlands.

8A.1.3 Authors of the Biodiversity Chapter

8A.1.3.1 Ecology Ireland Wildlife Consultants: Statement of Competence

Dr Gavin Fennessy

Ecology Ireland Wildlife Consultants Ltd. were commissioned by the developer to conduct an ecological impact assessment in relation to terrestrial biodiversity for the proposed wind energy development at Ballinagree, Co. Cork. Dr Gavin Fennessy (BSc PhD MCIEEM) is the Director & Principal Ecologist of Ecology Ireland Wildlife Consultants, a consultant ecologist with over 20 years of experience in environmental consultancy. Dr Fennessy has contributed to and Project Managed numerous ecological impact assessment projects including EcIA, EIA, AA, SEA *etc*. Gavin is also an experienced Expert Witness having presented expert testimony at several An Bord Pleanála Oral Hearings. He is also an experienced lecturer and has regularly contributed to B.Sc. Env. Sc. courses at UCC. Dr Gavin Fennessy has led the ecological impact assessment and associated ecology team regarding terrestrial biodiversity at the proposed wind energy study area of the proposed project from 2017-2021.

Dr Katherine Kelleher

Katherine Kelleher is a graduate of University College Cork with a BSc in Zoology and PhD in Ecology, and established Kelleher Ecology Services in 2011. She has over 15 years of experience in ecological consultancy, acting as project manager on a range of ecological assessments & projects including solar/wind farm, road, gas pipeline, landfill, grid connection, industrial development, retail and housing. Katherine has significant experience of research, evaluative and analytical work in relation to planning applications, planning compliance, commitments, licensing, baseline assessments, scoping studies *etc*. Katherine has acted as assistant Project Manager and Peer Reviewer throughout the project.

Dr Daphne Roycroft

Daphne has over 10 years of experience in the field of Ecological Consultancy and holds a BSc and PhD in Ecology from the National University of Ireland, Cork. She is a self-employed Ecological consultant, trading as Croft Ecology. Daphne is experienced in the preparation of Ecological Impact Assessment Reports and Appropriate Assessment screening appraisals as well as Natura Impact Statements for a variety of projects including wind farms, solar farms, roads, pipelines, residential developments, ports and landfill sites. She has published research papers in several peer-reviewed scientific journals and has lectured on several degree and certificate courses in The National University of Ireland, Cork. Dr. Roycroft has led the avian impact assessment in this chapter.

Eamonn Delaney

Eamonn holds a B.Sc. (Hons) in Science, and M.Sc. in Environmental Science. Eamonn has 14 years' experience in ecological consultancy. Eamonn is a full and Chartered Member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Eamonn is a member of the Botanical Society of Britain and Ireland (BSBI) and regularly attends local and regional BSBI field meetings in addition to carrying out recording for the proposed Botanical Society of Britain and Ireland (BSBI) 2020 Atlas, in north Co. Galway and south Co. Mayo. Eamonn has extensive experience in habitat, botanical, ornithological and mammal surveying, Ecological Clerk of Works, habitat management and site-specific mitigation. Eamonn contributed to the reporting and impact assessment in this Chapter.

John Deasy

John is an independent ecological consultant with experience across a range of ecological disciplines including botanical and habitat surveys, bird surveys, mammal surveys and protected invertebrate surveys. He has over 7 years of experience as a professional ecologist and has undertaken a range of botanical and habitat surveys including baseline surveys for renewable energy projects, shared-use greenways and domestic and commercial properties. These surveys have included non-native invasive species surveys, rare species surveys and evaluations of habitats listed on Annex I of the EU Habitats Directive. John holds a MSc. in Ecological Assessment and BSc. in Earth and Environmental Science from University College Cork and is a member of the Botanical Society of Britain and Ireland. John carried out field surveys and contributed to the impact assessment in this chapter.

Michelle O'Neill

Michelle has over 12 years of experience working as an ecological consultant within the public and private sector on projects that include habitat and botanical surveys, breeding and winter bird surveys, mammal surveys, data analysis, assessment and report writing. She has a B.Sc. in Ecology and Diploma in Field Ecology. She also holds an NCVA in Computer Graphics. To date, she has completed habitat and botanical surveys for a range of projects as part of National Surveys, Ecological Monitoring, Ecological Impacts Assessments (EcIA/EIAR) and Appropriate Assessment (AA/NIS). She has a particular interest in botany and habitats and has worked on an Irish semi-natural grassland survey (2009—2012) and a habitat mapping project for the provision of a Teagasc pilot methodology for farmland habitat assessment of sustainability scheme. Michelle was the lead botanist in carrying out the botanical and habitat surveys as part of the proposed development.

Tom O'Donnell

Tom O'Donnell is a Chartered Environmentalist and a full member of the Chartered Institute of Ecology and Environmental Management. He was awarded a BSc in Environmental and Earth System Science [Applied Ecology] from UCC in 2007 and an MSc in Ecological Assessment in 2009, both from UCC. He has gained significant experience in ecological assessment and environmental management over the last 12 years of professional employment. Tom has particular experience in bat survey, bat conservation and bat call sonogram analysis using Kaleidoscope Pro.

Athena Michaelides

Athena Michaelides (BSc Zoology & Animal Biology) has over five years of experience as a professional ecological consultant. She is a former secretary of the Irish Wildlife Trust with particular experience in field surveys and reporting as part of Ecological Impact Assessments. Athena formerly was employed by Ryan Hanley Consulting Engineers and now works as an independent ecologist. Athena assisted in the desktop review and report compilation process and produced GIS mapping for this chapter.

8A.2 Methodology

The terrestrial biodiversity EIAR study involved undertaking field assessments and desktop review, which are described in the relevant sections below, taking due regard of guidelines relating to ecological assessments (e.g. EPA 2017, CIEEM 2018). The terrestrial study area encompasses the application site boundary as well as surrounding habitats considered relevant to terrestrial fauna. In this report the term 'study area' relates to the terrestrial study area as shown on Figure 8A.2 and the term 'application site' relates to the red line application boundary.

8A.2.1 Relevant Guidelines

Guidelines relevant to the terrestrial biodiversity assessment (surveys and assessments) are outlined in the corresponding sections below.

8A.2.2 Scoping & Consultation

Details of EIA Scoping, Consultation and Key Issues are provided in Chapter 5 of the EIAR. Section 5.2.1 outlines the responses to scoping requests sent to wide range of consultees. The responses provided with information directly relevant to the biodiversity assessment included those received from the Biodiversity Officer of Cork County Council, Inland Fisheries Ireland, Butterfly Conservation Ireland and the Development Applications Unit, Department of Culture, Heritage and the Gaeltacht. These scoping responses were considered when designing the survey programme for the terrestrial biodiversity impact assessment.

Information and feedback received during the consultation phase was also useful in highlighting key issues and considerations for the local environment. For instance, a consultation meeting was held between the project team and National Park and Wildlife Service (NPWS) on the 26th of May 2020. This provided an opportunity for the project ecologists to discuss with the NPWS, the sensitive ecological receptors in the wider area and to query historical sightings and records of key species.

Feedback and consultation responses from local groups and members of the public was also relayed to the project ecologists throughout the public phase of the project.

8A.2.3 Designated Nature Conservation Sites

Designated nature conservation sites in the vicinity of the wind farm, including the wind turbines and associated infrastructure as well as along the grid connection route and on the TDR were considered in detail as part of the terrestrial ecological assessment. Geographical Information Systems (GIS) software was used to map and measure the distance from the application site boundary to nationally and European designated conservation sites. In addition, consideration was given in planning a Biodiversity Enhancement and Management Plan (BEMP) for lands in the vicinity of the development to the proximity of the lands under consideration to designated nature conservation sites.

The potential for likely significant effects on European designated Natura 2000 sites arising from the proposed project is considered in the Screening Stage assessment which is included with the Natura Impact Statement (NIS) which accompanies this planning application. The Screening Stage identified that three Natura 2000 sites could be affected in the absence of mitigation, the NIS considered whether the proposed project could on its own, or in combination with other plans or projects adversely impact the integrity of any of these Natura 2000 sites, with reference to the sites' Conservation Objectives.

8A.2.4 Field Assessment & Desktop Studies

Terrestrial biodiversity field surveys were undertaken from 2017 to 2021 inclusive, where detailed survey schedules are available in Appendix 8A.1. The terrestrial biodiversity study area boundary is shown in Figure 8A.1. This study area was provided by the developer as a focus for field surveys, in that it was within this area that potential turbines and associated infrastructure were to be located.

For certain surveys, including those along the GCR and TDR, ecological data (both desktop and field studies) was collected beyond this 'study area'. Consideration was given in identifying lands for inclusion in the BEMP – developing and agreeing land management measures to conserve and enhance the biodiversity value of lands in the vicinity to the proposed wind farm.

8A.2.4.1 Habitats and Flora

Habitat & Flora Assessment

A desktop review of botanical data available for the study area was undertaken by consulting online databases to identify botanical species of interest (*e.g.* rare, protected) previously recorded within the relevant national grid squares that overlap the study area; in this case a review was undertaken of the W38 10km national grid square from the National Biodiversity Data Centre (NBDC) online database. A review of the Flora Protection Order (FPO) Map Viewer – Bryophytes database as held by the NPWS was also reviewed (20th September 2021).

The habitat and flora site assessment was carried out in accordance with current Irish habitat survey guidelines (Smith *et al.* 2010). This involved a walkover of the study area where the dominant habitats present were classified according to Fossitt (2000) and recorded on a field map (see Appendix 8A.1 for survey dates). The proposed grid connection route between the wind farm and the proposed grid connection point at the existing Clashavoon substation was surveyed through a combination of walkovers and windscreen surveys. The botanical survey was conducted in-parallel with the habitats survey, where botanical species were identified and recorded according to dominant habitat type, with abundance documented using the DAFOR Scale (*i.e.* **D**ominant, **A**bundant, **F**requent, **O**ccasional and **R**are). Any other records of interest (*e.g.* invasive plant species) were also noted. Where applicable, additional vegetative community classification was completed through a review of the online resource Engine for Relevés to Irish Communities Assignment (ERICA) a web application provided by NBDC (in association with BEC Consultants Ltd. and NPWS), which can be used to assign dominant vegetative data collected to groups or communities as defined by the new Irish Vegetation Classification IVC system (Perrin 2019). ERICA works with both quantitative vegetation cover data (*e.g.* relevés/quadrats) and presence/absence data, such as species lists. Relevés were not required to classify dominant habitats present at the study area. In this instance the only habitats where further classification was of relevance or beneficial in describing the vegetative communities was in relation to the grassland and heathland habitats.

While as far as possible, the proposed windfarm layout has been designed with reference to the habitat surveys undertaken, avoiding areas of high value habitats identified, and as such availing of habitats of lower local importance (*i.e.* commercial conifer plantation WD4), on occasion, due to other design constraints, it was necessary to consider some areas of upland habitat for the proposed infrastructure. As a result, relevés/quadrats surveys were completed for two upland locations under consideration as both areas, as a whole comprise complex and often intrinsic mosaic habitat where the possibility of higher conservation value habitat occurring was more likely. The quadrat data collected was uploaded, analysed and as far as possible assigned to a division group and community type via input to ERICA database. Where applicable additional information on potential Annex I habitat quality was obtained with reference to the Guidelines for national survey and conservation assessment of upland vegetation and habitats in Ireland (Perrin *et al* 2014).

The conservation status of habitats and flora was considered in respect of the following: Irish Red Data Book for Vascular Plants (Wyse Jackson *et al.* 2016); Red List of Bryophytes (Lockhart *et al.* 2012); Flora Protection Order (2015); the EU Habitats Directive (92/43/EEC). Evaluation of the habitats present in terms of their ecological value was assessed using criteria amended from NRA (2009) and Nairn and Fossitt (2004); see Appendix 8A.2.

8A.2.4.2 Avifauna

Avian field surveys at the site comprised of the following: multi-season vantage point surveys, breeding season Hen Harrier hinterland surveys, general breeding and wintering season transect and point count surveys and a Red Grouse *Lagopus lapopus* survey. Survey design and extent was based on the professional knowledge of the project team and refined through the scoping and consultation process and with reference to a review of desktop information. Detailed survey methodologies are provided below.

In addition to the field surveys, a desktop study was also undertaken by consulting the National Biodiversity Data Centre (NBDC) online mapping database[1] to identify additional avian species historically recorded within the relevant W38 10km national grid square overlapping the terrestrial biodiversity study area.

The conservation status of bird species was considered in respect of the following: Irish Wildlife Acts (1976 – 2012 as amended); Birds of Conservation Concern in Ireland (BoCCI) Red, Amber and Green lists (see Gilbert *et al*. 2021); EU Birds Directive (2009/147/EC) Annex I list.

Consultation was also undertaken with the Development Applications Unit (see EIAR Volume 2, Chapter 5, Section 5.3.6). Supplementary information on Hen Harrier nesting activity in the hinterland was received from the local National Parks and Wildlife Services (NPWS) Ranger and information on Barn Owl *Tyto alba* nests in the area was received from Birdwatch Ireland (John Lusby). It is very important to note that such consultation only involved discussion of the relevant species relative to the location/locality in question to inform Ecology Ireland's EIAR assessment and did not constitute an opinion from the consultation parties on the proposed project under consideration here.

Vantage Point Survey

Standard vantage point (VP) field surveys were undertaken with due regard to NPWS VP methodology recommendations (see Appendix 8A.3) and guidance by Scottish Natural Heritage (SNH 2017).

SNH 2017 guidelines recommend that breeding/winter season surveys for target bird species be completed as part of assessments of proposed wind farm sites, with typically 6 hours of coverage per month from each VP location per season, resulting in 36-hours of survey effort per VP in each survey season (SNH 2017). Target species here included raptors, waterbirds and other high conservation value species, such as Hen Harrier (a qualifying species of the nearby Mullaghanish to Musheramore Mts. SPA) and any other Annex I species such as Peregrine Falcon *Falco peregrinus*, Merlin *Falco columbarius* and Golden Plover *Pluvialis apricaria*.

[1] https://maps.biodiversityireland.ie/Map

A total of six vantage point locations were initially used for the VP surveys completed at the site in 2017 and 2018 (see outline below), however the study area was increased during the 2019 breeding season in response to an expansion of the study area boundary as follows; an additional two VPs (VP7 and VP8) were incorporated from March 2019 and a further two VPs (VP9 and VP10) were incorporated in July and August 2019. These 10 VPs were utilised for all subsequent VP surveys at the study area (see summary below and Figure 8A.2).

The VP surveys completed at the terrestrial biodiversity study area are outlined as follows (see Appendix 8A.1 for survey schedules):

Summer/Breeding Season VP Surveys (March to August inclusive):

- Summer 2017 (6 VPs, 36 hours survey effort + 5km hinterland survey)
- Summer 2018 (6 VPs, 36 hours survey effort + 5km hinterland survey)
- Summer 2019 (8 VPs from March to August inclusive, 36 hours survey effort + 5km hinterland survey; additional 2VPs in July & August with a total of 12 hours survey effort for these two additional VPs in Summer 2019)
- Summer 2020 (10 VPs, 36 hours survey effort + 5km hinterland survey)

Winter Season VP Surveys (October to March inclusive):

- Winter 2017/2018 (6 VPs, 35.5 hours survey effort due to very inclement weather conditions where visibility became severely compromised)
- Winter 2018/2019 (6 VPs, 36 hours survey effort)
- Winter 2019/2020 (10 VPs, 36 hours survey effort)
- Winter 2020/2021 (10 VPs, 36 hours survey effort)

All bird species heard or seen during the VP watches were noted. Detailed field records were taken of target species (heard or seen) with as much of the following information recorded as possible:

- Species and estimated number
- Time first observed; Duration of observation; Estimated time on-site; Estimated time off-site (note that the expanded study area boundary was used for calculations of on and off-site times in all survey seasons including 2017 and 2018).
- Flight-line – drawn on a field map and numbered to link with associated field notes
- Estimated flight height – initial height estimate and any marked change noted during period of observation: 0-5m AGL (Close to ground) 5-25m AGL (Low Flight) 25-100m AGL (Medium Flight height) 0>100m AGL (High Flight Height)
- Any other observations of note: behaviour, association or interaction with other species *etc*.

Field surveys were undertaken using appropriate survey equipment as required (*e.g.* GPS units, binoculars, scope, notebooks *etc*.) and during suitable weather conditions. All field observers communicated with two-way radios/mobile phones to allow co-ordination in the event that a Hen Harrier, or other noteworthy (i.e. Annex I) species, was observed at or close to the site. The December and January 2017/2018 winter VP surveys (6 VPs across three dates from December 2017 to January 2018) overlapped with the onset of sunset/dusk that allowed an opportunity to note any Hen Harrier winter roosting activity.

Dr. Gavin Fennessy (Ecology Ireland) is an authority on collision risk and birds. He carried out Post-Doctoral research on collision risk and aircraft and has presented papers at a number of international conferences on wildlife hazard. He is retained as the advisor to Dublin Airport Authority on management of bird-strike risk at airports in Ireland. He is critical of the reliance of Collision Risk Modelling (CRM) which is prevalent in the UK. The 'Band' model which is widely used in avian collision risk assessments for wind farms is not evidence based and the driver of the model ('avoidance rate') is generally derived without any observational data. The weaknesses inherent on a reliance on CRM are recognised (e.g. Madsen & Cook 2016) but the methodology is still widely used, albeit less so in Ireland than in the UK. We prefer instead to describe the occurrence and flight behaviour of the birds at the proposed wind farm with a knowledge of the ecology and behaviour of the species.

Data are presented in this report as flightline observation tables with corresponding flightline maps. In addition, the proportion of time spent by Hen Harriers and other Annex I species on and off the site during the survey is calculated. Specific data/mapping relating to sensitive nest site locations will not be displayed in this report.

Hinterland Survey

Early and late season hinterland surveys (Hardey *et al*. 2013) were also completed in each of the four breeding season surveys to record any Hen Harrier nest sites within 5km of the terrestrial biodiversity study area. This involved a survey of Hen Harrier occupancy within 5km of the site during the bird breeding season. Suitable Hen Harrier nesting and foraging habitats within 5km of the study area were also noted. These areas, together with known historical nest sites, were then observed for Hen Harrier activity using a combination of transects and viewing points (see Appendix 8A.1 for survey schedule).

As for the VP surveys, the hinterland surveys also recorded other species of conservation importance such as Annex I species.

General Bird Transect/Point Count Surveys

Standard general breeding bird transect and point count surveys (Bibby *et al.* 2000) were undertaken at the terrestrial biodiversity study area as follows (Figure 8A.2; where additional transects and point counts were added in 2019 due to an expansion of the study area boundary):

Summer/Breeding Season General Bird Surveys (Early and Late Season):

- Summer 2017 (5 transects, 6 point counts)
- Summer 2018 (5 transects, 6 point counts)
- Summer 2019 (7 transects, 8 point counts)
- Summer 2020 (7 transects, 8 point counts)

Winter Season General Bird Surveys:

- Winter 2017/2018 (5 transects, 6 point counts, 3 surveys)
- Winter 2019/2020 (7 transects, 8 point counts, 2 surveys)

Transects were *c.* 500m in length and located in open habitats, while point-counts were of 5 minute duration and were located in closed/forestry habitats. These were established throughout the study area to survey the baseline general bird assemblage in the study area (see Figure 8A.2). These transects/point counts were surveyed twice in each breeding season (*i.e.* early and late periods of the nesting season) and 2 - 3 times in each wintering season surveyed.

At each transect/point count, all bird species encountered (seen or heard) within 100m of the observer were recorded and their abundance noted. The total number of birds per species was derived by adding abundance data from all transects from each survey visit; this allowed a measure of relative abundance to be examined for all bird species recorded during the transect study. The same was done with the point count data. The maximum count per visit was then derived for each species and used for subsequent analysis and interpretation of results.

Bird species occurring more than 100m from the observer or flying over the site and not using it during the transect/point count surveys, noted when walking between transects/point counts or casually noted during other aspects of the biodiversity field study (*e.g.* VP surveys), were not included in subsequent abundance analysis, but were considered as 'additional' species for subsequent consideration. This approach allowed a current taxa list of the birds present at/near the study area to be generated.

Red Grouse Survey

Given the nature of the habitats present and the historical presence of the species in the area, a standard Red Grouse study adapting NPWS/Birdwatch Ireland's transect-based 'tape-lure' methodology was undertaken in late March 2019 under NPWS licence (Licence No. 33/2019). Two observers simultaneously walked a total of three paired parallel transects to cover sections of the study area where potential Red Grouse habitat is available (see Figure 8A.2). Observers kept in touch by two-way radio throughout. Transect lengths varied from 590 – 1,000m and distances between paired transects ranged from *c.* 70 – 250m, as constrained by existing ground features/habitat.

At set distances along the paired transects, both ecologists stopped and one played the call of a male Red/Willow Grouse from one of the paired transects using a megaphone in order to illicit a response from any Red Grouse present. Initially, the call was played for 10 seconds at each set distance, where both ecologists listened/scanned for a response by Red Grouse for 30 seconds. The call/response were re-played for the same time period if no response was noted, before moving onto the next distance point. All responses to the call were noted, as well as any signs of Red Grouse (*e.g.* droppings, pellets and feathers) while walking the transects. Any Red Grouse signs or sightings observed during other ecology field surveys, but outside of the dedicated tape-lure survey, were also noted.

8A.2.4.3 Non-Volant Mammals

Non-volant mammal field surveys at the terrestrial biodiversity study area comprised of walkovers and long-term deployment of multiple wildlife trail cameras that were supplemented by casual records made in the course of other terrestrial field surveys (e.g. night-time bat surveys, VP surveys). Details of the dedicated schedule and trail camera deployment dates are provided in Appendix 8A.1, with trail camera locations shown in Figure 8A.3.

During the walkovers, all sightings and signs of mammal species or signs of mammal activity (e.g. droppings, tracks, burrows, setts, holts etc.) were recorded using field notes and/or hand-held GPS units. Techniques used to identify mammal activity followed recognised guidelines (e.g. Clark 1988, Sutherland 1996, Bang & Dahlstrom 2004 and JNCC 2004).

Trail cameras were deployed at 35 locations from May 2017 to late 2020 to record mammal activity in the study area (Figure 8A.3). These trail cameras ('camera traps') are small camera units that are left in situ to record mammals that pass close to the deployment locations. The trail camera deployments were for an average of 76 days (range: 8-293 days). In post-hoc analysis of the camera data, a record is counted if there has been at least 5 minutes between (photo/video) triggers for that particular species. That means if an animal (or group of animals) is present in the area for a prolonged period (e.g. grazing deer) that multiple triggers caused by the consistent presence over that period will not be overrepresented in the analysis.

To provide the most complete contemporary information on the mammal presence and activity near the proposed turbine locations, a dedicated walkover survey was completed in June-July 2021 (see Appendix 8A.1 for survey schedules). In this case, all accessible areas within 50m of the proposed turbine locations were checked for evidence of the presence of resting or breeding places of protected mammal species.

A desktop study of non-volant mammal data was also undertaken by consulting the NBDC online mapping database to identify species historically recorded within the relevant W38 10km national grid square overlapping the terrestrial biodiversity study area.

The conservation status of mammals was considered in respect of the following: EU Habitats Directive; Irish Wildlife Acts (1976 - 2012 as amended); Red List of Terrestrial Mammals (Marnell et al. 2019).

8A.2.4.4 Bats

Bat field surveys at the terrestrial biodiversity study area comprised of (i) general passive and active detector surveys and (ii) a passive detector study taking due regard to guidance from SNH (2019; subsequently revised as NatureScot 2021). Survey methodologies are described below. The conservation status of bats was considered in respect of the following: Irish Wildlife Acts (1976 - 2012 as amended); Red List of Terrestrial Mammals (Marnell *et al.* 2019); EU Habitats Directive. Survey guidance issued and amended more recently e.g. NatureScot (2021) and NIEA (2021) post-dated the design of the field surveys carried out for the proposed development.

General Study: Passive & Active Detector Surveys

General bat surveys at the terrestrial biodiversity study area commenced in May 2017 and continued into Autumn 2019 taking due regard of best practice guidelines (Collins 2016, Kelleher & Marnell 2006, Roche *et al*. 2009). Details of the survey schedule is available in Appendix 8A.1, with passive detector locations shown in Figure 8A.4.

As outlined in Appendix 8A.1, several dusk emergence surveys were carried out at structures identified as having roost potential during daylight site visits. This involved two ecologists, each with handheld time expansion detectors (Wildlife Acoustics Touch Pro 2 and Pettersson D240x outputting to Roland Edirol R01 Digital Recorder) and strong torches, monitoring bat activity at the structures in question. The dusk emergence watches were carried out from *c*. 30 mins before dusk to *c.* 1 hour after sunset. Bat registrations on the detectors and sightings observed were noted with the recorded calls later analysed using Kaleidoscope Pro software.

Active bat surveys involved two ecologists undertaking driven/walked transects at the study area, recording bat activity and mapping the location of these registrations using handheld GPS units. The driven transect methodology followed that described in Roche *et al*. (2009). Two active surveys were carried out during the months of peak bat activity in each year from 2017 to 2019 (see Appendix 8A.1). Recorded bat calls were later analysed using Kaleidoscope Pro software, while the distribution of bat records in each year was mapped using MapInfo Professional GIS software.

Passive bat detectors (Wildlife Acoustics SM3BAT and SM4BAT full-spectrum) were deployed across the study area between May 2017 and August 2019 (see Appendix 8A.1 and Figure 8A.4). Detectors were set to record bat calls (i.e. bat passes) from 30 minutes before sunset until 30 minutes after sunrise where GPS locations were set on each detector so that the units could automatically adjust their start and finish times based on sunrise/sunset times relative to the GPS locations. The average duration the detectors were deployed at the 26 sampling locations was 22.2 nights (range: 5-56 nights). The deployment locations were chosen to sample a range of habitat types and features within the study area (e.g. forest clearing, riparian corridor) and detectors were deployed to sample activity across the seasons (see Appendix 8A.1). The recorded bat calls were later analysed using Kaleidoscope Pro software, where the bat calls were recorded onto SD cards within the passive detectors. It is important to note that passive bat recordings are a measure of bat activity rather than a measure of abundance as recordings from the same species cannot be readily distinguished between individuals per se, especially in the absence of observations (see Collins 2016). In this case, a bat call or bat pass was defined as a recording of an individual species echolocation within a recording of up to 15 seconds duration (as prescribed in the settings for each Wildlife Acoustic SM4/Mini full-spectrum unit), thereby allowing comparison of bat passes between passive monitoring units in this study.

SNH Adapted Passive Detector Study

A multi-season passive detector study was carried out in autumn 2019, spring 2020 and summer 2020 taking due regard of guidance from SNH (2019), with modifications applied for an Irish context (see below). Details of the survey periods is available in Appendix 8A.1, with passive detector locations provided in Figure 8A.5.

Passive bat detectors comprised of Wildlife Acoustic SM4/Mini full-spectrum units that were deployed at a height of approximately 2m above ground level where possible. Detectors were set to record bat calls (i.e. bat passes) from 30 minutes before sunset until 30 minutes after sunrise where GPS locations were set on each detector so that the units could automatically adjust their start and finish times based on sunrise/sunset times relative to the GPS locations. Bat calls were recorded onto SD cards within the passive detectors to allow post-hoc species identification of bat recordings through sonogram analysis. The recorded bat calls were processed and automatically identified using Kaleidoscope Pro software (V. 5.4.1) and the British Trust for Ornithology (BTO) 'Acoustic Pipeline' sound analysis tool. Automatic identifications were manually reviewed and verified following Russ (2012).

It is important to note that bat recordings are a measure of bat activity rather than a measure of abundance as recordings from the same species cannot be readily distinguished between individuals per se, especially in the absence of observations (see Collins 2016). In this case, a bat call or bat pass was defined as a recording of an individual species echolocation within a recording of up to 15 seconds duration (as prescribed in the settings for each Wildlife Acoustic SM4/Mini full-spectrum unit), thereby allowing comparison of bat passes between passive monitoring units in this study.

The passive detector survey locations were informed by the proposed turbine layout available at the time of deployment, where the likelihood of design changes is acknowledged in SNH (2019). In this case, there were changes with proposed turbine locations arising from layout changes during the iterative design process as outlined in Chapters 1 and 2 of this EIAR.

Data was recorded for a minimum of 10 nights with suitable weather conditions in each of the four seasons as suggested by SNH (2019). Appropriate weather conditions for bat activity are described as temperatures of 10°C and above at dusk, maximum ground level wind speed of 18km/hr and no, or only very light, rainfall (SNH, 2019). It is considered that appropriate coverage was achieved in this passive bat detection survey.

It is important to remember that the SNH (2019) guidance was primarily written for a Scottish context. While survey effort and design here were carried out taking due regard of this guidance, the guidelines were adapted to an Irish context as follows:

- The timing of seasonal survey makes allowance for differences in seasonality between Scotland and Ireland in order to capture representative seasonal bat activity. In this case, the deployment periods considered relevant to the various seasons is available in Appendix 8A.1.
- SNH (2019) recommends the use of an online tool, 'Ecobat' to provide a measure of relative bat activity. The tool compares site specific inputted data to a comparator database to provide an interpretation of the level of bat activity compared to other regions across Britain. Therefore, this tool is not considered to be relevant in an Irish context (due to different range of species and differing ecology) and therefore interpretation of relative activity level at the proposed site versus other similar sites in Ireland relies on the expertise and experience of the authors.

- Assessment of vulnerability of bats to wind farms, including assessment of collision risk, generally follows the procedure outlined in SNH (2019) but with amendments to reflect the Irish species assemblage and the different relative abundance of individual species in an Irish context.

Desktop Study

A desktop study of bat data was also undertaken by consulting the NBDC online mapping database to identify bat species historically recorded within the relevant W38 10km national grid square overlapping the terrestrial biodiversity study area. The NBDC online mapping database also hosts the Model of Bat Landscapes for Ireland, which has assessed the relative importance of landscape and habitat associations for bat species across Ireland (see Lundy *et al.* 2011); therefore, the landscape resource value for bats within the W38 10km national grid square overlapping the study area here was also reviewed.

Consultation was also made with Bat Conservation Ireland regarding roost/general bat records held in their National Bat Database relative to a 10km radius of a central point of the study area (Irish Grid W34646 85737 in this case). *It is very important to note that such consultation only involved discussion of the relevant species relative to the location/locality in question to inform Ecology Ireland's EIAR assessment and did not constitute an opinion from the consultation party on the proposed project under consideration here.*

8A.2.4.5 Other Protected Fauna

Marsh Fritillary Survey

A dedicated Marsh Fritillary *Euphydryas aurinia* field study was achieved by undertaking a larval web survey at seven areas within the overall biodiversity study area (MF1-7, see Figure 8A.6) in September 2020 (see Appendix 8A.1). These seven areas were chosen on the basis of supporting potentially suitable habitat, especially those with the larval food plant Devil's-bit Scabious *Succisa pratensis*, as informed by the habitat and flora study.

The survey approach involved completing walked transect routes at each area utilising standard monitoring methods[2]. In this case, two ecologists simultaneously walked separate transects at each area in September 2020 (see Figure 8A.6), recording the number and locations of occupied larval webs within *c.* 1m of either side of their respective transect (*i.e. c.* 2m wide band per transect). The number and length of transects varied as limited by the extent and topography of the survey areas (see Figure 8A.6). Each ecologist also took notes on the suitability of the survey areas for Marsh Fritillary in relation to habitat/Devil's-bit Scabious. Access to one of the survey areas (MF5) was limited by the presence of a bull; the limited area was instead scanned with a pair of binoculars to visually assess its potential suitability in terms of habitat and Devil's-bit Scabious. Observations of Marsh Fritillary casually noted during other terrestrial biodiversity surveys were also included as part of this assessment.

[2] https://www.biodiversityireland.ie/wordpress/wp-content/uploads/Marsh-Fritillary-Larval-Survey-Form-1.pdf

A desktop study was also undertaken by consulting the NBDC online mapping database to identify historical records for Marsh Fritillary within the relevant W38 10km national grid square overlapping the terrestrial biodiversity study area.

The conservation status of Marsh Fritillary was considered in respect of the following: Irish Wildlife Acts (1976 - 2012 as amended); Irish Red List for Butterfly (Regan *et al.* 2010); EU Habitats Directive.

Other Taxa

Observations of other terrestrial taxa casually noted during other terrestrial biodiversity surveys were also included as part of this assessment. A desktop study of other terrestrial taxa was also undertaken by consulting the NBDC online database[3] to identify additional other taxa species that are legally protected previously recorded within the relevant W38 10km national grid square overlapping the terrestrial biodiversity study area.

The conservation status of other taxa was considered in respect of the following: Irish Wildlife Acts (1976 - 2012 as amended); Irish Red List for Butterfly (Regan *et al.* 2010); Irish Red List for Damselflies & Dragonflies (Nelson *et al.* 2011); Irish Red List for Amphibians, Reptiles & Freshwater Fish (King *et al.* 2011); Regional Red List of Irish Bees (Fitzpatrick *et al.* 2006); EU Habitats Directive.

8A.2.5 Other terrestrial study areas applicable to the proposed development/project

Turbine Delivery Route

A Turbine Delivery Route (TDR) windscreen survey was carried out on 24th July 2021 (see Appendix 8A.1). The TDR survey involved driving along the route that has been selected for transport of the turbines to the proposed wind farm located near Ballinagree approximately 10km north of Macroom in Co. Cork. The weather on the day was dry and warm and wind speed was low with good visibility.

The entire TDR spans approximately 141km (as seen in Figure 8A.7below). It begins at the Shannon Foynes Port, Foynes, Co. Limerick travelling east along the N69 where it joins in with the Limerick South Ring Road before branching onto the M20 for approximately 9.5km. It then exits the motorway and joins in with the N20 heading towards Mallow. After the Annabella Roundabout at Mallow the TDR follows the N72 for approximately 25km west. It then leaves the N72 and joins the R583 travelling southwest to the outskirts of Millstreet. It then carries onto the L2758 for a further 8.6km (approx.) before reaching its destination.

Throughout the windscreen survey there were certain Points of Interest (POIs) identified along the TDR as requiring some intervention (e.g. temporary removal of street furniture, branch trimming) to facilitate passage of the turbine components. These points and their locations along with associated works and notes from the survey are discussed in Section 8A.3.7. Photographs were taken at the POIs where it was safe to do so.

It should be noted that the avifauna VP surveys did not cover the TDR route as the habitats along the route (buildings and artificial surfaces and roadside verge/hedgerow) are not of ecological significance to the target avifauna species relevant to this assessment.

Grid Connection Route

The grid connection route (grid connection) will consist entirely of underground 110kV cable and will connect the on-site substation to the existing 110/220kV substation at Clashavoon, within the townland of Aughinida. The grid connection will be 11.37 km in length, with 9.35 km to be constructed within the existing forest tracks and public road corridor. The proposed grid connection arrangement is illustrated in Figure 3.4 in Chapter 3 of the EIAR (also Figure 8A.7).

Connection works from the on-site substation to Clashavoon substation will involve the installation of ducting, joint bays and ancillary infrastructure and the subsequent running of cables along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches and road surfaces.

A total of 13 no. watercourse crossings have been identified along the proposed grid connection route. The grid connection cable route contains 3 no. bridge watercourse crossings and one large culvert crossing which will be completed using horizontal directional drilling (HDD).

A number of other minor watercourses crossing locations have been noted along the cable route, i.e. culverts, pipe drains and minor field drains. Crossing of these existing culverts will be as per undercrossing or an overcrossing method, depending on the depth of the culvert or using open trenching. Further details of watercourse crossings along the proposed grid connection cable route and associated construction methodologies are provided in Appendix 3.3 and the CEMP in Appendix 3.1.

The grid connection route was walked and driven on three occasions (28th of October and 13th of November 2020 and 24th July 2021; see Appendix 8A.1) to assess the presence of sensitive habitats and species along the proposed GCR. Special attention was given to the watercourse crossings along the GCR. The grid route is shown in Figure 8A.7.

It should be noted that the avifauna VP surveys did not cover the GCR route as the habitats along the route (buildings and artificial surfaces and roadside verge/hedgerow) are not of ecological significance to the target avifauna species relevant to this assessment.

Biodiversity Enhancement Management Plan (BEMP)

A Biodiversity Enhancement Management Plan has been prepared to outline a set of land management prescriptions (commitments and monitoring) as part of proposed Ballinagree Wind Farm Project. The BEMP is not designed to mitigate or address particular potential impacts associated with the construction, operation or decommissioning of the proposed wind farm. It is instead a commitment provided to yield a lasting biodiversity benefit to the area around Ballinagree.

Four private landowners with a combined total of c. 304 ha of lands in the vicinity of the wind farm, but beyond 250m of any proposed turbine, have agreed to a long-term commitment to detailed land management measures designed to maintain and enhance local biodiversity. In addition, Coillte, a 50% stakeholder in Future Energy Ireland, has undertaken to create wildlife corridors through strategic tree-felling between areas of upland habitat in the vicinity of the proposed wind farm area.

The measures include those designed to protect watercourses, prevent overgrazing and to clear invasive and site inappropriate plants. Higher value habitats will be actively managed to maintain and improve their value and lower value habitats will see specific interventions designed to improve their attractiveness for a wide range of species. Inputs (e.g. fertiliser, herbicide) will be controlled and appropriate planting will increase the available feeding, roosting and nesting cover for wildlife. Certain measures (e.g. control of stocking density) will be universal across the management lands. Other measures (e.g. planting of wildbird cover and native deciduous woodland) will be entirely site specific. The measures proposed take into account the habitats present and their current condition and importance in the local landscape.

The BEMP programme represents a significant commitment to enhance the biodiversity value and ecological connectivity across a large land bank. The programme will run for the lifetime of the windfarm and many of the proposed features (e.g. tree and hedgerow planting) will have a longer-lasting biodiversity benefit to the lands included in this plan (see Appendix 3.4).

Replant Lands

Lands cleared of forestry to facilitate the proposed wind farm development are required to be replanted. The replanting of lands elsewhere in the State is subject to approval by the Forest Service. This is discussed in Chapter 3 of this EIAR.

8A.2.6 Evaluation Criteria for Ecological Assessment

Ecological evaluation of the study area for terrestrial biodiversity follows criteria amended after NRA (2009) and Nairn & Fossitt (2004; Appendix 8A.2).

8A.2.7 Assessing Impact Significance

The description and evaluation of potential and residual impacts arising from the proposed project on the existing terrestrial biodiversity of the study area and surrounding area follows guidelines published by the EPA 2017 with reference to CIEEM (2018).

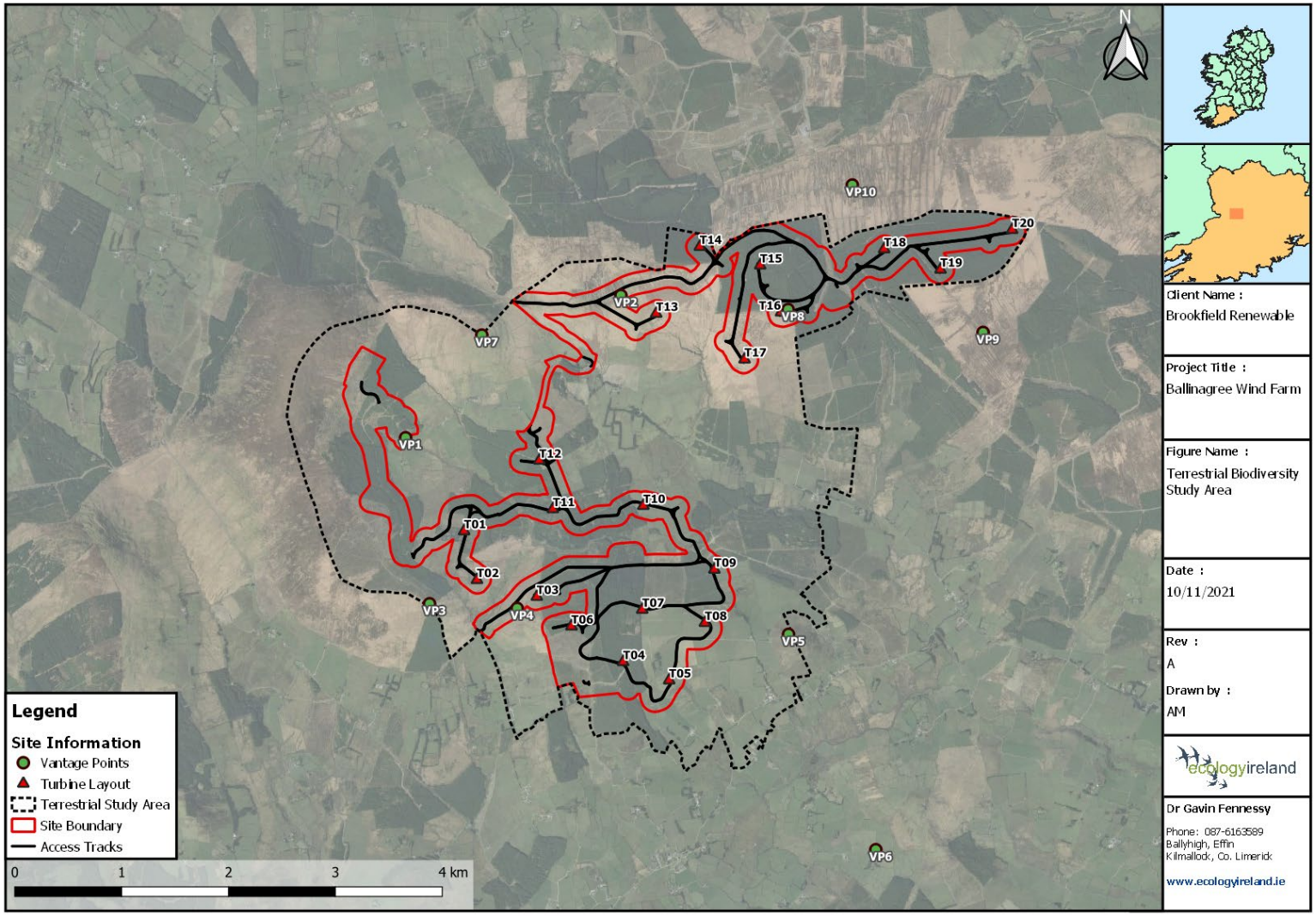

Figure 8A.1: Terrestrial Biodiversity Study Area. The proposed turbine layout and the Vantage Points (VPs) used in breeding and winter bird surveys are shown for reference.

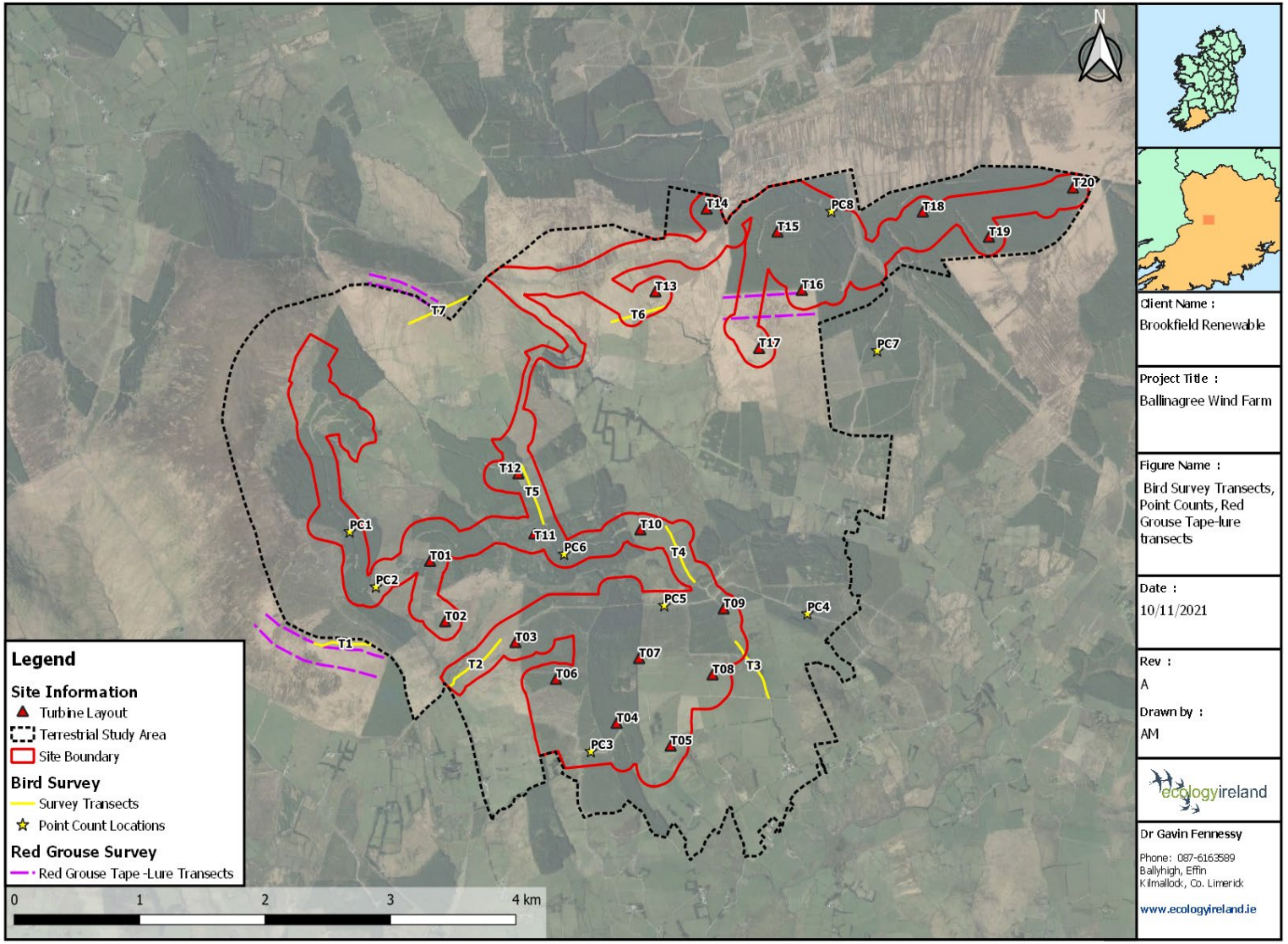

Figure 8A.2: **Terrestrial Biodiversity: Birds. Map shows the location of bird survey transects and point count locations as well as the Red Grouse Tape Lure survey transects.**

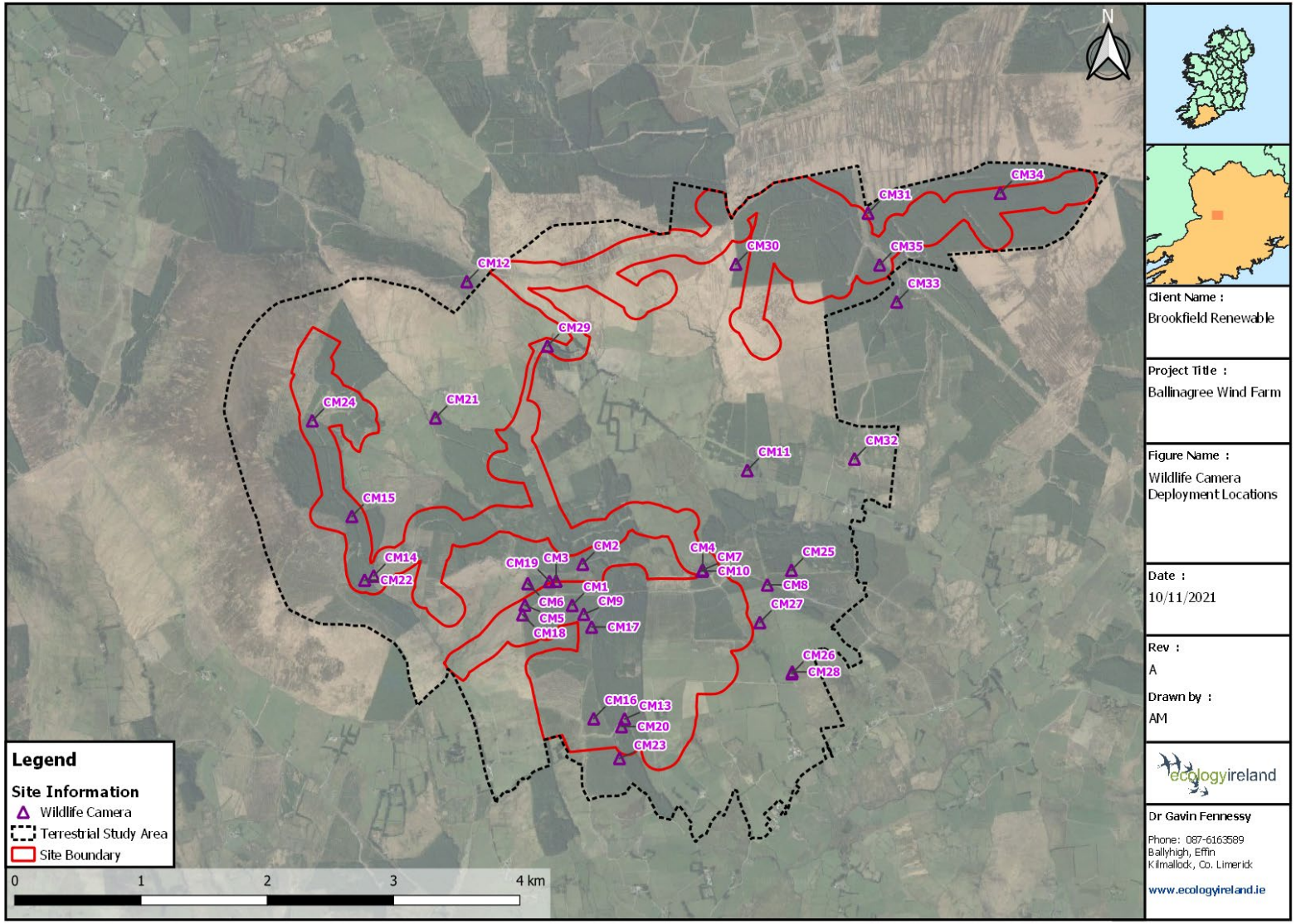

Figure 8A.3: Terrestrial Biodiversity: Wildlife Camera Deployment Locations.

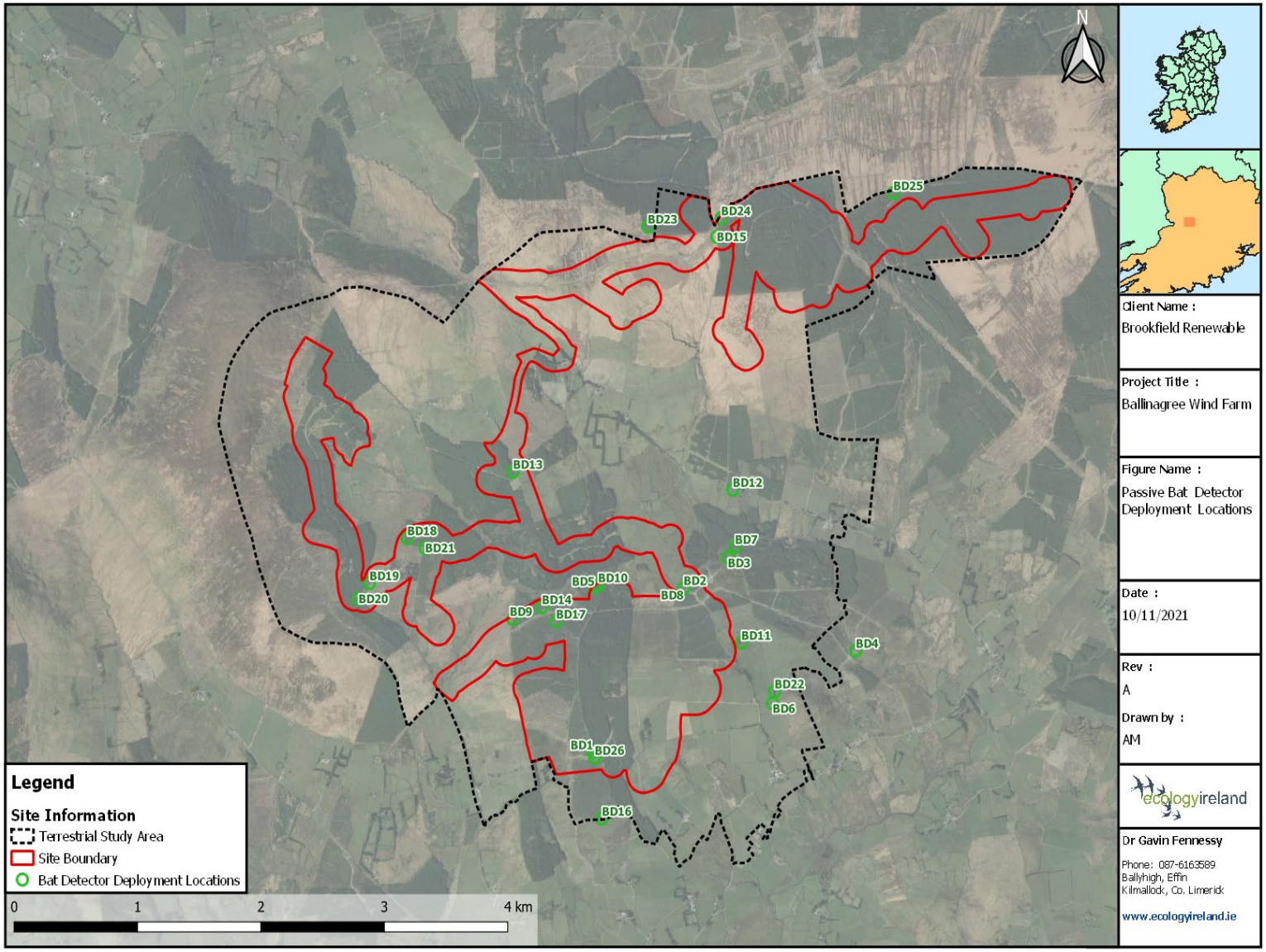

Figure 8A.4: terrestrial Biodiversity: General Passive Bat Detector Deployment Locations

BAT_ID	Grid Ref. (IG)
Bat_01	W3450483955
Bat_01a	W3405584542
Bat_01b	W3439484115
Bat_01c	W3382783658
Bat_02	W3592382652
Bat_03	W3540583139
Bat_03a	W3560883127
Bat_03b	W3571382912
Bat_04	W3620883293
Bat_05	W3679882845
Bat_05b	W3630482701
Bat_06	W3675583807
Bat_06a	W3595883669
Bat_07	W3626584253
Bat_08	W3547884142
Bat_08a	W3575884437
Bat_08b	W3517184230
Bat_09	W3525784687
Bat_09a	W3525684798
Bat_10	W3672086645
Bat_11	W3739486492
Bat_11a	W3716786399
Bat_12	W3761585968
Bat_12a	W3791286132
Bat_13	W3842586560
Bat_13b	W3891986685
Bat_14	W3898686396
Bat_15	W3966686802

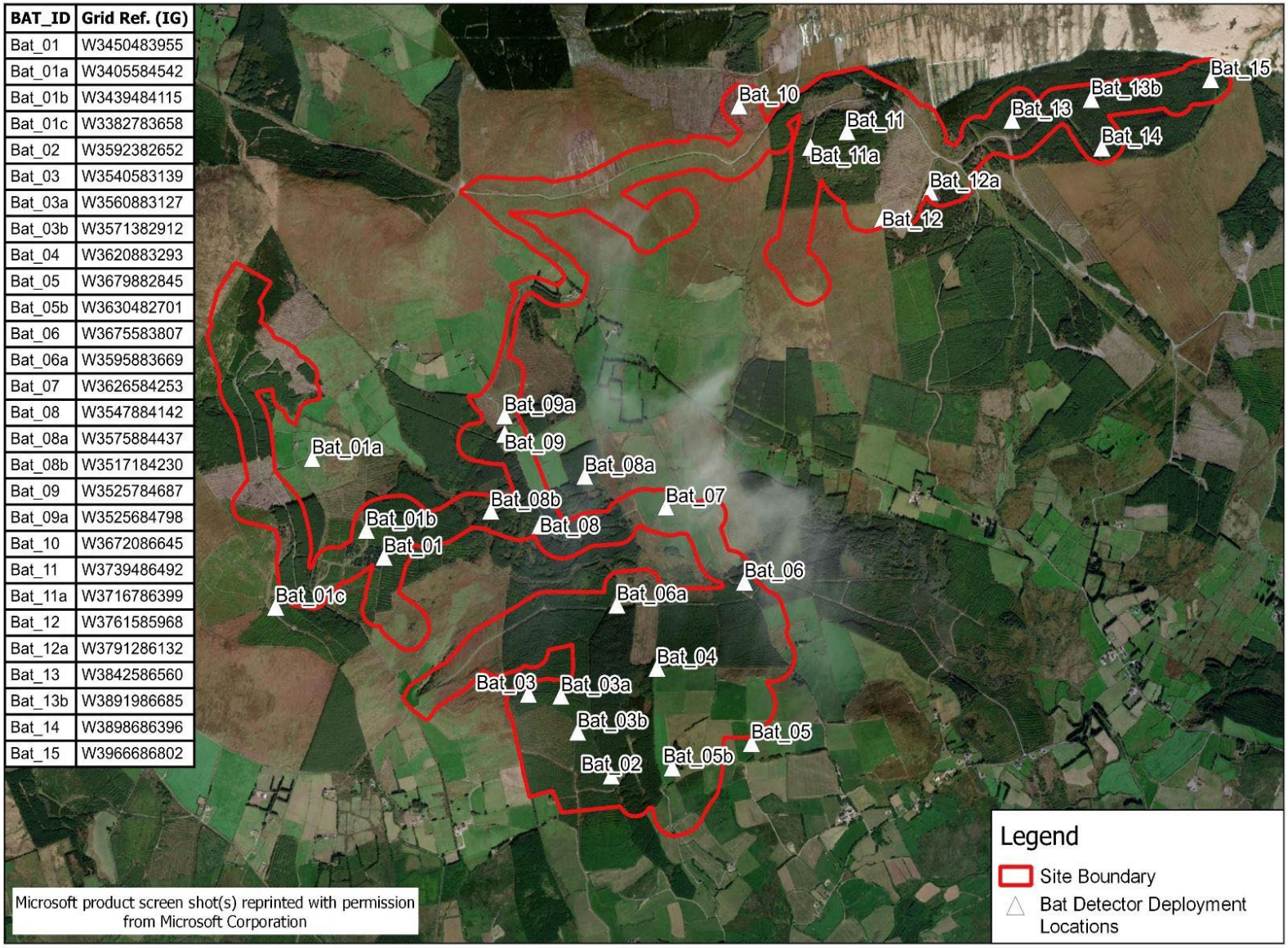

Figure 8A.5: Terrestrial Biodiversity: SNH Adapted Passive Bat Detector Deployment Locations.

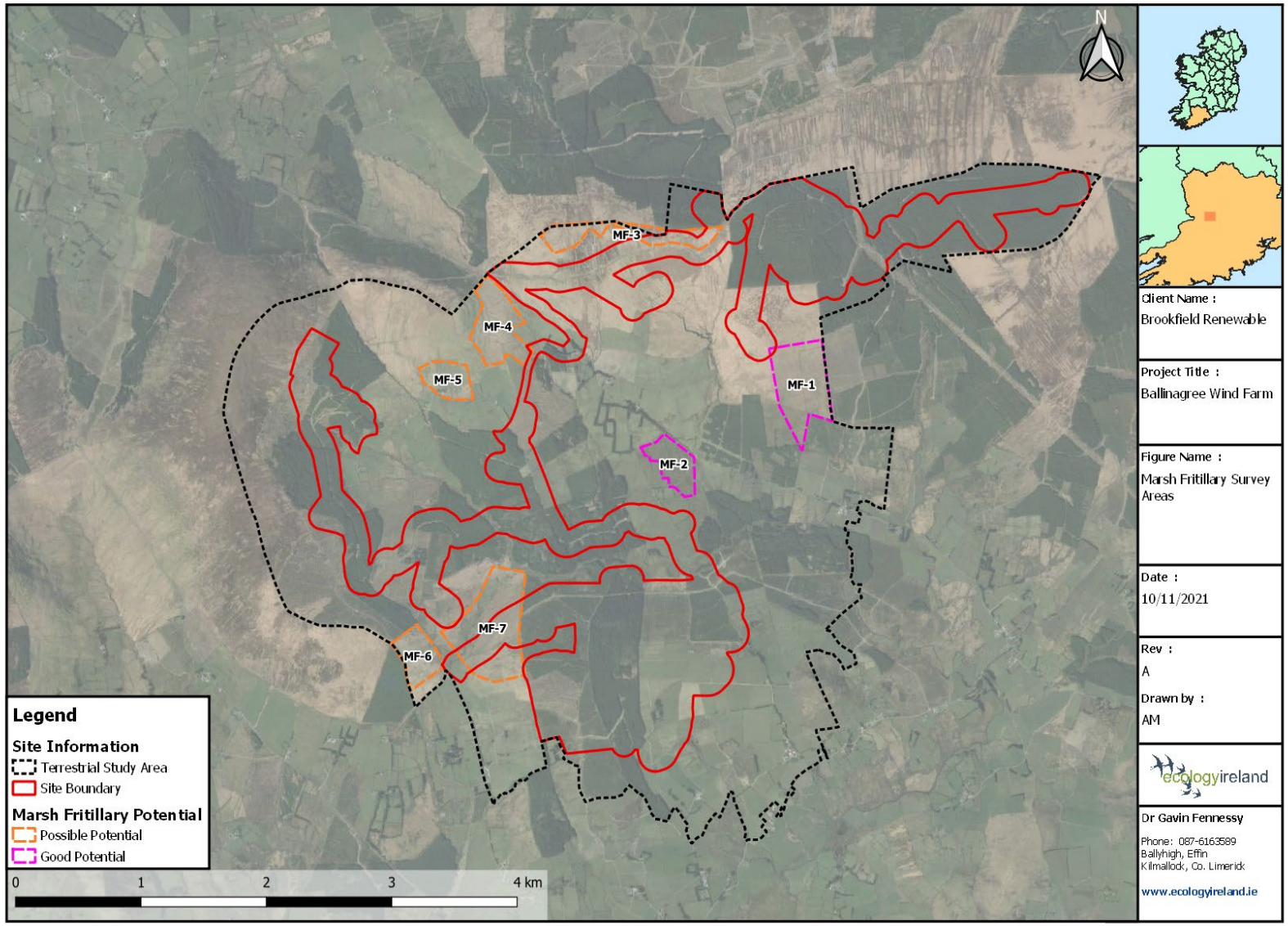

Figure 8A.6: Terrestrial Biodiversity: Marsh Fritillary Survey Areas.

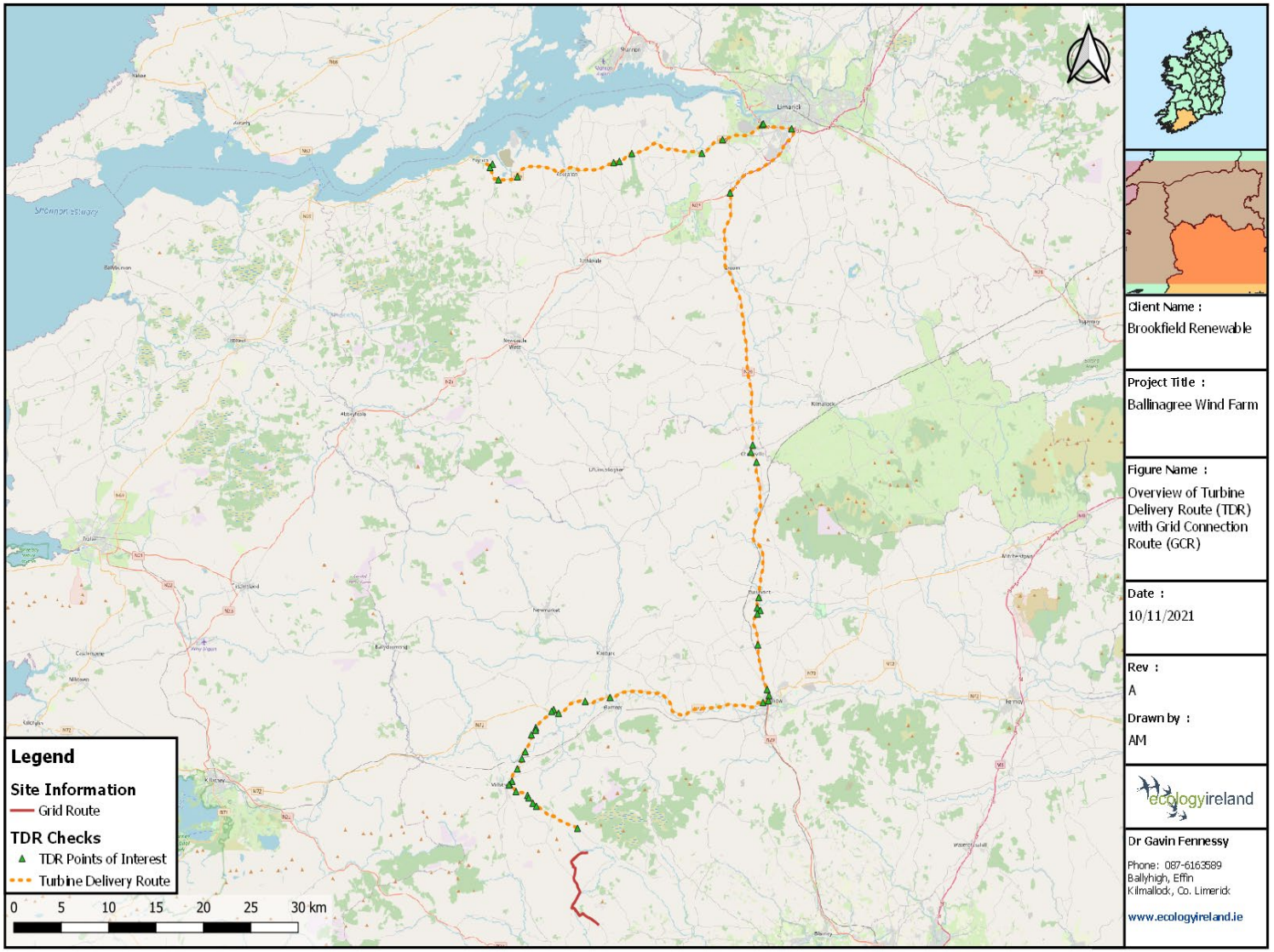

Figure 8A.7: Terrestrial Biodiversity: Overview of Turbine Delivery Route (TDR). Grid Connection Route (GCR) also shown.

8A.3 Description of Existing Environment

8A.3.1 Designated Nature Conservation Sites

There are no European sites geographically overlapping with the Site, grid connection and BEMP. The Turbine Delivery Route will be along existing roads which run close to the following European sites:

- Lower River Shannon SAC (002165)
- Barrigone SAC (000432)
- Curraghchase Woods SAC (000174)
- Askeaton Fen Complex SAC (002279)
- River Shannon and River Fergus Estuaries SPA (004077)

However, there are no works proposed at these locations for the purpose of turbine delivery and as such the movement of delivery vehicles along the road will have no effects on the European sites.

The main terrestrial study area and the grid connection route lie outside any designated Natura 2000 site although the study area directly adjoins Mullaghanish to Musheramore Mts. SPA (004162). However, the nearest proposed turbine location to the SPA is 0.5km from the site boundary (Table 8A.1). Figure 8A.8 shows the location of the study area and GCR relative to the Natura 2000 sites in the 15km hinterland area. Figure 8A.9 shows the location of nationally designated sites (NHAs and pNHAs) in this hinterland area. The minimum distances of these sites from the study area and GCR and from the nearest turbine location are summarised in Table 8A.1.

Only two Natura 2000 sites are located within 5km of the study area and GCR. These are Mullaghanish to Musheramore Mts. SPA and Blackwater River SAC (002170; 3.3km). The turbines at the northeast of the proposed layout are located within the catchment of the Blackwater River. The Mullaghanish to Musheramore Mountains SPA encompasses a large part of the Boggeragh/Derrynasaggart Mountains in Co. Cork. It is a large site designated for the protection of breeding Hen Harrier. Most of the site is over 200m in altitude, rising to heights of 475m in the eastern sector (Musherabeg) and 462m in the western sector (Knockullane). The Blackwater River is one of the largest rivers in Ireland. The SAC is of considerable conservation significance for the occurrence of good examples of habitats and populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive respectively. It has a wide range of qualifying interests associated with both the freshwater and estuarine parts of the river complex.

The Boggeragh Mountains NHA (002447) overlaps the northern part of the wind farm study area and part of the underground cabling will be along the local road which is located within the NHA. However, as this work will involve the burying of cable and associated resurfacing within the existing road corridor there will be no direct impact upon the habitats for which the NHA is designated (Figure 8A.9; Table 8A.1).

None of the other wind farm development works will occur within any of these designated sites. Full consideration of the potential for impacts arising from the development upon the Natura 2000 sites and their conservation objectives is provided in the NIS accompanying the planning application.

Following an initial screening exercise, it was considered that there was some likelihood that there could be negative effects on the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) cSAC, and the Gearagh SPA as a result of indirect effects from the proposed project (see NIS that accompanies the planning application). In the absence of mitigation measures (which have not been considered at the screening stage), likely significant effects on the qualifying interests of the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) cSAC, and The Gearagh SPA could not be excluded on the basis of objective scientific information.

Table 8A.1: Designated nature conservation sites within the wider hinterland of the proposed development.

Site Name	Site Code	Minimum Distance from Study Area and GCR	Minimum Distance from Turbine location
Natura 2000 sites			
Mullaghanish to Musheramore Mts. SPA	004162	0.0	0.5
Blackwater River SAC	002170	3.3	3.5
The Gearagh SAC	000108	6.1	11.4
The Gearagh SPA	004109	6.6	11.8
Killarney Nat. Pk., Macgillycuddy Reeks & Caragh R. Catchment SAC	000365	10.0	11.9
Mullaghanish Bog SAC	001890	11.1	12.5
St. Gobnet's Wood SAC	000106	14.2	15.5
Nationally Designated Sites			
Boggeragh Mts. NHA	002447	0.0	0.1
Lough Gal pNHA	001067	2.3	7.5
Glashgarriff River pNHA	001055	4.8	8.8
The Gearagh pNHA	000108	6.1	11.4
Prohus Wood pNHA	001248	8.4	12.1
Killarney Nat. Pk., Macgillycuddy Reeks & Caragh R. Catchment pNHA	000365	10.0	11.9
Banteer Ponds pNHA	001036	10.3	10.5
Mullaghanish Bog pNHA	001890	11.1	12.5
Boylegrove Wood pNHA	001854	11.5	16.6
St. Gobnet's Wood pNHA	000106	14.3	15.8

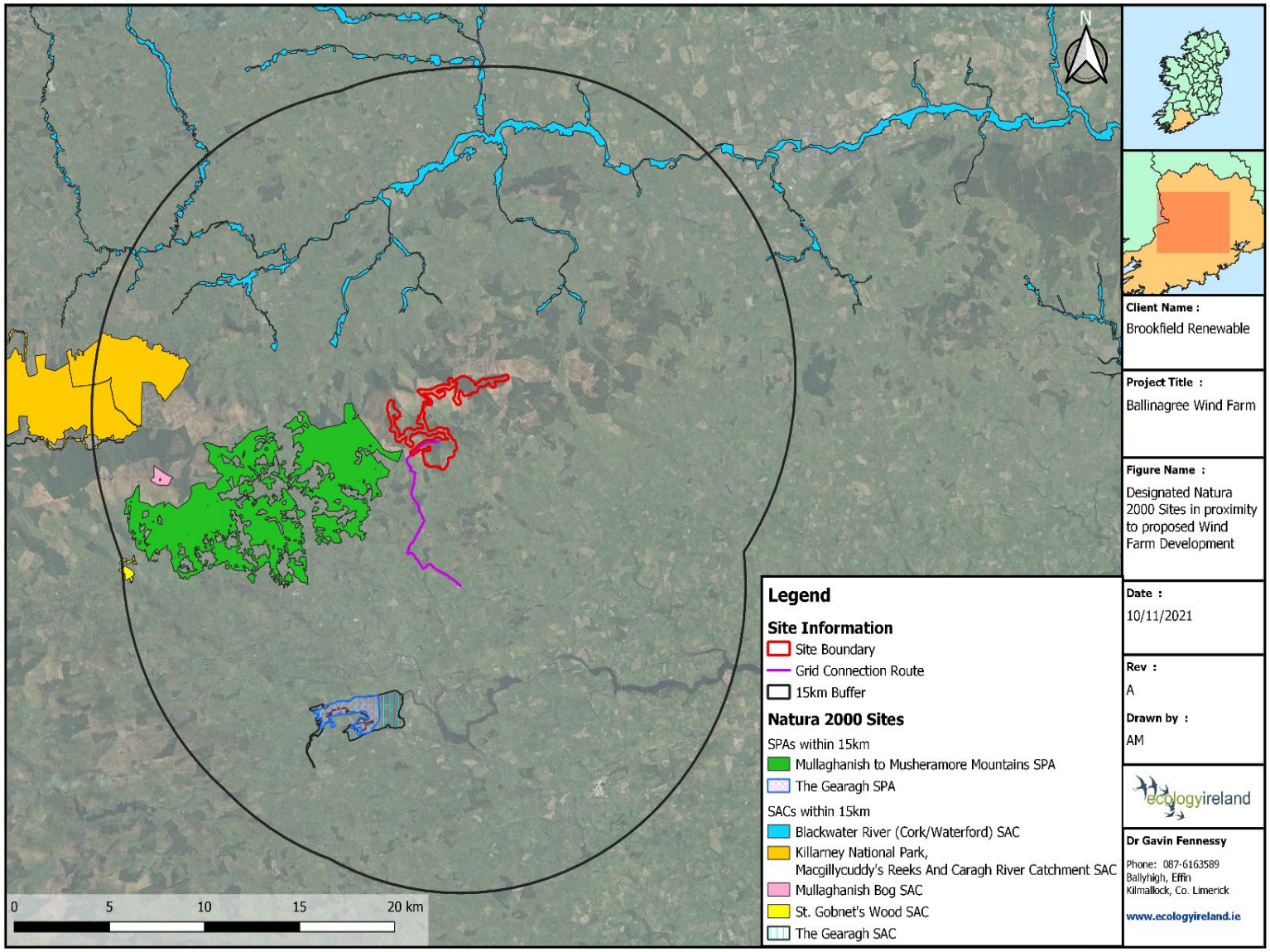

Figure 8A.8: Designated Natura 2000 Sites in the Ballinagree Wind Farm area.

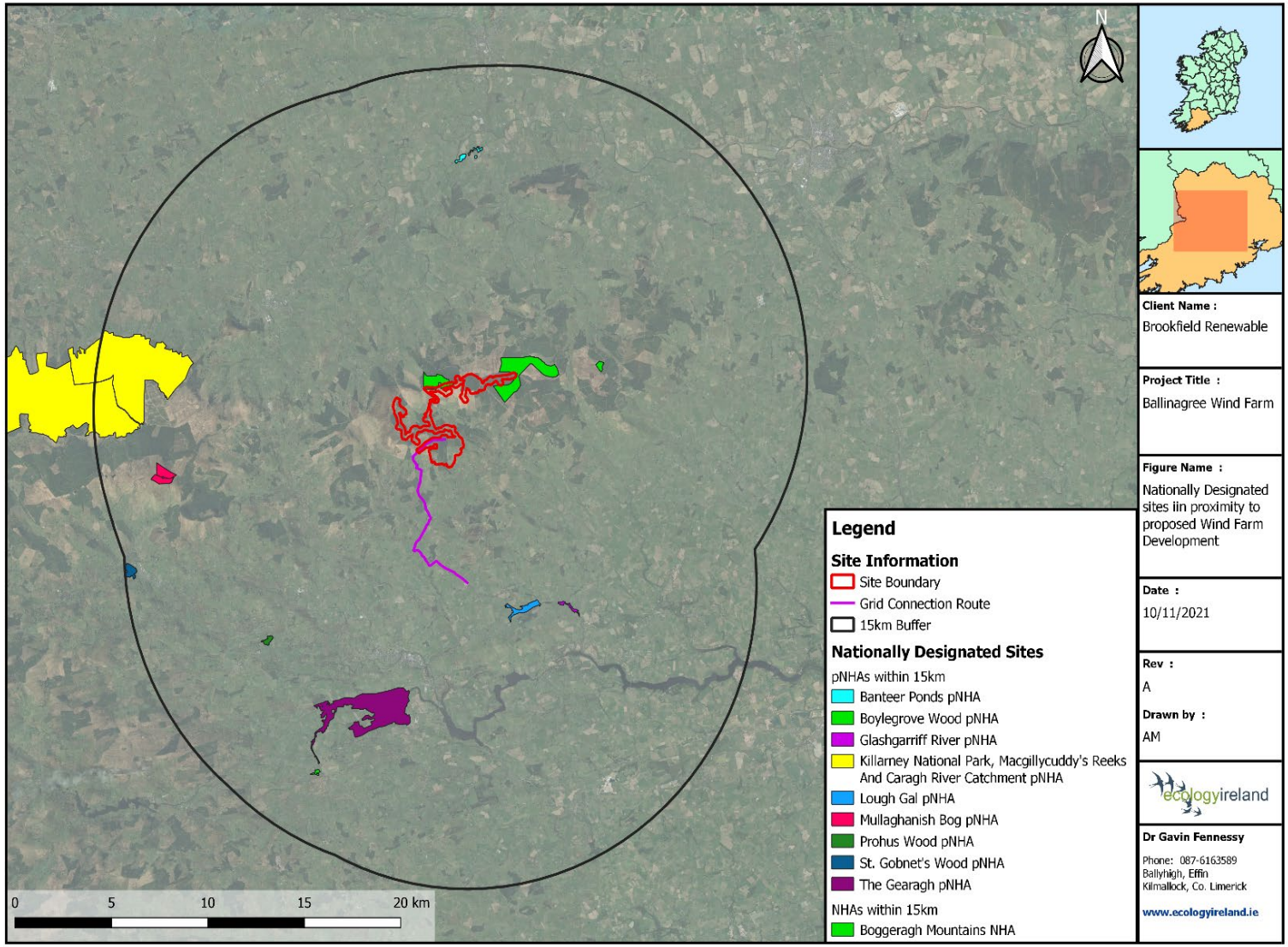

Figure 8A.9: Nationally designated sites in the hinterland of the proposed wind farm development.

8A.3.2 Habitats and Flora

Habitats in the Existing Environment

Two habitats listed on Annex I of the EU Habitats Directive: northern Atlantic wet heaths with *Erica tetralix* (4010) and European dry heath (4030) are present within the terrestrial study area boundary shown in Figure 8A.1. Both habitats occur together as a complex upland mosaic along the western boundary of the study area and areas of northern Atlantic wet heaths with *Erica tetralix* (4010) are found within upland habitat to the north and south of the study area and in a low-lying area of farmland towards the centre/east of the study area. While included in the study area boundary, through the process of constraints led design confirmed Annex I habitats are located outside the proposed development works footprint. One eroding upland stream FW1 present within the study area boundary supports water crowfoot vegetation, which may correspond to the Annex I habitat 'Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260)'. This habitat is also outside the proposed development works footprint.

The dominant habitats present within the proposed development works footprint are largely modified habitats; including mature, semi-mature and young 1st and 2nd rotation commercial conifer plantation WD4, improved agricultural grassland GA1, semi-natural to semi-improved wet grassland GS4 and buildings and artificial surfaces BL3 (forestry tracks, local roads). Modified habitats such as commercial conifer plantation WD4, improved agricultural grassland GA1 and buildings and artificial surfaces BL3 are considered of low to no particular ecological value at present. Semi-natural to semi-improved wet grassland GS4 has also been modified to a degree, however at least in part this habitat may have local biodiversity value and as such is of low to higher local importance overall. Complex open upland habitats present within the study area boundary are influenced by historic and current land-management activates which have altered habitat structure/function and species composition to varying degrees. For instance, large areas of significantly disturbed/degraded rank Purple Moor-grass *Molinia caerulea* dominated wet heath HH3 of lower local importance are present to the north and south of the study area. Similarly altered peatland habitats: historic cut-over bog PB4 and wet heath HH3 and cutover bog PB4 mosaic are also found to the north and south of the study area. These habitats are highly degraded or disturbed and while at least some pockets of wet heath HH3 Annex 4010 may persist within these habitat areas, through the process of constraints led design any potential higher quality habitat was as far as possible avoided and as such the proposed development works footprint is confined to very degraded peatland habitats of lower local importance.

Other habitats present include eroding upland streams FW1, dry-humid and acid grassland GS3, poor fen and flush PF2, stone walls and other stonework BL1, conifer woodland WD3, broadleaved woodland WD1, Semi-natural woodland WN and scrub WS1 which are of higher local importance and habitats of low local importance such as cut over bog PB4, spoil and bareground ED2 and spoil and bareground/recolonising bareground ED2/ED3 mosaic. One small area of intact upland blanket bog PB2 (Annex 7030), which is of international importance is present to the far north of the study area outside of the development site. While this area is outside the proposed development footprint it should be noted it is being subjected to ongoing mechanical peat extraction by third parties.

Botanical Species

No botanical species protected under the Flora Protection Order FPO as amended (2015), listed in Annex II or IV of the EU Habitats Directive (92/43/EEC), or red listed in the Irish Red Data Books were recorded within the site boundary. Taking the scale of the study area into account the dominant habitats included in the proposed development works footprint (*e.g.* conifer plantation WD4, improved agricultural grassland GA1 and semi improved/semi-natural grassland GS4) support limited flora/diversity overall. Peatland habitats that could potentially support Flora Protection Order (FPO) listed mosses and liverworts are largely outside the proposed development footprint; however, where they are included in the proposed development, they were subject to more detailed quadrat surveys during which no such bryophytes were recorded. Overall, the botanical species recorded are considered typical of the habitats present within the study area, with such habitats also common in the wider environment.

No rare or protected flora were recorded within the study area. There are no documented records for vascular plant species as held by the NBDC for the relevant 10km Grid Square (W38) that overlaps the proposed windfarm development footprint. There are three records for rare or protected mosses: Big-spored Rock Moss *Andreacea megistospora* (Threatened species: Vulnerable), North Grimmia *Grimmia longirostris* (Threatened species: Regionally Extinct) and Large White-moss *Leucobryum glaucoma* (Protected Species: Annex IV of EU Habitats Directive, Threatened Species: Listed as Least Concern in Ireland). Big-spored Rock Moss is typically associated with wet rock at the edge of streams or fens that are usually fed by snow-beds on seeping outcrops *etc.* (Smith 2004). North Grimmia is predominately a northern and upland species growing on base rich to acidic rock (Atherton *et al* 2010). Large White-moss can be found in a broad range of habitats, but most commonly in acidic woodland and heath, bog or fen habitat (Atherton *et al.* 2010). These records from NBDC are from Bryophytes of Ireland and dated 1851, 1880 and 1967 respectively. No Bryophytes protected under the Flora (Protection) Order 2015 are documented for the study area (Flora Protection Order, Map Viewer NPWS accessed on 22nd November 2021). The dominant habitats within the proposed windfarm development footprint such as commercial plantation and improved farmland are unlikely to support these protected moss species and in the upland habitat under consideration as part of the windfarm design, quadrats were undertaken for relevant habitats where none of the above species were documented.

The vascular plant Heath Cutweed *Gnaphalium sylvaticum* (Threatened Species: Vulnerable) is documented for the 10km grid square (W37) associated with the proposed grid connection route. This species is associated with acidic, damp or dry, often sandy or gravel substrates (often only on intermediately available habitats/transitional habitats). This species was not recorded for the gravel substrate along the access road to conifer plantation, where the proposed route leaves the windfarm development boundary and the dominant habitat along the proposed grid connection route (*i.e.* tarmacked buildings and artificial surfaces BL3) is unlikely to support this vulnerable species. Similarly, Mudwort *Limosella aquatica* (Threatened Species: Vulnerable) recorded for the wider 10km grid square, is typically associated with nutrient rich mildly acidic mud and shingle adjacent to watercourses, and as such is unlikely to occur along the proposed grid route. While this species was not recorded for areas associated with water crossings via directional drilling such crossings are confined to within adjacent farmland habitats (*i.e.* improved agricultural grassland GA1 or wet grassland GS4) which are unlikely to support this species. Round-leaved Cranes-bill *Geranium rotundifolium* (Threatened Species: Vulnerable), a species of dry, calcareous, grassy habitats is also documented for the 10km grid square (W37).

The dominant habitat of tarmacked, buildings and artificial surfaces BL3 is unlikely to support this species and while grassy verges are present, they are predominately damp and more acidic in nature where they occur.

Furthermore, such adjacent grassy verge habitats will be maintained and or re-instated such that there will be no significant permanent loss.

High impact invasive plant species, Japanese knotweed *Fallopia japonica* was recorded within a farmland holding towards the centre/east of the study area (Figure 8A.1) and off-site to the south of the study area. Japanese knotweed is also present in the wider environment and is present along roadsides in the wider area although it was not recorded along the grid connection route or at POIs on the TDR. Rhododendron *Rhododendron ponticum* is also occasionally present within conifer plantation WD4 towards the centre of the study area and to the south.

Dominant Habitats (those associated with the proposed windfarm development infrastructure within the development footprint (*e.g.* turbines, substation and access tracks)

- Commercial Conifer Plantation WD4
- Improved Agricultural Grassland GA1
- Semi-natural to semi-improved Wet Grassland GS4 (incl. Wet Grassland/Poor Fen and Flush GS4/PF2)
- Wet Heath and Cutover bog HH3/PB4 Mosaic
- Wet Heath HH3
- Buildings and Artificial Surfaces BL3

Other habitats present in the overall study area

- Dry-humid Acid Grassland GS3 and Dry-humid Acid Grassland with occ. Wet Grassland GS3 (occ. GS4)
- Wet Grassland/Wet Heath GS4/HH3
- Wet Heath HH3 (Annex 4010)
- Wet Heath HH3 (Annex 4010)/Dry Siliceous Heath HH1(Annex 4030) Mosaic
- Dry Siliceous Heath HH1
- Wet Heath HH3 (Annex 4010)/Cutover Bog PB4 Mosaic
- Wet Heath/Wet Grassland/Poor Fen and Flush HH3/GS4/PF2 Mosaic
- Wet Heath/Upland Blanket Bog HH3/PB2 Mosaic
- Wet Heath/Cutover Bog HH3/PB4
- Upland Blanket Bog PB2 (*Annex 7130)
- Cutover Bog PB4
- Broadleaved Woodland WD1
- Conifer Woodland WD3
- Conifer Plantation WD4
- Semi-natural Woodlands (WN): Semi-natural Woodland/Poor Fen and Flush WN/PF2 and Oak-Ash-Hazel Woodland WN2
- Scrub WS1
- Eroding Streams FW1 (Not mapped be MON)

- Spoil and bare ground/Recolonising Bareground ED2/ED3
- Recolonising Bareground ED3
- Recolonising Bareground/Wet Grassland/Acid Grassland/Wet Heath ED3/GS4/GS3/HH3

The layout of the wind farm has been designed to minimise the direct and indirect impacts upon any Annex I habitats present in the study area by carrying out detailed micro-siting surveys (see description of Dedicated Quadrat Surveys below).

Commercial Conifer Plantation (WD4), including 1st rotation and 2nd rotation plantations

Commercial conifer plantation WD4 is the dominant habitat occurring across the study area and within the proposed development works footprint (Figure 8A.10). The commercial conifer plantations WD4 present are comprised of a mosaic of different aged stands of 1st rotation, semi-mature/maturing (closed canopy) and mature (closed canopy) plantations WD4 and more recently felled and replanted (open canopy) 2nd rotation plantations WD4 (Plate 8A.2).

Stands of 1st rotation plantations WD4, ranging in age from semi mature to mature closed canopy, are situated to the north/north-east and towards the centre, south and east of the study area. Species diversity within these plantations WD4 is typically low as they are primarily comprised of regular/uniform stands of commercial timber species such as Sitka Spruce *Picea sitchensis*, Norway Spruce *P. abies* and/or Lodgepole Pine *Pinus contorta*. Ground flora is rare with grasses such as Creeping Bent *Agrostis stolonifera*, Yorkshire Fog *Holcus lanatus* and Annual Meadow Grass *Poa annua* and mosses including *Rhytidiadelphus squarrosus*, *Pseudoscleropodium purum*, *Hypnum jutlandicum* and *Thuidium tamariscinum*, occurring along the canopy edges only as, away from the plantation edge, the tree canopy closes in, light levels are much reduced, and the ground layer consists predominately of a dense layer of dead and decaying conifer leaf litter.

Small remnant areas of historic cutover bog PB4, dominated by a dry, rank Purple Moor Grass *Molinia caerulea* - Ling Heather *Calluna vulgaris* vegetative community (Perrin *et al* 2014), persist in open sections of mature plantation WD4 towards the centre of the study area (Plate 8A.1) and occasionally along the plantation forestry edges and/or firebreaks within this location. These areas of heathland habitat are unmanaged and subjected to very limited disturbance which has accommodated the establishment of scrub species (Bramble *Rubus fruticosus* agg., Gorse *Ulex europaeus*) and Willows (incl. Grey Willow *Salix cinerea* agg.) in parts.

Plate 8A.1: Overview of remnant cutover bog PB4 within conifer plantation WD4

Stands of mature plantation WD4 towards the northern boundary of the study area were being harvested at the time of the field surveys (completed in 2019/20). The mature trees were being removed at the time and as such no replanting had occurred with bare/disturbed substrate, tree brash and stumps remaining.

Stands of 2nd rotation plantations WD4 are also situated across the study area, where blocks of mature plantations WD4, have been harvested and subsequently replanted with commercial conifers (Plate 8A.2). These young plantations range in age from very recent felling (up until 2019) and replanted to those consisting of more established young conifer trees. Where the canopy remains open the understory habitat is typically dominated by abundant, rank Soft Rush *Juncus effusus* with frequent Purple Moor Grass, Common Nettle *Urtica dioica* Yorkshire Fog, Creeping Bent, Bramble, European Gorse, Foxglove *Digitalis purpurea* and occasional Tormentil *Potentilla erecta*, Silverweed *P. anserina*, Common Sorrel *Rumex acetosa* and Ling Heather. Young Grey/Rusty Willow Salix cinerea agg., *Salix cinerea* subsp*. oleifolia* trees and shrubs are also frequent. The establishment of this mixed assemblage of species is considered transient in nature and is likely to change as the conifer trees become established and mature and as such the tree canopy closes, with a resulting loss in current open habitat characteristics.

Plate 8A.2: 2nd rotation commercial conifer plantation WD4

Stands of 1st and 2nd rotation commercial conifer plantation WD4, including areas of young (open canopy), semi-mature and/or mature (closed canopy) plantation forestry, are highly modified habitat types, which are typically species poor, being dominated by uniform stands of commercial timber species. This habitat type is therefore considered to be of low local importance.

Improved Agricultural Grassland (GA1)

Improved agricultural grassland GA1 is also common across the study area. Agricultural grassland GA1 present to the south of the study area is particularly intensively managed dairy farmland. Here the grassland sward is dominated by a lush sward of Perennial Ryegrass *Lolium perenne*, with occasional to rare White Clover *Trifolium repens*, Broadleaved Dock *Rumex obtusifolius* and Creeping Thistle *Cirsium arvensis*. Some land reclamation was occurring in this area at the time of the site surveys (completed in 2018), where areas of wet grassland GS4 (with occ. Poor fen and flush PF2) and degraded peatland habitats (wet heath HH3 with scrub WS1) were being converted to improved agricultural grassland GA1.

Improved agricultural grassland GA1 is also present in farmland holdings towards the centre, north, northwest and east of the study area (Figure 8A.10, Plate 8A.3). These farmland areas are predominately grazed by sheep, but also support small suckler herds or had been cut for silage at the time of the site surveys (completed in 2018/2019). The grassland swards are also typically dominated by Perennial Rye Grass but also include frequent Creeping Bent, Common Bent *A. capillaris*, Yorkshire Fog, Annual Meadow Grass and occasional Soft Rush, White Clover, Daisy *Bellis Perennis*, Common Chickweed *Stellaria media*, Creeping Thistle, Marsh Thistle *C. palustre* and Creeping Buttercup *Ranunculus repens*, with some areas of grassland more intensively managed than others. Occasionally, areas of grassland GA1 also appeared to have been recently reseeded with a new lush sward of Perennial Ryegrass establishing (surveyed in 2018).

Plate 8A.3: Improved Agricultural Grassland GA1

Improved agricultural grassland GA1 is a highly modified grassland habitat, which is typically species poor and dominated by agricultural grassland species. This habitat type has limited biodiversity and as such is considered of low local importance.

Wet grassland (GS4)

Wet Grassland GS4 is present at a number of locations within the study area boundary where it is largely associated with less intensively managed, semi-natural and/or semi-improved farmland pastures. This habitat also occurs to a lesser extent as a verge along unmanaged/undisturbed plantation forestry WD4 tracks and where it has re-established on cutover bog PB4 habitat to the north of the study area. The dominant vegetative communities recorded for these wet grassland GS4 areas are primarily associated with Group GL2 (Creeping Bent *Agrostis Stolonifera* – Creeping Buttercup *Ranunculus repens*, after NVC classification, Perrin 2018 available on NBDC) and are considered species poor, typical of unimproved or semi-improved wet farmland pastures with impeded site drainage and as such are considered to be of limited conservation value overall (after O'Neill *et al.* 2013).

Across unimproved wet grassland GS4 areas, the dominant wet grassland community is mostly comprised of abundant Soft Rush with frequent Yorkshire Fog, Creeping Bent, Sweet Vernal Grass *Anthoxanthum odoratum*, Creeping Buttercup, Meadow Buttercup *R. acris*, Marsh Thistle and Common Sorrel (Plate 8A.4). Other occasional to rare species include Lesser Spearwort *R. flammula*, Greater Bird's-foot Trefoil *Lotus pedunculatus*, Lady's-smock *Cardamine pratensis* and the mosses *Brachythecium rutabulum, Calliergonella cuspidata* and *Rhytidiadelphus squarrosus*. Where there are some levels of ongoing semi-improvement there is a shift in this wet grassland community to include agricultural species such as Perennial Ryegrass, White Clover, Common Nettle and Spear Thistle *C. vulgaris* (Plate 8A.4). In areas where the underlying ground conditions appear to change (drier/freely draining but acidic) there is a shift in the dominant species to include species such as Jointed Rush *J. articulatus*, Tormentil, Heath Bedstraw *Galium saxatile*, Red Fescue *Festuca rubra* and Purple Moor Grass.

These wet grassland GS4 pastures are generally grazed by herds of sheep. Where this habitat type occurs along plantation forestry WD4 track edges the habitat is unmanaged and as a result is dominated by tall and rank Soft Rush with frequent Bramble and young Rusty Willow.

Small pockets of poor fen and flush PF2 occur in poorly draining, seepage and/or wet or waterlogged areas within the wet grassland GS4 habitat, in particular to the northwest and south of the study area boundary (see Figure 8A.10). Where they occur the ground conditions become more waterlogged and together with Soft Rush and Creeping Bent, they support abundant mosses such as Bog Mosses (*Sphagnum* species) and *Polytrichum commune var. commune* and flora such as Lesser Spearwort, Marsh Violet *Viola palustre,* Marsh Bedstraw *Galium palustre* and Marsh Pennywort *Hydrocotyle vulgaris*. Where this habitat does occur, it is typically very limited in size and extent. Given the scale of the study area and complexity of habitats together with the characteristically small size of this habitat type, other areas (than those mapped) may be present.

Plate 8A.4: Semi-natural and semi-improved wet grassland GS4

In farmland to the west of the study area wet grassland GS4 forms a complex mosaic with a wet heath HH3 where species such as Purple Moor-grass, Heath Rush *Juncus squarrous* and Ling Heather become frequent in parts (see Figure 8A.10). As this area of farmland borders conifer plantation WD4 along the south, there is evidence of historic peat extract (*i.e.* drains, shelves) and Bramble and Rusty Willow also become frequent to abundant.

While poor fen and flush habitat PF2 is not listed as Annex I habitat, due to its limited extent in Ireland it is considered of conservation importance (Fossitt, 2000 pers. comm O Criodain), and as such is of higher local importance. Wet grassland GS4 although dominated by rank Soft Rush in parts has biodiversity value in a local context and is of low (semi-improved) to higher (semi-natural) local importance, but of limited conservation value overall (after O'Neill *et al.* 2013). The area of wet grassland GS4/wet heath HH3 mosaic has biodiversity in a local context and is of higher local importance.

Buildings and Artificial Surfaces (BL3)

Buildings and artificial surfaces BL3 present within the study area boundary include residential/farm holdings, local public roads and plantation forestry access tracks. Private residential and farmyard holdings present where documented from nearby and as such not accessed in full. However, they appeared to be typically comprised of man-made materials such as concrete, plastered concrete, metals, corrugated metals *etc.* and support limited native vegetation and are of little ecological value. Similarly public roads that transverse the study area are comprised of maintained, resurfaced/tarmacked roads, where ongoing vehicular disturbance limit the establishment or persistence of any significant vegetation and as such are also of no particular ecological value at present.

Plantation forestry site access tracks BL3 are also maintained and have been artificially resurfaced but a few of the tracks are subjected to limited disturbance and have begun to recolonise with a mixed assemblage of vegetation.

The recolonising species includes a mixed assemblage of grasses and rushes including Annual Meadow Grass, Sweet-vernal Grass, Purple, Moor Grass, Red Fescue, Sweet Vernal Grass, Yorkshire Fog, Soft Rush and Heath Rush and frequent to occasional broadleaved herbs including; White Clover, Red clover *T. pratensis*, Heath Speedwell *Veronica officinalis*, Cat's-ear *Hypocharis radicata*, Marsh Thistle, Selfheal *Prunella vulgaris*, Tormentil, Foxglove and Common Sorrel. Bryophytes are common on track edges and in small wet depressions within these areas, including *Rhytidiadelphus squarrosus*, *Calliergonella cuspidata* and occasional Bog Mosses (*e.g. S. capillifolium and S. palustre*).

Buildings and artificial surfaces BL3 habitat is highly modified or man-made which lacks any significant vegetation cover and/or local biodiversity and is of no to low local importance. Recolonising areas on under-used forestry tracks BL3 are also highly modified and transient in nature, establishing as a result of low disturbance, however due to some local biodiversity value (*e.g.* invertebrates foodsources) these areas are of low local importance at present.

Wet Heath (HH3) (Degraded)

A type of wet heath HH3 habitat, which is dominated by dense tussocks of Purple Moor-grass and an associated thick layer of plant litter, is common across the study area, recorded for up to fourteen locations (see Figure 8A.10, Plate 8A.5). Occasional Tormentil or rarely mature/spindly shrubs of Ling Heather or Cross-leaved Heath *Erica tetralix* persist in parts, but overall cover of these species is rare. Similarly, mosses are rare to absent here. These heathland areas are grazed/accessed by sheep and this very degraded/modified heath habitat may have formed/reformed as a result of ongoing and historic overgrazing and other land-uses such as turf cutting and associated drainage and/or adjacent afforestation.

Plate 8A.5: Degraded wet heath HH3 type habitat

In the context of past and current land management activities and associated level of habitat degradation and change this habitat type does not at present correspond Annex I habitat and given the limited biodiversity value overall, this habitat type is considered of lower local importance at present.

Wet Heath and historic Cutover Bog HH3/PB4 mosaic

An intrinsic mosaic of wet heath HH3 and wet heath on cutover bog HH3/PB4 habitat is present within the northern and north-western sections of the study area (Plate 8A.6). Here in areas of historically deeper peat, peat extraction/disturbance activities have ceased and as such a peatland vegetative community has re-established on the remaining but altered (*i.e.* shallower/drained) peaty substrate. This vegetative community is generally species poor dominated by a Purple Moor-grass and Ling Heather, with Purple Moor-grass forming a dense rank and tussocky sward in parts, particularly in more heavily disturbed or altered areas. Other occasional species recorded include Cross-leaved Heath and Tormentil. In areas where the peat appears naturally shallower (*i.e.* no evidence of historic peat extraction), but has been heavily influenced by historic and ongoing land management (primarily sheep grazing) a wet heath HH3 habitat type still persists. Here the sward is dominated by abundant, Ling Heather and Purple Moor Grass with occasional to rare Tormentil, Cross-leaved Heath, Bilberry *Vaccinium myrtillus* Bog Myrtle *Myrica gale* and Common and Hare's-tail Cotton Grasses (*Eriophourum angustifolium* and *E. vaginatum*), Heath Rush *Juncus squarrous,* Green Ribbed Sedge *Carex binervis* and Carnation Sedge *Carex panicea*. Mosses such as *Polytrichum commune* var. *commune, Rhytidiadelphus squarrosus, R. loreus, Hylocomium splendens, Racomitrium lanuginosum, Aulacomnium palustre*, *Dicranum scoparium*, and rarely Bog mosses (i.e. *S. papillosum, S. capillifolium)* were also recorded. These areas of heathland are currently managed for livestock grazing.

Plate 8A.6: Intrinsic mosaic of regenerated cutover bog PB4 and wet heath HH3 mosaic habitat

While much of this area is degraded via historic peat extraction or overgrazing regimes, given the scale of the area and intrinsic mosaic of peatland habitats present, areas of higher quality wet heath HH3 may still persist. With this in mind a section of this peatland habitat area was included in a more detailed quadrat survey (as part of an initial constraints led design approach undertaken), within the location of a proposed turbine (T13). This was considered necessary to minimise any potential disturbance to habitats of higher conservation value that could be present.

Regenerating cutover bog PB4 is comprised of a very species poor heathland community and in the context of peat depth, historic and ongoing land management and associated level of habitat degradation is therefore considered a modified peatland habitat of lower local importance. Wet heath HH3 is also degraded as a result of land management activities (*e.g.* forestry, drainage, grazing and peat extraction) which have resulted in a loss of overall peatland structure, due to its biodiversity in a local context, this habitat is of low to higher local importance at present.

Wet Heath HH3 (Annex 4010) and regenerated Cutover Bog (PB4) Mosaic

An area of wet heath HH3 (including areas corresponding to Annex I northern Atlantic wet heaths with *Erica tetralix* 4010) and regenerated cutover bog (PB4) occurs as a mosaic towards the south/southwest of the study area. On historic cutover bog PB4 vegetation has since regenerated with a typical Purple Moor-grass/Ling Heather (as described above) community. In areas where the peat appears naturally shallower (*i.e.* no evidence of historic peat extraction) but has been influenced by historic and ongoing land management (primarily sheep grazing) a wet heath HH3 habitat type persists. Here the sward is dominated by abundant, Ling Heather and Purple Moor Grass. Other typical species include Cross-leaved Heath, Tormentil, Green-ribbed Sedge, Star Sedge *C. echinata*, Carnation Sedge, Common and Hare's Tail Cottongrasses, Deergrass, Heath Milkwort *Polygala serpyllifolia*, Heath Woodrush *Luzula multiflora*, Round-leaved Sundew *Dosera rotundifolia* and Bog Aspodel *Narthecium ossifragum*.

Bryophytes recorded include *Hylocomium splendens, Aulacomnium palustre, Racomitrium lanuginosum, Pleurozium schreberi, Hypnum jutlandicum, Breutelia chrysocoma, Rhytidiadelphus squarrossus, Thuidium tamariscinum* and occasional Bog Mosses such as *Sphagnum capillifolium* and *Sphagnum papillosum*. In badly degraded areas, along the conifer plantation boundary Bracken *Pteridium aquilinum* dominates and Willow shrubs are well established in parts. Away from the plantation boundary the habitat improves and areas of higher quality wet heath HH3 corresponding to Annex I 4030, form an intrinsic mosaic with lower quality areas of heathland. With this in mind a section of this peatland habitat area was included in a more detailed quadrat survey (as part of an initial constraints led design approach undertaken), within the location of a proposed turbine (T3). This was considered necessary to minimise any potential disturbance to habitats of high or potential national/international conservation value that could be present (see below for results of the quadrat survey, in particular in relation to proposed turbine location: T3).

Although degraded regenerated cutover bog PB4 here supports a reasonable assemblage of peatland species (at least in part), similarly areas of damaged wet heath HH3 also support a reasonable assemblage of heathland species. Overall, this habitat ranges in value from low to higher local importance with areas of national importance also present. As described habitats of higher or potentially national importance have been avoided through a constraint led design approach that was adopted.

Wet Heath HH3 (Annex 4010) and Dry Siliceous Heath HH1 (4030) Mosaic

Wet heath HH3/4010 and dry siliceous heath HH1/4030 form an extensive and complex upland mosaic within the western boundary of the study area, which is associated with the lower slopes of Mushera mountain that is included in the study area. This habitat mosaic also extends off-site from here. Although somewhat degraded in parts, overall, both habitats conform to Annex I habitat types; northern Atlantic wet heaths with *Erica tetralix* (4010) and European dry heath (4030).

Where it occurs wet heath HH3/4020 is typically comprised of abundant Ling Heath, Cross-leaved Heath and Purple Moor-grass with frequent sedges (e.g. Green-ribbed Sedge *C. binervis* and *C. panicea*), Deergrass Trichophorum caespitosum/germanicum, Heath Rush *J. squarrosus* and Common Cottongrass *Eriophorum* angustifolium and occasional to rare broadleaved herbs Tormentil, Bog Aspodel and Loosewort Pedicularis sylvatica. Typical bryophytes include *Hylocomium splendens*, *Hypnum jutlandicum*, *Rhytidiadelphus loreus, Breutelia chrysocoma*, *Polytrichum commune* var. *commune* and *Pleurozium schreberi*. Bog Mosses such as*. S. capillifolium* are also occasional to frequent. Where the underlying acid soils appear drier and/or more freely draining a dry siliceous heath HH1 community becomes more prevalent. The community is typically comprised of abundant Ling Heather and occasional Bell Heather *E. cinerea* with occasional to rare Bilberry, Tormentil and mosses such as *Hylocomium splendens, Racomitrium lanuginosum and Pleurozium schreberi*. Occasionally dry-humid acid grassland species such as Creeping Bent, Red Fescue, Mat Grass and Sweet Vernal Grass become dominant. This open upland area is used as rough grazing land for sheep, with some overgrazing evident in parts. Although this upland area is included in the study area area in Figure 8A.1, it is outside the proposed development footprint.

Another area of wet heath HH3/4010 and dry siliceous heath HH1/4030 mosaic was recorded on the southern side of the study area. This habitat consisted of frequent Ling heather and Bell heather along with Bilberry.

Tormentil, Great wood-rush *Luzula sylvatica*, Wavy hair-grass *Deschampsia flexuosa* and heath bedstraw were recorded occasionally. Bramble was recorded rarely. Around the rock-outcrops and boulders St Patrick's cabbage *Saxifraga spathularis*, hard fern *Blechnum spicant*, Common dog violet *Viola riviniana*, wood sage *Teucrium scorodonia* and Goldenrod *Solidago virgaurea* were occasionally recorded. Eared willow *Salix aurita* was scattered around the slopes, particularly the steeper ground. The dry heath habitat formed a mosaic with Purple moor-grass dominated wet heath habitat. This habitat also included frequent tormentil and wavy-hair grass. Sweet vernal grass, Heath wood-rush *Luzula multiflora*, Heath milkwort *Polygala serpyllifolia* and Bracken *Pteridium aquilinum* were recorded occasionally Yorkshire fog, soft rush, hard fern and Irish spurge *Euphorbia hyberna* were rarely recorded. This area is grazed by cattle which has led to some degradation of the habitat, particularly to the western end. Although this area is included in the study area boundary, it is outside the proposed development footprint.

Where wet heath HH3 and dry siliceous heath HH1 occur, both habitats conform to Annex I habitat types; northern Atlantic wet heaths with *Erica tetralix* (4010) and European dry heath (4030) respectively and as such are considered of national importance.

Dry Siliceous Heath HH1

A similar (as described above) but smaller area of dry siliceous heath HH1 habitat is located within the northwestern section of the study area. This dry siliceous heath HH1 community is also typically comprised of abundant Ling Heather and occasional to rare Bell Heather, Western Gorse *Ulex galii,* Tormentil, Wavy Hair-grass *Deschampsia flexuosa*, Heath Bedstraw and bryophytes such as *Hylocomium splendens, Racomitrium lanuginosum* and *Pleurozium schreberi*. Patches of European Gorse U. europaeus are also present. This small area of dry siliceous heath HH1 grades to dry humid acid grassland GS3 with species such as Creeping Bent, Red Fescue, Mat Grass, Sweet Vernal Grass, Heath Bedstraw, Tormentil and sheep's Sorrel *Rumex acetosella* becoming dominant (as described in dry-humid acid grassland GS3 habitat description below.

This open upland area of the study area is used as rough grazing land for sheep, with some overgrazing evident in parts, particularly where grassland species become more dominant and at the expense of heathland dwarf shrubs (Plate 8A.7).

Plate 8A.7: Dry siliceous heath HH1

Although small in overall extent and influenced by livestock grazing levels this habitat may still conform to Annex I European dry heath 4030 and as such is of national importance.

Another area of Dry Siliceous Heath was recorded on the southern side of the study area with Western gorse, Bramble and Tormentil and Purple moor-grass were frequently recorded. Bracken, Heath bedstraw, Ling heather, Bilberry, Yorkshire fog, Sweet vernal grass and Bell heather were occasionally recorded. Foxglove was rarely recorded along with scattered Rowan and Hawthorn trees. European gorse was recorded rarely around the edge of the habitat. Small patches of grassy vegetation between the Western gorse-dominated heath included Soft rush, Heath bedstraw, Yorkshire fog, Sweet vernal grass, Common bent and False oat grass. Another patch contained frequent Yorkshire fog, Soft rush, Common bent along with occasional Common sorrel, Birds foot trefoil and Creeping buttercup. At the margin of this area on the higher ground was a small area of frequent Yorkshire fog and occasional Red fescue and Sweet vernal grass. Bilberry, Ling heather, Heath bedstraw, Cat's ear and Lousewort *Pedicularis sylvatica* were rarely recorded. This habitat was fenced off by wire fence and the prevalence of western gorse and bramble as well as waist high heather suggests that grazing is low to absent. In addition, areas of disturbance which have subsequently been recolonised by the grassy vegetation described above were noted at the edge of the habitat. This area is included in the study area boundary, however, it is outside the proposed development footprint.

Although subject to past disturbance and undergoing succession to scrub habitat in the absence of suitable management, this habitat may still conform to Annex I European dry heath 4030 and as such is of national importance.

Wet Heath HH3 (Annex 4010)

High quality wet heath HH3 which corresponds to the Annex I habitat: northern Atlantic wet heaths with *Erica tetralix* (4010) was confirmed for up to six locations within the study area boundary. This habitat type was recorded in open upland shallow peaty habitat in the northwest, northeast and southwest of the study area and within a lower lying/poorly draining area of farmland towards the centre of the study area. Similar to that described above (*i.e*. Wet Heath HH3 (Annex 4010) and Dry Siliceous Heath HH1 (4030) Mosaic) a typical wet heath community comprised of abundant Ling Heather, Cross-leaved Heath, Deergrass, Bog Myrtle and Purple Moor-grass was documented here. Other typical species include Tormentil, Green-ribbed Sedge, Star Sedge, Carnation Sedge, Common and Hare's Tail Cottongrasses, Deergrass, Heath Milkwort, Heath Woodrush, Round-leaved Sundew and Bog Aspodel. Bryophytes include *Hylocomium splendens, Aulacomnium palustre, Racomitrium lanuginosum, Pleurozium schreberi, Hypnum jutlandicum, Breutelia chrysocoma, Rhytidiadelphus squarrossus, thuidium tamariscinum* and occasional Bog Mosses such as *Sphagnum capillifolium* and *Sphagnum papillosum.* To the northeast and within farmland towards the centre Devil's-bit Scabious *Succisa pratensis* is frequent.

Wet heath HH3 which corresponds to the EU Annex I habitat: northern Atlantic wet heaths with *Erica tetralix* (4010) is of international conservation value and as such is of national importance. The layout of the wind farm has been designed to minimise the direct and indirect impacts upon this and any other Annex I habitat present in the study area by carrying out detailed micro-siting surveys (see description of Dedicated Quadrat Surveys below).

Cut-over Bog (PB4)

Cut-over Bog PB4 is also present in the northern section of the study area where mechanical peat extraction from upland blanket bog PB2 (*Annex 7030) is ongoing (site survey 2020). Where peat has been extracted recently, there has been no or very limited re-establishment of vegetation with large sections of remnant mixed peat or the underlying exposed stone substrate remaining. In sections where disturbance is less recent there has been some recolonisation of plant species including soft Rush, Ling Heather, Purple Moor Grass, Bog Asphodel and Carnation Sedge. Away from the edge of more recent disturbance's and where some *albeit* very limited mixed peat substrate remains areas of a species poor (Soft Rush-Yorkshire Fog) wet grassland, dry humid acid grassland GS3 and/or wet heath (Purple Moor Grass – Ling Heather) communities are more established.

Cut-over bog PB4 is a disturbed and degraded habitat type and has formed as a result of current and historic peat extraction activities and is therefore considered a highly modified habitat of low local importance.

Dry-humid Acid Grassland GS3/Dry-humid Acid Grassland with occ. Wet Grassland GS3 (occ. GS4) (1).

Dry-humid Acid Grassland GS3 is found at up to ten locations within the study area boundary, and at one location where it forms an occasional mosaic with wet grassland GS4 habitat (see Figure 8A.10).

Typical species recorded for this community (*e.g.* community code GL4C Common Bent – Tormentil Grassland (Perrin 2016) include: abundant to frequent Creeping Bent, Sweet Vernal Grass, Yorkshire Fog, Red Fescue *Festuca rubra*, Tormentil, Heath Bedstraw *Galium saxatile* and White Clover and occasional to rare Ribwort Plantain *Plantago lanceolata*, Selfheal *Prunella vulgaris*, Yarrow *achillea millefolium,* Crested Dogs-tail *Cynosurus cristatus*, Eyebright *Euphrasia officinalis* agg. Creeping Buttercup, Marsh Thistle, and Mat Grass *Nardus Stricta*. Mosses include *Rhytidiadelphus squarrosus, Hylocomium splendens*, *Scleropodium purum* and *Calliergonella cuspidata* are frequent.

Purple moor Grass is occasional to rare and as such never dominant in the grassland sward. On slightly lower slopes the community becomes more variable with species indicative of the uplands (*e.g.* Heath Bedstraw) and others characteristic of lowlands (Cat's-ear *Hypochaeris radicata*) and/or wet grassland (*e.g.* Soft Rush) occurring in the sward (*i.e.* shift to Common Bent – White Clover grassland, GL4A).

This grassland habitat occurs as discrete grassland areas on sloping ground within more extensive open upland habitat (*e.g.* upland wet heath HH3 or dry siliceous heath HH1), most likely where the acidic soil is shallow, occasionally rocky and as such more freely draining or dry. The most extensive area and best example of dry-humid and acid grassland GS3 is located in upland habitat to the northwest of the study area. This grassland GS3 community has also developed along the edge of tracks BL3 and associated cutover bog PB4 habitat to the north of the study area and as discrete patches within wet grassland GS4 areas, which were too small to map at scale, except for one area where the acid grassland GS3 community was more extensive than that of wet grassland GS4 (towards the western boundary of the study area as per Figure 8A.10). This habitat is managed as rough sheep grazing pasture.

Although this habitat may have formed as a result of historic overgrazing of upland habitats due to their overall semi-natural state and biodiversity value locally, dry-humid acid grassland GS3 is of higher local importance

Spoil and Bareground ED2

Spoil and bareground ED2 present within the study area include; a disused borrow pit and two smaller areas of disturbed farmland to the south of the study area. This habitat BL2 also occurs as part of a small mixed mosaic comprised of disturbed recolonising bareground/wet grassland/dry-humid acid grassland/wet heath ED2/GS4/GS3/HH3, situated near the far northern boundary of the study area and associated with works surrounding a mast here.

Each of these small areas have been subject to some level of past or more recent disturbance, where the substrate of gravel and soils has been altered or exposed and to date (up until 2020) re-establishing vegetation is limited in extent. The disused borrow pit to the south also contains a small depression with standing water.

Spoil and bareground ED2 is a modified habitat of low, local importance.

Stone Walls and Other Stone Work BL1

Stone walls and other stone-work BL1 are situated across the study area where they are primarily associated with farmland field boundaries, with three derelict stone buildings BL1 present to the south. Many of these stone walls BL1 are maintained and as such support limited vegetation. However occasionally these stone walls BL1 support species such as Sweet Vernal Grass, Red Fescue, Yorkshire Fog, Cock's-foot *Dactylis glomerata*, Wall Pennywort *Umbilicus rupestris*, Maidenhair Spleenwort *Asplenium trichomanes*, Heath Bedstraw, Foxglove, Common Nettle, Polyploidy and Fern species. Non-native *Fuchsia* is common on walls BL1 towards the centre of the study area.

While most of the stone walls BL1 support limited vegetation at present, others that support flora have biodiversity value in a local context and as such the stone walls BL1 present are of low to higher local value.

Spoil and Bareground/Recolonising bareground ED2/ED3

This habitat was recorded within the study area in the form of a small quarry/borrow pit feature. The habitat consisted of a mosaic of recently disturbed ground in the form of fresh aggregate piles and areas of previous disturbance which are being recolonised by vegetation. Bramble, Cat's-ear, Foxglove, Yorkshire fog, Cocksfoot, False oat-grass *Arrhenatherum elatius* and Broad-leaved dock *Rumex obtusifolius* were all recorded frequently. Spear thistle, Creeping buttercup, White clover, Common mouse-ear *Cerastium fontanum*, Pineappleweed Matricaria discoidea, Daisy, Heath speedwell, Broadleaf plantain *Plantago major*, Prickly sowthistle *Sonchus asper*, Selfheal, Procumbent pearlwort *Sagina procumbens*, Marsh foxtail *Alopecurus geniculatus*, Common ragwort *Jacobaea vulgaris*, Marsh thistle, Rosebay willow herb *Chamaenerion angustifolium*, Sheep sorrel, New Zealand willowherb *Epilobium brunnescens*, Bog stitchwort *Stellaria alsine*, Willowherb sp., Sweet vernal grass and Common sorrel were recorded occasionally. Marsh cudweed *Gnaphalium uliginosum* was rarely recorded.

Spoil and bareground/Recolonising bareground ED2/ED3 is a modified habitat of low, local importance.

Eroding Upland Streams FW1

There are a number of semi-natural eroding watercourses present within the study area. The watercourses FW1 present are comprised of relatively narrow streambeds (<2m – 3m), with shallow, fast flowing water, flowing over a mud, sand and/or stone/rock substrate. Small ripples and pools are also common. In general the fast-flowing water limits the establishment of wetland vegetation, with the exception of the stream FW1 flowing across the middle of the study area, where it becomes wider in part (4-5m) and occasional in stream vegetation includes water crowfoots (*e.g.* Stream Water-crowfoot *Ranunculus penicillatus,* Common Water-crowfoot *R. aquatilis*), which may correspond to the Annex I habitat; Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] is present.

Due to the overall semi-natural state and importance to local biodiversity, the eroding streams (FW1) present within and along the study area boundaries are considered of higher local importance. One stream supporting water crowfoot vegetative community is of national importance. Watercourses are discussed and their aquatic habitats and fisheries potential assessed as part of the Aquatic Ecology component of the Biodiversity Chapter (Chapter 8B).

Broadleaved Woodland WD1

A small area of broadleaved woodland WD1 is located within improved agricultural grassland GA1 to the south of the study area. This woodland WD1 is dominated by non-native/naturalised Beech *Fagus sylvatica* with occasional Rowan *sorbus aucuparia* and Hawthorn *Crataegus monogyna* and non-native/naturalised Sycamore *Acer pseudoplatanus*. The substrate is very rocky here and typical ground flora include Bramble, Red Fescue, Germander Speedwell *V. chamaedrys*, Wood Sage *Teucrium scorodonia* and mosses such as abundant *Rhytidiadelpus triquetrus.*

Although limited in extent and considered somewhat modified due to the presence of Beech and Sycamore this woodland feature has biodiversity locally and as such is considered of higher local importance.

Conifer Woodland WD3

Two small areas of conifer woodland WD3 are also present within agricultural farmland to the south of the study area. This habitat is comprised of planted mature Sitka Spruce trees, which are planted close together with a resulting dense canopy and no established understory or ground flora in one area and relatively spaced with a grassy understory in the other. Such woodland WD3 features were planted in the past as shelters for livestock.

Conifer woodland WD3 are very small in extent and dominated by non-native species and are of low local importance.

Semi-natural Woodlands (WN)

A small area of what can be best described as remnant semi-natural woodland WN is situated across an area of steeply sloping ground to the south/southeast of the study area. A small, narrow scattered stand of Oak *Quercus petraea* with occasional Alder *Alnus glutinosa* is present here. This area is grazed by sheep and as such has a grassy understory of Common Bent, Sweet Vernal Grass and Tormentil. Due to the level of grazing it is difficult to classify this area with reference to Fossitt (2000) and the IVC (NBDC database). At the base of the slope poor fen and flush habitat PF2 develops (*e.g.* Soft Rush Bog Mosses (*Sphagnum* species) and Common Haircap *Polytrichum commune var. commune,* Lesser Spearwort, Marsh Violet, Marsh Bedstraw, Marsh Pennywort and Bogbean *Menyanthes trifoliata)*.

A type of Oak-Ash-Hazel woodland WN2 is present along a gully/sloping ground near a stream FW1 to the south of the study area. Here the woodland canopy is comprised of Hazel *Corylus avellana*, Pedunculate Oak and Ash *Fraxinus excelsior* with occasional Birch *Betula* spp. and non-native/naturalised Beech. This woodland WN2 is somewhat disturbed by dairy livestock poaching and as such bareground is common, however typical understory/groundflora include Blackthorn *Prunus spinosa*, Ivy *Hedera helix*, Wood anemone *Anemone nemorosa*, Primrose *Primula vulgaris*, Bramble *Rubus fruticosus* agg. Honeysuckle *Lonicera periclymenum* and mosses *R. triquetrus*, *Kindbergia prealonga* and *Polytrichum commune* var. *commune* and ferns (*e.g. Dyropteris filix-mas*). Although occurring along a stream FW1 this woodland WN2 does not appear subjected to flooding/waterlogging and as such is dry, well-draining overall. Further downstream as the slope levels off and the ground becomes wetter this woodland is replaced by a narrow band of Willow and Grose Scrub WS1.

Although very limited in extent, due to the semi-natural composition of these woodland areas and the associated biodiversity value both woodland areas are considered of higher local importance.

Dedicated Quadrat Surveys

As part of the design process any turbines or infrastructure proposed within areas mapped as potentially containing higher value plant species and potentially areas of Annex I habitat were subject to more detailed high-resolution surveys.

T02 is proposed for an area of peaty wet/acidic grassland GS3/GS4 to the southwest of the study area and T17 in an area of dry, species poor and rank Purple Moor-grass dominated heath habitat HH3 to the north, northeast of the study area. Based on the initial habitat surveys completed it was determined that enough information was available to describe these areas and that the proposed locations of these turbines would have minimal impact on key upland habitat areas identified. It was considered that additional quadrat surveys would not have provided any value in these instances.

Two other areas under consideration for turbines required additional details on the vegetative communities/quality as both areas, as a whole, are comprised of complex and often intrinsic mosaic habitat where the possibility of higher conservation value habitat occurring could not be ruled out. This included an area of historic cutover bog PB4 with wet heath HH3 mosaic to the north of the study area (near T13) and an area of historic cutover bog PB4 and wet heath HH3 (with Annex 4030) mosaic to the south of the study area (near T3). This process was designed to microsite the Turbine locations away from any areas of higher value habitat.

A total of five quadrats were used to document the typical habitat (vegetative community) to the north, in the vicinity of where T13 is to be located, which includes modified heathland and grassland habitats, which have established on an historically altered/cutover peaty substrate (Plate 8A.8). Based on input of the data collected to the ERICA online database; quadrat R1 and R3 were assigned (at a max value of 54.7 and 92.6, respectively, see Perrin 2019) to the heath group Purple Moor-grass – Heath Milkwort and community type HE43 Purple Moor-grass – Ling Heather-Crossed-leaved Heath heath. The vegetative community here is species poor, dominated by Purple Moor-grass with woody Ling Heather shrubs (Figure 8A.10). Broadleaved herb and bryophyte diversity and cover is low. Cross-leaved Heath was not recorded and few positive indicator species for Annex wet heath (4030), were present and as such cover was much less than 50% (See Appendix V Monitoring criteria for upland Annex I habitats, Perrin *et al.* 2014).

Quadrat R2 was assigned to the group HE2: Bell Heather – Ling Heather and the community HE2D Ling Heather – Purple Moor-grass – Erica cinerea, however the assignment was only transitional (at 23) and as the results should be interpreted with caution as the community is not a great fit to this or any other community type available in ERICA. This result may reflect the fact that the habitat area has been altered historically and as such the revegetated community is a result of the alterations to peat substrate and associated structure and function. Broadleaved herb and bryophyte diversity and cover is low. Cross-leaved Heath was not recorded and few positive indicator species for Annex wet heath (4030), were present and as such cover was less than 50% (See Appendix V Monitoring criteria for upland Annex I habitats, Perrin *et al* 2014).

Quadrats R4 and R5 were assigned to an acid grassland group: GL4: Mat Grass – Heath Bedstraw and the community type: GL4B: Mat Grass – Tormentil (at 50.8 and 66.8 respectively).

This grassland GS3/GL4 has established on heavily altered substrate and the modified community has limited diversity associated with species rich *Nardus* grassland.

Based on the information collected and subsequently analysed the proposed location of T13, is within area R1,2 and R3 which is assigned (albeit weakly in the case of R2) to heathland). While such marginal habitats may still conform to Annex habitat such as wet heath 4030, in the context of historic degradation as a result of peat extraction and current grazing levels, a rank Purple Moor-grass – Ling Heather community is likely to persist here and as such this would not be considered as Annex I habitat.

Potential sensitive areas to the south had also been identified around T3 which required further investigation and micro-siting. Following a walkover of these areas in October 2020, a number of potential locations were considered unsuitable for development as they conformed to Annex I habitat. Based on the site walkover a total of four quadrats were completed in areas close to T3, which is situated just south of the existing access road and along the edge of commercial conifer plantation. Quadrats R1 and 2 were completed close to the conifer plantation along the northern edge of a search area, with this area considered the most suitable in the field as it was comprised of very degraded rank heathland, with frequent Grey Willow shrubs establishing. Bracken was also frequent just south of this location. A further two quadrats were also completed further west away from the edge of the plantation, with one used to evaluate a small area containing a good example of wet heath (potentially Annex I 4030). The second quadrat was used to document representative heath habitat in the areas further out from the edge of the conifer plantation.

Plate 8A.8: Overview of typical degraded habitat in the location of T13

Quadrat R1 was assigned to the group HE4: Purple Moor-grass – Heath Milkwort, community type: HE4E: Purple Moor-grass – Ling Heather – Cross-leaved Heath (90.7). Similar to R1, Quadrat R4 was assigned to the group Purple Moor-grass – Heath Milkwort, community type: HE4E: Purple Moor-grass – Ling Heather – Cross-leaved Heath (93.9). Cross-leaved Heath was not recorded and few positive indicator species for Annex wet heath (4030), were present and as such cover was less than 50% (See Appendix V Monitoring criteria for upland Annex I habitats, Perrin *et al.* 2014).

Quadrat R2 (considered most suitable location in the field) was also assigned to the group: Purple Moor-grass – Heath Milkwort, and the community HE4D Purple Moor-grass – Tormentil – Cross-leaved Heath (81.4). Cross-leaved Heath was not recorded and few positive indicator species for Annex wet heath (4030), were present and as such cover was much less than 50% (See Appendix V Monitoring criteria for upland Annex I habitats, Perrin *et al*. 2014). Willow is also encroaching here.

As described R3 was completed in a small area considered to be representative of a good example of higher value habitat and this quadrat was assigned to the Crossed-leaved Heath– Bog Moss (*Sphagnum capillifolium*) group BG3 and the community BG2C Cross-leaved Heath – Purple Moor-grass – Reindeer Lichen bog/heath. Although in an unfavourable condition, and influenced by ongoing sheep grazing, the community present (albeit in small discrete areas) is likely to correspond to Annex I (4030).

Plate 8A.9: Proposed location of T3 based on quadrat analysis (See R2).

Based on the information collected and subsequently analysed the proposed location of T3 is within the area of R2 that is heavily altered, degraded heath habitat, where in its current context and with consideration of a do-nothing scenario, very rank Purple Moor-grass and establishing Willow are likely to persist under current conditions. The area is not considered to be in Annex I habitat.

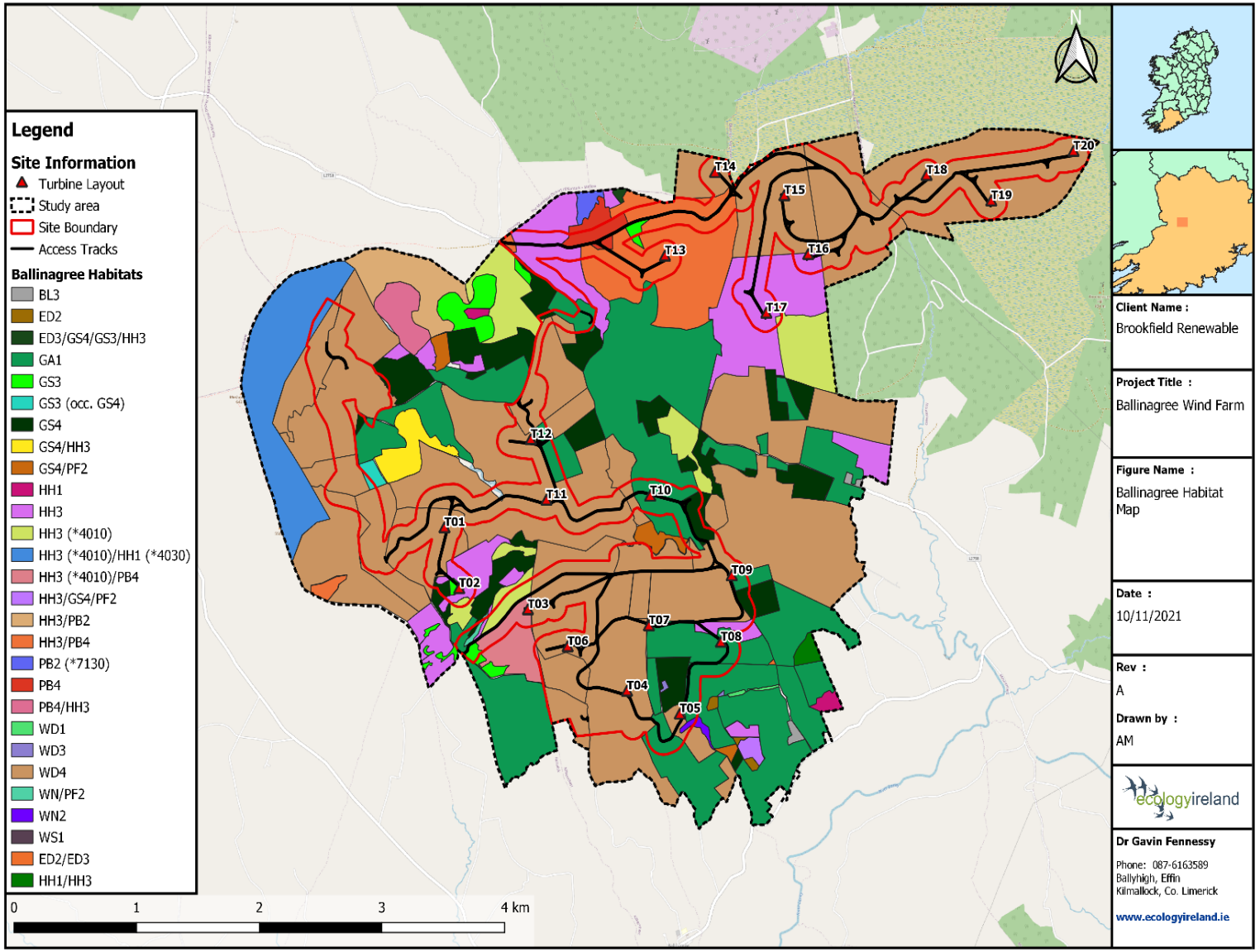

Figure 8A.10: Habitat Map.

8A.3.3 Avifauna

8A.3.3.1 Breeding Season Vantage Point Survey Results

A total of four breeding season vantage point (VP) surveys were completed at the terrestrial biodiversity study area (*i.e.* 2017, 2018, 2018 & 2019). Survey results are summarised below with survey schedule provided in Appendix 8A.1 and flightline observations/mapping provided in Appendix 8A.4.

Six Annex I bird species were recorded during the breeding season VP surveys; Hen Harrier *Circus cyaneus*, Peregrine Falcon *Falco peregrinus*, Golden Plover *Pluvialis apricaria*, Merlin *Falco columbarius*, Marsh Harrier *Circus aeruginosus* and White-tailed Sea Eagle *Haliaeetus albicilla*.

Hen Harrier Activity

Hen Harriers were recorded during all four breeding season vantage point surveys, with the number of flightlines recorded per season ranging from 4 to 13. Activity levels on site were relatively low (< 1.5% of the total survey time, see Table 8A.1) during all VP surveys and primarily related to foraging and commuting, generally at heights <30m (see Appendix 8A.4). Individuals were recorded successfully catching and/or carrying prey on a number of occasions (see Appendix 8A.4). No courtship/display behavior was noted during the VP surveys and no nesting activity took place at the study area or within 2km of the study area boundary in any of the survey years. Activity was relatively broadly distributed at the site, with no areas of high or focused activity noted. Relatively regular flightlines were noted in the Dooneen Hill area to the southeast of the site, outside of the terrestrial biodiversity study area boundary in association with a known nest site in the wider area. Male Hen Harrier accounted for the bulk of the flightline activity at the site, although at least one Ringtail Hen Harrier (female or immature) flightline was recorded each season. Hen Harriers were generally present in all survey months, with no clear temporal pattern of activity noted. The predominant habitat where Hen Harriers were recorded was heath/bog, conifer plantation and grassland.

A comparison of Hen Harrier activity recorded on-site (*i.e.* within the study area boundary) and off-site (outside the study area boundary but within view of the vantage points) during the breeding season surveys is presented below in Table 8A.2 and Figure 8A.11. Data are presented as the percentage of total VP survey time that Hen Harrier were present on the site. Note that the number of vantage points used increased from six (in 2017 and 2018) to 10 in the 2019 and 2020 breeding seasons as a result in an expansion of the study area boundary. An increase in observations might therefore be expected as a result in the increase in area covered. No such trend is apparent however and an overall decline in Hen Harrier activity on the site was in fact observed throughout the study period (Table 8A.2 and Figure 8A.11).

This Annex I species is *Amber-Listed* on the Birds of Conservation Concern in Ireland list (BOCCI List) due to moderate breeding population decline and due to its unfavourable status in Europe (after Gilbert et al. 2021). Hen Harrier is a special conservation interest species of the adjacent Mullaghanish to Musheramore Mountains SPA (NPWS 2021; www.npws.ie).

Table 8A.2: Percentage of VP Survey time that Hen Harrier was recorded on/off site during the breeding season surveys

Breeding Season Summary	% Total of VP Survey Time			
Hen Harrier Activity	2017	2018	2019	2020
On Site	1.00	1.33	0.19	0.57
Off Site	0.46	0.64	0.21	0.06
VP Study Survey effort	36 HRS	36 HRS	36 HRS	36 HRS
No. of VPs	6 VPs	6 VPs	8-10 VPs	10 VPs

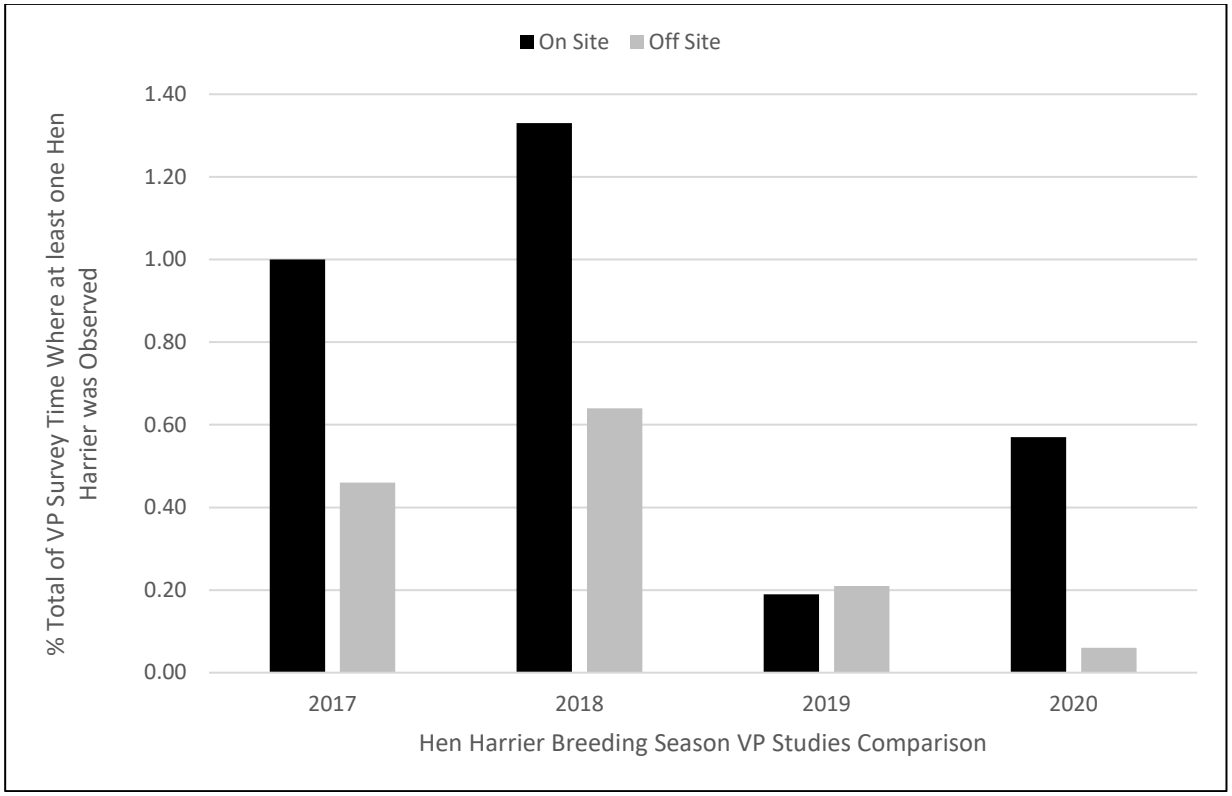

Figure 8A.11: Comparison of percentage Hen Harrier activity recorded during the four breeding VP surveys.

Golden Plover Activity

Golden Plover were recorded in all survey years apart from summer 2017 (see Table 8A.3). However, this species was recorded in March and April only and was therefore considered likely to be commuting between wintering and breeding areas. The number of flightlines varied from two (in 2018) to 15 (in 2020) and flock size varied from three to 200 individuals (see Appendix 8A.4). Flocks were recorded resting on the ground or flying, typically at heights of over 80m above ground level (see Appendix 8A.4). This Annex I species was generally associated with upland bog/heath and wet grassland habitat in the north and northwest of the terrestrial biodiversity study area where the expansion of the study area boundary northwards in 2019 to include more of such habitats (i.e. Mushera and Seefin Hills) resulted in an increase in observations of this species, with Golden Plover recorded 'on-site' for 7% of the total survey time in the 2020 breeding season.

This Annex I species is *Red-Listed* on the Birds of Conservation Concern in Ireland list (BOCCI List) due to high breeding population decline (after Gilbert *et al*. 2021).

Golden Plover are a conservation interest of the Boggeragh Mountains NHA, which partially overlaps the northeastern portion of the terrestrial biodiversity study area.

Table 8A.3: Percentage of VP Survey time that Golden Plover were recorded on/off site during the breeding season surveys

Breeding Season Summary	% Total of VP Survey Time			
Golden Plover	2017	2018	2019	2020
On Site	0.00	0.06	0.74	7.00
Off Site	0.00	2.31	0.03	0.22
VP Study Survey effort	36 HRS	36 HRS	36 HRS	36 HRS
No. VPs	6 VPs	6 VPs	8-10 VPs	10 VPs

Peregrine Falcon Activity

Peregrine Falcon have been consistently recorded on the terrestrial biodiversity study area during all survey years, however activity levels were generally low (< 0.7% of the total survey time 'on-site', see Table 8A.4) and comprised 1-3 flightlines per season (see Appendix 8A.4). This Annex I species was recorded widely on the site and was recorded predominantly flying over improved agricultural grassland and conifer plantation. No particular areas of importance were noted for this species within the study area boundary and no nest site or evidence of breeding was recorded on the site, where suitable nesting habitat is lacking. A number of 'off-site' sightings occurred in association with Musheramore Mountain.

Table 8A.4: Percentage of VP Survey time that Peregrine Falcon were recorded on/off site during the breeding season surveys

Breeding Season Summary	% Total of VP Survey Time			
Peregrine Falcon	2017	2018	2019	2020
On Site	0.13	0.69	0.03	0.005
Off Site	0.02	0.00	0.07	0.003
VP Study Survey effort	36 HRS	36 HRS	36 HRS	36 HRS
No. VPs	6 VPs	6 VPs	8-10 VPs	10 VPs

Merlin Activity

Two confirmed Merlin observations took place at the terrestrial biodiversity study area during the four breeding seasons VP studies as follows (see Appendix 8A.4). A female/immature Merlin was recorded in March 2019 perched on a Hawthorn tree for 20 seconds off-site in the Dooneens area southeast of the terrestrial biodiversity study area; it then flew over rough grassland at a height of 20-30m off site for 8 secs (or 0.02% of the total survey time). A Merlin was also recorded flying 'on-site' at a height of 5-25m and interacting with a Hooded Crow in the west of the study area for 15 seconds in August 2020.

A possible Merlin observation also took place in June 2018. The sighting comprised a possible female Merlin flying low and fast over heather/bog in the west of the site near VP3. No Merlin observations were made in the 2017 breeding season.

This Annex I species is *Amber-Listed* on the Birds of Conservation Concern in Ireland list (BOCCI List) due to moderate breeding range decline (after Gilbert *et al*. 2021).

Marsh Harrier Activity

A female Marsh Harrier was recorded in May 2019 flying over heath/bog in the northeast of the site for 120 seconds (see Appendix 8A.4). It was flying at a height of 5-25m above ground level (AGL) for one minute and 25-100m AGL for one minute and was chased by Hooded Crow. This was the only record of this species at the terrestrial biodiversity study area during the VP study (as well as all other ecological surveys at the site).

This Annex I species is *Amber-Listed* on the Birds of Conservation Concern in Ireland list (BOCCI List) as it is a breeding rarity in Ireland (after Gilbert *et al*. 2021).

White-tailed Sea Eagle Activity

A juvenile White-tailed Sea Eagle was recorded flying through the terrestrial biodiversity study area in a south-westerly direction on 20th March 2020 (see Appendix 8A.4). It was recorded flying and soaring at heights of 40-250m AGL and was visible from several vantage points as it moved through the area. The individual had a red wing tag but numbers were not decipherable. The individual was recorded on the site for a total of 420 seconds and off-site (*i.e.* outside of the study area boundary but within view of the VPs) for an additional 120 seconds. White-tailed Sea Eagle was seen on this single occasion on March 2020 (Appendix 8A.4).

This Annex I species is *Red-Listed* on the Birds of Conservation Concern in Ireland list (BOCCI List) due to historical decline (after Gilbert *et al*. 2021), where this species was reintroduced to Killarney National Park in 2007-2011.

8A.3.3.2 Breeding Season Hen Harrier Hinterland Survey Results

Hinterland surveys were completed in all four breeding seasons (2017-2020), with survey schedules provided in Appendix 8A.1. Details of nest site locations, which are known to NPWS, are not disclosed here due to the sensitive nature of this information.

In the 2017, 2018 and 2019 breeding seasons no nest site or evidence of breeding was recorded on the study area or within 2km of the study area.

Two active nest sites were recorded between 2.5 and 5km from the study area boundary, one to the southwest and one to the southeast. The same nest sites were used in all three breeding seasons. Both nest sites were recorded as successfully producing young in the 2017 and 2018 survey seasons, however in the 2019 survey season one of the nest sites (the south-eastern nest) appeared to have failed.

An increase in Hen Harrier nesting activity within the 5km hinterland area was confirmed during the 2020 breeding season. A total of five nest sites were recorded, including the two historically used nest sites (2017-2019) and three newly confirmed nest sites. Four of the five nests were recorded as successfully producing at least one chick. Supplementary information on these nest sites such as nesting success was received from the local NPWS ranger (see EIAR Section 5.3.6).

In summary, the number of Hen Harrier nests sites in the 5km hinterland area of the study area has varied during the survey period from 1-2 and up-to 5 more recently, with no nest sites located at or within 2km of the study area. Overall, the Hen Harrier population in the Mullaghanish to Musheramore Mountains SPA has undergone serious decline in the last 10 years, however an increase in numbers of nesting pairs in the SPA was noted in 2020 (Hen Harrier Project 2020).

8A.3.3.3 Winter Season Vantage Point Survey Results

A total of four winter season VP surveys (2017/2018, 2018/2019, 2019/2020 & 2020/2021) were undertaken at the terrestrial biodiversity study area. Survey results are presented below for each season. The survey schedule is provided in Appendix 8A.1 with flightline observations/mapping provided in Appendix 8A.5.

Six Annex I Bird species were recorded during the breeding season VP surveys; Hen Harrier, Peregrine Falcon, Golden Plover, Merlin, Red Kite *Milvus milvus* and White-tailed Sea Eagle.

Hen Harrier Activity

Hen Harriers were recorded during all four winter season vantage point surveys with the number of flightlines ranging from 7 to 11. Activity levels on site were low (< 0.7% of the total survey time, see Table 8A.2) during all VP surveys and related primarily to foraging and commuting, generally at heights of <25m (see Appendix 8A.4). Individuals were regularly recorded being mobbed by Corvids, particularly Hooded Crow and Raven (see Appendix 8A.4). Activity was relatively dispersed at the site, with no areas of high or focused activity noted. Male Hen Harrier accounted for the bulk of the flightline activity at the site, although at least two Ringtail Hen Harrier (female or immature) flightlines were recorded in each season, apart from the winter of 2019/2020 when all observations comprised male Hen Harriers. During the 2018/2019 season a number of ringtail flightlines were noted in the Dooneen Hill area to the southeast of the site, outside of the study area boundary in association with a known nest site in the wider area. Hen Harriers were generally present in all survey months, with no clear temporal pattern of activity noted. The predominant habitat where Hen Harriers were recorded was heath/bog, conifer plantation and grassland. No roosting activity was noted on/near the study area during the December and January 2017/2018 VP surveys that overlapped with the onset of the sunset/dusk period, where the study area supports limited areas of potentially suitable winter roosting habitat.

A comparison of Hen Harrier activity recorded on-site (*i.e.* within the study area boundary) during the winter season surveys is presented below in Table 8A.5 and Figure 8A.12, where data are presented as the percentage of total VP survey time that Hen Harrier were present on the site. Note that the number of vantage points used increased from six (in 2017/3018 and 2018/2019) to 10 in the 2019/2020 and 2020/2021 winter seasons as a result of an expansion of the study area boundary. An increase in observations might therefore be expected as a result in the increase in area covered. Overall Hen Harrier winter season activity levels appeared to be relatively stable at the study area throughout the study period until a drop with on-site activity in 2020/2021 (Table 8A.5 and Figure 8A.12). Note that the off-site activity was relatively high in the 2020/2021 season (*i.e.* almost 13 minutes recorded) however indicating the Hen Harriers were still active in the general area.

Table 8A.5: Percentage of VP Survey time that Hen Harrier were recorded on/off site during the winter season surveys

Winter Studies Comparison	% Total of VP Survey Time			
Hen Harrier (both sexes/ages)	**2017/2018**	**2018/2019**	**2019/2020**	**2020/2021**
On Site	0.51	0.51	0.64	0.16
Off Site	0.40	0.00	0.08	0.60
VP Study Survey effort	35.5 HRS	36 HRS	36 HRS	36 HRS
No. VPs	6 VPs	6 VPs	10 VPs	10 VPs

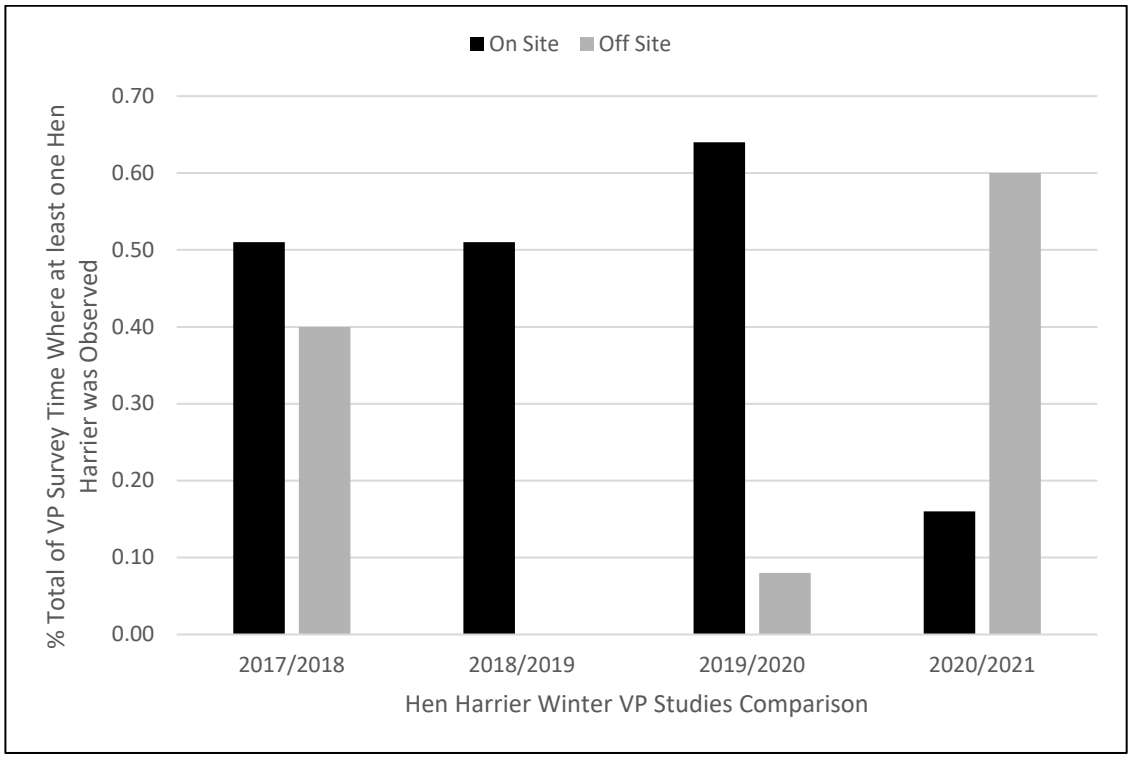

Figure 8A.12: Comparison of percentage Hen Harrier activity recorded during the four winter VP surveys

Golden Plover Activity

Golden plover was the most commonly recorded species during the winter VP study, with flocks present throughout the survey period in most survey months (see Table 8A.6). The number of flightlines ranged from nine (in 2018/2019) to 98 (in 2020/2021) and flock size ranged from single individuals to 500 birds (see Appendix 8A.5). This species was typically recorded resting on heath/bog or flying over bog, pasture and conifer plantation associated with upland areas of the site (i.e. the northern and northwestern portion of the site) as well the southwestern area of the site around VP4 (see Appendix 8A.5). Flight heights were typically <100m, although ranged as high as 200m on occasion.

The expansion of the study area boundary northwards in 2019 to include more upland heath/bog and wet grassland habitats (i.e. Musheramore Mountain and Seefin Hill) resulted in an increase in observations of this species both on and off site, with Golden Plover recorded 'on-site' for 12.1% of the total survey time in the 2019/2020 winter season.

While Golden Plover were only recorded 'on-site' for a total of 3.1% of the total survey time in the 2020/2021 winter season, this species was present 'off-site' (mainly to the north of the site near VP 10 and to the northeast around Knocraugh Mountain/VP9) for 26% of the total survey time. Much of the off-site observation time comprises flocks of Golden plover on the ground, often in association with an operational wind farm site (particularly the hard-standing area adjacent to the substation) to the north of the study area.

Table 8A.6: Percentage of VP Survey time that Golden Plover was recorded on/off site during the winter season surveys

Winter Studies Comparison	% Total of VP Survey Time			
Golden Plover	**2017/2018**	**2018/2019**	**2019/2020**	**2020/2021**
On Site	7.57	0.08	12.10	3.11
Off Site	1.42	4.73	4.79	26.04
VP Study Survey Effort	35.5 HRS	36 HRS	36 HRS	36 HRS
No. Of VPs	6 VPs	6 VPs	10 VPs	10 VPs

Peregrine Falcon Activity

Peregrine Falcon have been consistently recorded on the study area during all survey years, however activity levels were generally low (< 0.5% of the total survey time) apart from the winter 2019/2020 survey when an individual was present on the site for over four hours (resulting in a total of 12.7% of the total survey time, see Table 8A.7 and Appendix 8A.5). Number of flightlines ranged from one (in 2017/2018) to nine (in 2019/2020) and comprised both adult and immature birds. This Annex I species was recorded widely on the site and was observed predominantly flying/commuting and foraging, generally at heights of less than 70m over heath/bog and conifer plantation. No particular areas of importance were noted for this species, although a cluster of sightings was present in the southwest of the site in 2019/2020 and this species was regularly sighted in association with Musheramore Mountain.

Table 8A.7: Percentage of VP Survey time that Peregrine Falcon was recorded on/off site during the winter season surveys

Winter Studies Comparison	% Total of VP Survey Time			
Peregrine Falcon	**2017/2018**	**2018/2019**	**2019/2020**	**2020/2021**
On Site	0.02	0.49	12.77	0.11
Off Site	0.03	0.25	0.05	0.20
VP Study Survey Effort	35.5 HRS	36 HRS	36 HRS	36 HRS
No. Of VPs	6 VPs	6 VPs	10 VPs	10 VPs

Merlin Activity

Merlin were only recorded 'on-site' during the 2020/2021 winter season, however off-site activity was recorded in the 2018/2019 and the 2019/2020 winter seasons (see Appendix 8A.5). Recorded activity levels were relatively low in all cases (<1 % of total survey effort, Table 8A.8). The number of flightlines varied from one (in March 2019) to four (in 2019/2020). The bulk of the sightings comprised female/immature Merlin, however male Merlin were also recorded.

The sighting details are as follows. A female/immature Merlin was recorded in March 2019 perched on a Hawthorn tree in the Dooneens area southeast of the terrestrial biodiversity study area; it then flew over rough grassland at a height of 20-30m. In 2019/2020, four Merlin sightings were recorded off-site to the northeast of the study area boundary over heath/bog habitat. A female/immature Merlin was recorded flying in December 2019 (two observations) and a possible Merlin was observed perched on a fencing pole in February on two occasions. Three Merlin sightings were recorded during the 2020/2021 survey period. All flightlines occurred in the southwest of the study area over heath/bog and forestry habitat. Both male and female Merlin were present in the 2020/2021 season; the female Merlin was recorded in January (two flightlines) and the male was recorded in March.

Table 8A.8: Percentage of VP Survey time that Merlin was recorded on/off site during the winter season surveys

Winter Studies Comparison	% Total of VP Survey Time			
Merlin	**2017/2018**	**2018/2019**	**2019/2020**	**2020/2021**
On Site	0.00	0.00	0.00	0.07
Off Site	0.00	0.02	0.72	0.00
VP Study Survey Effort	35.5 HRS	36 HRS	36 HRS	36 HRS
No. Of VPs	6 VPs	6 VPs	10 VPs	10 VPs

Red Kite Activity

A single Red Kite was recorded flying through the site in a south-westerly direction in October 2019 (see Appendix 8A.5). It was initially seen south/southwest of VP5 over improved grassland at a height of 150-200m. It was mobbed by Hooded Crows/Rooks before gliding off to the west/southwest off-site at a height of 80-100m. The individual was recorded on the site for a total of 480 seconds (or 0.37% of the total survey time of 36 hours) and off-site (*i.e.* outside the study area boundary but within view of the VPs) for an additional 359 seconds (or *c.* 0.28% of the total survey time). This was the first sighting of a Red Kite since the VP surveys began.

This Annex I species is *Red-Listed* on the Birds of Conservation Concern in Ireland list (BOCCI List) as it is of global conservation concern (after Gilbert *et al*. 2021). This species was reintroduced on the east coast of Ireland in 2007 and is slowly expanding its range.

White-tailed Sea Eagle

A juvenile White-tailed Sea Eagle was recorded flying through the study area in a south-westerly direction in March 2020 (see Appendix 8A.5). It was recorded flying and soaring at heights of 40-250m and was visible from several vantage points as it moved through the area. The individual had a red wing tag but numbers were not decipherable. The individual was recorded on the site for a total of 420 seconds and off-site (*i.e.* outside the study area boundary but within view of the VPs) for an additional 120 seconds. White-tailed Sea Eagle was seen on this single occasion on March 2020 (Appendix 8A.4).

Please note that this is the same White-tailed Sea Eagle observation noted above for the breeding season; this is due to the fact that March is a transition period that overlaps the winter and summer breeding ecological needs and associated behaviour changes in birds.

8A.3.3.4 Breeding Season Transect & Point Count Results

A total of 44 avian species were recorded during the dedicated breeding season transect and point count surveys (see Table 8A.9). The maximum count for each species across all seasons for transect and point count data separately is shown in Table 8A.9, with a break-down of counts for each season available in Appendix 8A.6. It is important to remember that these data do not include birds that were present more than 100m from the observer or birds flying over and not using the site during the transect/point count surveys.

The species with the highest maximum abundance on the transect surveys was Meadow Pipit with a maximum count of 42 individuals recorded across the seven transects, followed by Woodpigeon (38) and Skylark (36; see Table 8A.9). These species were present on the site in all four survey seasons. It should be noted that the high Woodpigeon numbers is attributed to one early season count in 2019 when relatively higher numbers were noted at two transects, where the maximum count for this species was generally lower (< 18). Other relatively abundant species recorded during the transect surveys were Chaffinch, Rook (28 each) and Wren (21).

While Jackdaw had the highest maximum abundance during the point count surveys (50, see Table 8A.9), this high count comprised a single flock at PC5 in 2018 where this species was generally not present or present in very low numbers during the point count surveys overall.
After Jackdaw, the species with the highest maximum count was Chaffinch (22), followed by Wren (16), Willow Warbler (12) and Robin (10) (see Table 8A.8). These species were present on the site in all four survey seasons.

Table 8A.9: Maximum abundance of bird species recorded during the transect and point count surveys during the four breeding bird seasons (2017, 2018, 2019 and 2020)

Species Name	Scientific Name	Max. Abundance Transects 2017-2020	Max. Abundance Point Counts 2017-2020	Conservation Status BoCCI*
Blackbird	*Turdus merula*	6	6	GREEN
Blackcap	*Sylvia atricapilla*	3	5	GREEN
Blue Tit	*Cyanistes caeruleus*	8	4	GREEN
Bullfinch	*Pyrrhula pyrrhula*	2	1	GREEN
Chaffinch	*Fringilla coelebs*	28	22	GREEN
Chiffchaff	*Phylloscopus collybita*	3	6	GREEN
Coal Tit	*Periparus ater*	2	5	GREEN
Crossbill	*Loxia curvirostra*	1	1	GREEN
Dunnock	*Prunella modularis*	2	2	GREEN
Goldcrest	*Regulus regulus*	14	7	**AMBER**
Goldfinch	*Carduelis carduelis*	3	0	GREEN
Grasshopper Warbler	*Locustrella naevia*	1	1	GREEN
Great Tit	*Parus major*	1	2	GREEN
Greenfinch	*Carduelis chloris*	1	2	**AMBER**
Grey Heron	*Ardea cinerea*	1	0	GREEN
Hen Harrier	*Circus cyaneus*	1	0	**AMBER**
Hooded Crow	*Corvus cornix*	14	3	GREEN
House Martin	*Delichon urbica*	5	0	**AMBER**
Jackdaw	*Corvus monedula*	6	50	GREEN
Jay	*Garrulus glandarius*	0	1	GREEN
Kestrel	*Falco tinnunculus*	1	0	**RED**
Lesser Redpoll	*Carduelis cabaret*	5	2	GREEN
Long-tailed Tit	*Aegithalos caudatus*	0	4	GREEN
Magpie	*Pica pica*	6	4	GREEN
Meadow Pipit	*Anthus pratensis*	42	7	**RED**
Mistle Thrush	*Turdus viscivorus*	1	2	GREEN
Pheasant	*Phasianus colchicus*	3	3	N/A
Pied Wagtail	*Motacilla alba*	2	1	GREEN

Species Name	Scientific Name	Max. Abundance Transects 2017-2020	Max. Abundance Point Counts 2017-2020	Conservation Status BoCCI*
Raven	*Corvus corax*	8	2	GREEN
Reed Bunting	*Emberiza schoeniclus*	1	1	GREEN
Robin	*Erithacus rubecula*	9	10	GREEN
Rook	*Corvus frugilegus*	28	1	GREEN
Sedge Warbler	*Acrocephalus schoenobaenus*	0	1	GREEN
Siskin	*Carduelis spinus*	2	10	GREEN
Skylark	*Alauda arvensis*	36	0	**AMBER**
Song Thrush	*Turdus philomelos*	3	3	GREEN
Spotted Flycatcher	*Muscicapa striata*	1	0	**AMBER**
Starling	*Sturnus vulgaris*	5	0	**AMBER**
Stonechat	Saxicola torquata	1	0	GREEN
Swallow	*Hirundo rustica*	11	1	**AMBER**
Whitethroat	*Phylloscopus trochilus*	1	1	GREEN
Willow Warbler	*Phylloscopus trochilus*	8	12	**AMBER**
Woodpigeon	*Columba palumbus*	38	6	GREEN
Wren	*Troglodytes troglodytes*	21	16	GREEN

*After Gilbert *et al* 2021, Birds of Conservation Concern in Ireland List (BoCCI List).

An additional 22 avian species were recorded on a casual basis during other terrestrial biodiversity surveys on the study area (primarily during VP surveys) or were 'off-transect' (i.e. recorded >100m from the observer or flying over, see Table 8A.10[4]). The presence/absence of the additional species during the survey seasons are outlined in Table 8A.10 below. This includes many species which are typically recorded in flight such as Buzzard, House Sparrow, Lesser Black-backed Gull, Sand Martin, Sparrowhawk and Swift. Other species that were casually recorded at the terrestrial biodiversity study area across all survey seasons included Feral Pigeon, Grey Wagtail, Linnet, Mallard and Snipe. Mallard is a special conservation interest (SCI) species of the Gearagh SPA, which is considered as part of the Designated Sites sections of this EIAR chapter. It is worth noting that such casually recorded Mallard were infrequently observed in very low numbers (<5 individuals, typically 1-2 at any one time) and that the study site does not support foraging, loafing or roosting features of significance for this species due to the absence of suitable habitats (*e.g.* wetlands, lakes).

Tables 8A.9 and 8A.10 also display the conservation status of the avian species recorded according to the BoCCI list (after Gilbert *et al*. 2021). A total of six *Red-Listed* species of high conservation concern in Ireland have been recorded at the study area during the dedicated transect/point count surveys or on a casual basis during the four breeding seasons; Grey Wagtail, Kestrel, Meadow Pipit, Redwing, Snipe and Swift. A total of 18 of the species recorded are *Amber-Listed* on the BoCCI list (see Tables 8A.9 and 8A.10).

[4] Note that Table 8A.10 excludes target species of the VP survey which have already been described above in Sections 8.3.3.1 and 8.3.3.3 above.

Table 8A.10: Additional bird species recorded on a casual basis during other terrestrial biodiversity surveys at the study area during the 2017, 2018, 2019 and 2020 breeding seasons

Common Name	Scientific Name	2017	2018	2019	2020	BoCCI List*
Black-headed Gull	*Limosa lapponica*			x		**AMBER**
Buzzard	*Buteo buteo*	x	x	x	x	GREEN
Collared Dove	*Streptopelia decaocto*	x	x			GREEN
Cuckoo	*Cuculus canorus*	x	x		x	GREEN
Dipper	*Cinclus cinclus*			x		GREEN
Feral Pigeon	*Columba livia*	x	x	x	x	N/A
Fieldfare	*Turdus pilaris*		x		x	GREEN
Grey Wagtail	*Motacilla cinerea*	x	x	x	x	**RED**
Gull species	*Larus sp.*	x	x			**AMBER**
House Sparrow	*Passer domesticus*	x	x	x	x	**AMBER**
Herring Gull	*Larus argentatus*		x	x	x	**AMBER**
Lesser Black-backed Gull	*Larus fuscus*	x	x	x	x	**AMBER**
Linnet	*Carduelis cannabina*	x	x	x	x	**AMBER**
Mallard	*Anas platyrhynchos*	x	x	x	x	**AMBER**
Redwing	*Turdus iliacus*		x		x	**RED**
Reed Warbler	*Acrocephalus scirpaceus*	x	x			GREEN
Sand Martin	*Riparia riparia*	x	x	x	x	**AMBER**
Sedge Warbler	*Acrocephalus schoenobaenus*	x	x			GREEN
Snipe	*Gallinago gallinago*	x	x	x	x	**RED**
Sparrowhawk	*Accipiter nisus*	x	x	x	x	GREEN
Swift	*Apus apus*		x		x	**RED**
Wheatear	*Oenanthe oenanthe*			x	x	**AMBER**

*After Gilbert et al. 2021.

8A.3.3.5 Winter Season Transect & Point Count Results

A total of 33 avian species were recorded during the dedicated winter season transect and point count surveys (see Table 8A.11). The maximum count for each species across all seasons for transect and point count data separately is shown below in Table 8A.11, with a break-down of counts for each season available in Appendix 8A.6. It is important to remember that these data do not include birds that were present more than 100m from the observer or birds flying over and not using the site during the transect/point count surveys.

The species with the highest maximum abundance on the transect surveys was Starling with a maximum count of 120 individuals recorded across the seven transects, followed by Meadow Pipit (97) and Fieldfare (80; see Table 8A.11). These species were present on the site in both survey seasons and are typical species of open habitats. Other abundant species recorded during the transect surveys were Hooded Crow (55), Woodpigeon (48) and Redwing (41).

Species with the highest maximum abundance during the point count surveys were Robin, Siskin, Chaffinch and Wren (varied 10 to 18; see Table 8A.11). All of these species, apart from Siskin were present in both survey seasons.

Table 8A.11: Maximum abundance of bird species recorded during the transect and point count surveys during the two winter bird seasons (2017/2018 & 2019/2020)

Species Name	Scientific Name	Max Abundance Transects Winter 2017/2018 & 2019/2020	Max Abundance Point Counts Winter 2017/2018 & 2019/2020	BoCCI*
Blackbird	*Turdus merula*	12	2	GREEN
Blue Tit	*Cyanistes caeruleus*	12	4	GREEN
Bullfinch	*Pyrrhula pyrrhula*	0	3	GREEN
Chaffinch	*Fringilla coelebs*	25	12	GREEN
Coal Tit	*Periparus ater*	10	5	GREEN
Crossbill	*Loxia curvirostra*	1	2	GREEN
Dunnock	*Prunella modularis*	4	3	GREEN
Fieldfare	*Turdus pilaris*	80	0	GREEN
Goldcrest	*Regulus regulus*	12	8	**AMBER**
Goldfinch	*Carduelis carduelis*	18	0	GREEN
Great Tit	*Parus major*	2	1	GREEN
Hooded Crow	*Corvus cornix*	55	7	GREEN
Jackdaw	*Corvus monedula*	17	3	GREEN
Jay	*Garrulus glandarius*	1	0	GREEN
Kestrel	*Falco tinnunculus*	0	1	**RED**
Lesser Redpoll	*Carduelis cabaret*	4	1	GREEN
Magpie	*Pica pica*	5	3	GREEN
Mallard	*Anas platyrhynchos*	2	0	**AMBER**
Meadow Pipit	*Anthus pratensis*	97	4	**RED**
Pheasant	*Phasianus colchicus*	1	1	N/A
Pied Wagtail	*Motacilla alba*	2	1	GREEN
Raven	*Corvus corax*	19	2	GREEN
Redwing	*Turdus iliacus*	41	0	**RED**
Reed Bunting	*Emberiza schoeniclus*	1	1	GREEN
Robin	*Erithacus rubecula*	18	18	GREEN

Species Name	Scientific Name	Max Abundance Transects Winter 2017/2018 & 2019/2020	Max Abundance Point Counts Winter 2017/2018 & 2019/2020	BoCCI*
Rook	*Corvus frugilegus*	30	1	GREEN
Siskin	*Carduelis spinus*	4	13	GREEN
Skylark	*Alauda arvensis*	2	0	AMBER
Snipe	*Gallinago gallinago*	4	0	**RED**
Song Thrush	*Turdus philomelos*	4	1	GREEN
Sparrowhawk	*Accipiter nisus*	2	0	GREEN
Starling	*Sturnus vulgaris*	120	0	**AMBER**
Woodpigeon	*Columba palumbus*	48	1	GREEN
Wren	*Troglodytes troglodytes*	7	10	GREEN

*After Gilbert et al. 2021, Birds of Conservation Concern in Ireland List (BoCCI List).

An additional 20 avian species were recorded on a casual basis during other terrestrial biodiversity surveys at the study area (primarily during VP surveys) or were 'off-transect' (i.e. recorded >100m from the observer or flying) during the winter seasons (see Table 8A.12[5]). The presence/absence of the additional species during the survey seasons are shown below in Table 8A.12. This includes species which were typically recorded in flight such as Great Black-backed Gull, Lesser Black-backed Gull, House Martin and Swallow (where the summer hirundine migrants were recorded in March, a transition period between winter and summer). Other species that were consistently recorded on the terrestrial biodiversity study area during all survey seasons included Buzzard, Mistle Thrush and Stonechat.

Tables 8A.11 and 8A.12 also outline the conservation status of the avian species recorded (BoCCI List, after Gilbert et al. 2021). A total of eight *Red-Listed* species of high conservation concern in Ireland have been recorded at the study area during the dedicated transect/point count surveys or on a casual basis during the winter seasons; Grey Wagtail, Kestrel, Meadow Pipit, Redwing, Snipe, Song Thrush, Stock Dove and Woodcock. A total of nine of the species recorded are *Amber-Listed* on the BoCCI list (see Tables 8A.11 and 8A.12).

An additional Annex I species that is *Amber-Listed* on the BoCCI list was noted at two different locations in the wider area of the study area; Whooper Swan *Cygnus cygnus*. These Whooper Swan data are not included in the additional casual bird results here as they did not occur at/near the study area. A flock of 61 individuals were noted at a field (51.92927 -8.911225) >5km south of the study area in early March 2019. A flock of 13 individuals were casually observed flying north over Rylane at a height of > 150m in October 2020 *c.* 4km off-site.

[5] Note that Table 8A.12 excludes the target species of the VP survey that have already been described in Sections 8.3.3.1 and 8.3.3.3 above.

Table 8A.12: Additional bird species recorded on a casual basis during other terrestrial biodiversity surveys at the study area during winter season surveys

Common Name	Scientific Name	2017 / 2018	2018/ 2019	2019/ 2020	2020 / 2021	BoCCI*
Buzzard	*Buteo buteo*	X	X	X	X	GREEN
Chiffchaff	*Phylloscopus collybita*				X	GREEN
Cormorant	*Phalacrocorax carbo*	X				**AMBER**
Feral Pigeon	*Columba livia*	X	X	X		GREEN
Great Black-backed Gull	*Larus marinus*			X		GREEN
Greenfinch	*Carduelis chloris*	X				**AMBER**
Grey Heron	*Ardea cinerea*			X	X	GREEN
Grey Wagtail	*Motacilla cinerea*		X	X	X	**RED**
House Sparrow	*Passer domesticus*			X		**AMBER**
Jack Snipe	*Lymnocryptes minimus*	X		X	X	GREEN
Lapwing	*Vanellus vanellus*				X	**RED**
Lesser Black-backed Gull	*Larus fuscus*			X		**AMBER**
Linnet	*Carduelis cannabina*	X		X	X	**AMBER**
Long-tailed Tit	*Aegithalos caudatus*	X		X	X	GREEN
Mistle Thrush	*Turdus viscivorus*	X	X	X	X	GREEN
Stock Dove	*Columba oenas*				X	**RED**
Stonechat	*Saxicola torquata*	X	X	X	X	GREEN
Swallow	*Hirundo rustica*				X	**AMBER**
Treecreeper	*Certhia familiaris*				X	GREEN
Woodcock	*Scalopax rusticola*	X		X		**RED**

*After Gilbert *et a*l. 2021, BoCCI List.

8A.3.3.6 Red Grouse Tape Lure Survey Results

No Red Grouse responses, signs or sightings were recorded during the dedicated Red Grouse tape-lure field survey completed in late March 2019. This species was, however, confirmed at the terrestrial biodiversity study area during the VP study where a total of 11 sightings were casually noted over the survey period. Red Grouse observations occurred primarily in the winter months between January 2019 and March 2021, with a concentration of activity off-site in the vicinity of VP9 and VP10.

Red Grouse were also heard calling and signs were noted (i.e. pellets, feathers) in the vicinity of VP3 and VP7 on a number of occasions – with some of the observations occurring within the study area boundary (i.e. pellets found to the southwest of VP7). It is considered likely that at least one pair of Red Grouse were breeding in the vicinity of VP9 and also near VP10 as pairs of birds were observed in suitable habitat at both locations.

Red Grouse is *Red-Listed* of high conservation concern in Ireland due to a high decline in its breeding population in recent decades (see Gilbert *et al*. 2021). This species is generally associated with open bog/heath habitats that have suitable heather cover (Cummins *et al.* 2010). Such habitats at the study area here are associated with Musheramore Mountain and upland areas in the north and northeast of the study area (both on and off site).

8A.3.3.7 Avian Desktop Study

A total of six additional avian species have been record historically within the W38 10km national grid square overlapping the terrestrial biodiversity study area (after NBDC database accessed on 10th May 2021). The additional species are as follows; Brambling *Fringilla montifringilla*, Moorhen *Gallinula chloropus*, Curlew *Numenius arquata*, Long-eared Owl *Asio otus*, Short-eared Owl *Asio flammeus*, and Yellowhammer *Emberiza citrinella*. Curlew and Yellowhammer are *Red-Listed* as birds of high conservation concern in Ireland (Gilbert *et al*. 2021), where Curlew have experienced a drop in breeding population of 96% since the 1980's (O'Donoghue 2020). The terrestrial biodiversity study area is not located within the current breeding range of Curlew (Balmer *et al*. 2013) and there is limited suitable foraging habitat (*i.e.* cereal crops) at the study area for Yellowhammer that is a grain/cereal food dependent species. The remaining species may occur at the study area from time to time, although the study area lacks significant wetland habitat to support Moorhen and Short-eared Owl is a rare and sporadic breeding species (Balmer *et al*. 2013) where the historical record here dates back to the 1980s.

Information on the current known distribution of Barn Owl nest sites (including all active sites recorded over the past ten-year period) was received from Birdwatch Ireland (BWI) in relation to the study area at Ballinagree (email from John Lusby on 5th August 2021). There are no known Barn Owl sites within the boundary of the study area (where the study area is shown on Figure 8A.1). The closest known Barn Owl site (an active nest site) is over 2km from the study area boundary. There are no other Barn Owl sites on the BWI database which are within 5km of the study area boundary, but several are located within 10km. It is important to note that BWI do not have information on all Barn Owl sites in this area, and the information provided should not be treated as a complete assessment of Barn Owl sites in this area.

8A.3.4 Non-Volant Mammals

In general, the study area has relatively low non-volant mammal abundance with limited field sightings and signs recorded across the entirety of the survey period. The large areas of conifer plantation tend to be fairly unattractive to terrestrial mammals and much of the more exposed upland areas are heavily grazed and/or intensively managed. However, several non-volant mammal species have been recorded at the terrestrial biodiversity study area. Some of these have only been recorded by direct observation (sightings and field signs) but the majority have also been recorded on the trail cameras deployed at various locations around the site.

Two non-volant mammal species were seen and their signs observed far more frequently than any other terrestrial mammal species over the course of the site visits: Fox *Vulpes vulpes* and Irish Hare *Lepus timidus hibernicus*. Adult and young Foxes were recorded as casual observations during VP surveys and also during the deployment and collection of wildlife trail cameras. Tracks and scat of both species were recorded widely with Fox signs spread across the range of habitats present. Hare sightings and signs were more concentrated on open grassland and upland areas. None of the dens recorded as active were located within 50m of any proposed turbine location.

Foxes were recorded actively provisioning young along the edge of the conifer plantation at two separate locations (see Appendix 8A.7). The cameras also captured pictures of adults bringing Hares and small birds to feed young at these dens. Subsequently, the young foxes were recorded widely in the area, including on the trail cameras. Fox signs, particularly feeding signs and scat are especially widespread at the site. The most consistently active Fox den was located close to VP4 (W34813 83269).

Badger *Meles meles* latrines and tracks have been recorded on farmland within the study area and an adult Badger was recorded on the forestry track during active bat surveys in Summer 2017 and again in 2019. Fresh latrines were recorded in farmland in the southeast of the site at W36783 82307 during walkovers in July 2017. To the north of that area there are a number of badger setts present (exact locations treated as confidential). Both of these setts were intermittently active, with some fresh bedding and recently excavated spoil indicating current occupancy in July and August 2017. When revisited in February 2018, the latter burrow system had fresh Fox prints and scat and the former burrow system appeared unoccupied. These burrows were again revisited in February 2019 and both burrows had signs of recent activity with some fresh excavation. A number of badger latrines were noted in the area on that visit confirming the presence of Badgers. While the setts appeared to be active, the size of the burrow systems and general signs of activity were not suggestive of an active breeding sett.

Badger latrines were recorded at several locations south of the River Laney during the course of field walkovers (including deployment of trail cameras) but no additional setts were recorded anywhere within the study area. The burrow systems recorded are greater than 50m from any of the proposed turbine locations and other associated wind farm infrastructure. The assessment of accessible areas within 50m of the proposed turbine locations which was completed in June 2021 did not record any evidence of the presence of breeding places of protected mammal species.

The analysis of the 35 trail camera deployments confirmed the presence of a range of non-volant mammal species (Tables 8A.13 & 8A.14; Appendix 8A.7). The analysis of the photographic record confirmed that, as it had appeared from the field walkovers, the species most widely recorded in this area are Fox and Irish Hare. Red Deer *Cervus elaphus*, were recorded at 9 of the 35 camera deployment locations, although there were relatively few records of the species overall (12 registrations only). Badger and Red Squirrel *Sciurus vulgaris* were present at 8 of the 35 trail camera deployment locations. In contrast, five of the taxa identified were only recorded at one of the 35 camera deployment locations: Brown Rat *Rattus norvegicus*, Rabbit *Oryctolagus cuniculus*, Hedgehog *Erinaceus europaeus*, Stoat *Mustela erminea hibernica* and a small mammal, possibly Bank Vole *Clethrionomys glareolus.*

Table 8A.13: Non-volant mammals recorded on the trail cameras deployed in the terrestrial study area (2017-2020)

Common Name	Scientific Name	Number of locations detected	% of locations detected
Fox	*Vulpes vulpes*	25	71
Badger	*Meles meles*	8	23
Red Squirrel	*Sciurus vulgaris*	8	23
Irish Hare	*Lepus timidus hibernicus*	17	49
Red Deer	*Cervus elaphus*	9	26
Deer sp.	Cervidae	4	11
Rabbit	*Oryctolagus cuniculus*	1	3
Cat	*Felis catus*	3	9
Dog	*Canis domesticus*	3	9
Field Mouse	*Apodemus sylvaticus*	2	6
Brown Rat	*Rattus norvegicus*	1	3
Hedgehog	*Erinaceus europaeus*	1	3
Small mammal (poss. Bank Vole)	*Clethrionomys glareolus* (possibly)	1	3
Stoat	*Mustela erminea hibernica*	1	3

While it was possible to identify that Red Deer were present at a number of camera locations and indeed stags were seen and heard on occasion it is possible that occasional Sika *Cervus nippon* and/or Fallow Deer *Dama dama* may be present. An aged dropping recorded at the edge of woodland at the northeast of the site in October 2019 was identified as likely to belong to Sika Deer. There were deer images captured at four of the camera deployment locations that could not definitively be identified to species.

There was a number of records of unaccompanied domestic pets (Cats and Dogs) and roaming livestock (particularly Sheep) recorded throughout the trail camera study.

Table 8A.14: Non-volant mammal registrations and the camera locations where each taxa was recorded

Common Name	Total no. of Registrations	Cameras Recorded
Fox	236	CM1, CM3, CM5, CM6, CM8, CM9, CM11, CM12, CM15, CM17, CM18, CM19, CM21, CM23, CM24, CM25, CM26, CM27, CM28, CM29, CM30, CM31, CM32, CM33, CM34
Badger	18	CM1, CM2, CM9, CM12, CM16, CM17, CM18, CM28
Red Squirrel	38	CM1, CM15, CM19, CM24, CM29, CM30, CM33, CM34

Common Name	Total no. of Registrations	Cameras Recorded
Hare	71	CM3, CM6, CM7, CM8, CM9, CM12, CM13, CM15, CM17, CM19, CM21, CM23, CM28, CM30, CM31, CM33
Red Deer	12	CM1, CM4, CM15, CM20, CM22, CM25, CM28, CM29, CM34
Deer sp.	6	CM12, CM17, CM29, CM33
Rabbit	2	CM8
Cat	5	CM10, CM26, CM29
Dog	3	CM1, CM12, CM35
Field Mouse	4	CM14, CM15
Brown Rat	3	CM29
Hedgehog	1	CM14
Small mammal (poss. Bank Vole)	1	CM15
Stoat	1	CM34

The distribution of the Badger registrations on the trail camera record is concentrated around the known sett locations at the southern end of the study area. There was a single anomaly, which was a record of Badger from CM12 in the northwest of the study area. This is likely to be associated with a different social group or vagrant individual from outside of the study area. The distribution of Red Deer records are concentrated within forestry or forest edge but the species was found relatively widely throughout the study area. In terms of the overall number of registrations recorded the relative abundance of Fox is highlighted in the number of registrations of the species compared with other widely recorded non-volant mammal species. Overall, there was a relatively low rate of occurrence of non-volant mammals in the photographic record given the prolonged periods of deployment in this study.

There were a number of additional casual observations of non-volant mammals made during VP surveys or other terrestrial biodiversity related visits/surveys (Table 8A.15). There was good general agreement with the information collected as casual records with that compiled from the dedicated walkover and trail camera surveys. There were two records of Pine Marten *Martes martes* (one direct sighting in July 2017) and one observation of a scat (north of the study area in October 2019). The only other non-volant taxa recorded from the site as a casual record but not recorded in the dedicated surveys was an aural identification of Shrew species (*Sorocidae*) from near VP4. The species was not identified. There are two Shrew species in Ireland, Pygmy Shrew *Sorex minutus* and the recently introduced Greater White-toothed Shrew *Crocidura russala*. Greater White-toothed Shrew are spreading rapidly in Ireland since first identified in the country in 2008 (see NBDC).

It is a larger and more vocal species than Pygmy Shrew and it is likely to have been the species heard from near VP4 in the 2017 breeding season.

Table 8A.15: Casual mammal observations made during other terrestrial biodiversity surveys

Common Name	Scientific Name	Summer	Winter	Location	Note
Badger	*Meles meles*	2017	2017/2018	TB4, VP4	Footprint, Latrine and snuffle holes near VP4, prints on track, trail from river to end of Breeding Bird Transect TB4. Badgers seen on forest track during active bat surveys in summer 2017 and 2019.
Deer Sp.	*Cervidae*	2017		VP3, PC2	Droppings, recorded
Red Deer	*Cervus elaphus*		2019	South of Laney	Observed and heard on occasion, especially close to the forestry. Stag seen on forestry track south of the River Laney during collection of passive bat detectors in September 2019.
Feral Goat (possibly)	*Capra hiscus*		2017/2018	VP1	White goats seen in conifer plantation - could be feral.
Fox	*Vulpes vulpes*	2017, 2018, 2019, 2020	2017/2018, 2019/2020	VP1, VP2, VP3, VP5, VP6, VP8, PC5, VP4, PC6, PC7, TB1, TB3, TB4, TB5	Foraging, lambs chased it away. Active den at W34813, 83269 (near VP4), adult seen, 2 foxes seen foraging in field, scats
Irish Hare	*Lepus timidus hibernicus*	2017, 2018, 2019, 2020	2017/2018, 2018/2019, 2019/2020	VP4, VP5, VP8, TB2, TB3, TB5, PC1, PC2, PC6, PC8	Seen on track driving up to VP8 and at several other locations, droppings recorded widely
Rabbit	*Oryctolagus cuniculus*	2017, 2018, 2019, 2020	2017/2018, 2019/2020	TB4, VP6, VP3, TB4	Individuals seen
Red Squirrel	*Sciurus vulgaris*	2019	2019/2020	VP6, VP8, TB5, PC6	Observed on site in clearfell at eastern site boundary. 2 seen at north end of breeding bird transects, foraging on beech trees in October
Shrew Sp.	*Sorocidae*	2017		VP4	Shrew species heard squeaking at VP4

Common Name	Scientific Name	Summer	Winter	Location	Note
Stoat	*Mustela erminea hibernica*	2018		VP6	Foraging along stone wall close to VP6
Pine Marten	*Martes martes*	2017			One individual seen crossing Coillte track in central portion of site in July 2017. Pine Marten scat recorded in woodland at north of the site in October 2019.
Small mammal (probable Bank Vole)		2017			Two individuals seen crossing road during Active Bat surveys in 2017
Hedgehog	*Erinaceus europaeus*	2018		Near Ballinagree	Roadkilled Hedgehog recorded near Ballinagree in June 2018.

There has been no evidence of the presence of Otter *Lutra lutra* recorded in the study area. It is possible that Otters occur on the River Laney on occasion, but no sightings, scats, couches, or holts have been recorded. Trail cameras deployed near the banks of the River Laney did not record any evidence of the presence of Otter. The aquatic ecology and fisheries surveys in the wider area (Aquatic Ecology section of this Biodiversity Chapter) also recorded no evidence of the presence of Otter.

The non-volant mammal species recorded historically from the W38 10km national grid square in which the study area is located are shown in Table 8A.16. Unsurprisingly, there has been a number of historic records of Otter from this area, as well as Mink *Mustela vison*. There are also historic records of Sika Deer from the area and a single record of a Feral Ferret *Mustela furo*. Feral Ferrets have been recorded sporadically in Ireland and from time to time may establish a viable wild-breeding population. These individuals are believed to be the result of escapes or deliberate releases of captive bred animals. There is no known persisting wild population of Feral Ferrets in this part of County Cork.

Table 8A.16: Non-volant mammal species recorded historically in W38 national grid square

Species	Most Recent Record
American Mink (*Mustela vison*)	05/09/2015
Bank Vole (*Clethrionomys /Myodes glareolus*)	13/01/2016
Badger (*Meles meles*)	31/12/2014

Species	Most Recent Record
Red Squirrel (*Sciurus vulgaris*)	21/04/2018
Otter (*Lutra lutra*)	09/05/2017
Rabbit (*Oryctolagus cuniculus*)	10/09/2016
Feral Ferret (*Mustela furo*)	12/06/2007
Irish Hare (*Lepus timidus subsp. hibernicus*)	17/12/2018
Red Deer (*Cervus elaphus*)	31/12/2008
Fox (*Vulpes vulpes*)	05/07/2011
Sika Deer (*Cervus nippon*)	31/12/2008
Hedgehog (*Erinaceus europaeus*)	06/06/2012

The conservation status of non-volant wild mammal species confirmed at the study area and/or historically at the overlapping W38 national grid square is summarised in Table 8A.17. None of the non-volant mammal species are currently of conservation concern in Ireland (see Marnell *et al*. 2019). Otter is listed on Annex II and Annex IV of the EU Habitats Directive as a species requiring SAC designation and in need of strict protection. Irish Hare *Lepus timidus subsp. Hibernicus* and Pine Marten *Martes martes* are both listed on Annex V of EU Habitats Directive as a species where measures can be undertaken to ensure that its exploitation and taking in the wild is compatible with maintaining it in a favourable conservation status. For the non-volant mammal species legally protected by the Irish Wildlife Acts (1976 – 2012 as amended), it is an offence to hunt or interfere with or destroy their breeding or resting places (unless under statutory licence / permission).

Table 8A.17: Conservation status of non-volant mammal species overall

Species	Conservation Status
American Mink *Mustela vison*	Not assessed*; invasive species.
Badger *Meles meles*	Least Concern*; listed on the Irish Wildlife Acts
Bank Vole *Clethrionomys/Myodes glareolus*	Not assessed*; invasive species.
Brown Rat *Rattus norvegicus*	Not assessed*; invasive species.
Fallow Deer *Dama dama*	Least Concern*; listed on the Irish Wildlife Acts.
Field Mouse *Apodemus sylvaticus*	Least Concern*.
Fox *Vulpes vulpes*	Least Concern*.
Hedgehog *Erinaceus europaeus*	Least Concern*, listed on the Irish Wildlife Acts.
Irish Hare *Lepus timidus subsp. hibernicus*	Least Concern*; listed on Annex V of EU Habitats Directive and the Irish Wildlife Acts.

Species	Conservation Status
Irish Stoat *Mustela erminea subsp. hibernica*	Least Concern*; listed on the Irish Wildlife Acts.
Otter *Lutra lutra*	Least Concern*; listed on Annex II and Annex IV of EU Habitats Directive and the Irish Wildlife Acts.
Pine Marten *Martes martes*	Least Concern*; listed on Annex V of EU Habitats Directive and the Irish Wildlife Acts.
Rabbit *Oryctolagus cuniculus*	Not assessed*; invasive species.
Red Deer *Cervus elaphus*	Least Concern*; listed on the Irish Wildlife Acts.
Red Squirrel *Sciurus vulgaris*	Least Concern*; listed on the Irish Wildlife Acts.
Sika Deer *Cervus nippon*	Not assessed*; invasive species; listed on the Irish Wildlife Acts.

*after Marnell *et al.* 2019

8A.3.5 Bats

The desktop study found that five species of bat have been historically recorded in the W38 10km national grid square overlapping the terrestrial biodiversity study area (after NBDC); Brown Long-eared Bat *Plecotus auratus*, Daubenton's Bat *Myotis daubentonii*, Leisler's Bat *Nyctalus leisleri*, Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus*.

The overall landscape resource value for bats in which the terrestrial biodiversity study area is located, suggests that it is of low to moderate suitability for resident bats in general (after Lundy *et at*. 2011 as hosted on NBDC online mapping database). The main exception to this is Nathusius' Pipistrelle where the study area landscape is considered to be of no value for this species (after Lundy *et at*. 2011), which is outside of its known national distribution (see Roche *et al.* 2014). Of the remaining resident bat species, the study area landscape has been assessed as being of very low to low resource value for both Lesser Horseshoe Bat and Daubenton's Bat and ranging very low to moderate for all other bat species (after Lundy *et at*. 2011).

Information on the presence of known roosts within a 10km search area containing the study area was provided by Bat Conservation Ireland. Details of known roosts in the relevant search area provided below in Table 8A.18, and Figure 8A.12 shows the 1km gird square within which these roosts were located:

Table 8A.18: Records of known roosts from Bat Conservation Ireland database

Grid reference	Species Recorded
W2579	Pipistrelle (50kHz)
W2677	Brown Long-eared Bat
W2776	Brown Long-eared Bat

Grid reference	Species Recorded
W2789	Brown Long-eared Bat
W2790	Common Pipistrelle; Soprano Pipistrelle; Brown Long-eared Bat
W2876	Brown Long-eared Bat
W2893	Common Pipistrelle; Brown Long-eared Bat
W2976	Brown Long-eared Bat
W3882	Common Pipistrelle
W4182	Common Pipistrelle; Brown Long-eared Bat
W4480	Common Pipistrelle

8A.3.5.1 General Study: Passive & Active Detector Surveys

General Active Surveys

Active surveys included dusk emergence surveys at a number of locations within and adjacent to the study area, including old buildings and bridges. One confirmed bat roost was located in an old farmhouse at Knockpogue, which appears to be unoccupied. An emergence check of this structure on June 18th in 2018 recorded several Pipistrelles (both Common & Soprano Pipistrelle) departing from the roof-space around dusk. This roost is not located within the footprint of the proposed windfarm infrastructure. The nearest proposed turbine (T10) is located ca. 700m south-west of this confirmed bat roost. The exact location of this roost site is not provided here due to the sensitive nature of information regarding roost sites of protected species.

Structures checked included old sheds and other accessible dilapidated sheds were visited during daylight hours as part of the general mammal survey walkovers. Surveys of private and otherwise inaccessible structures located close to the public road and identified as being suitable for roosting bats were conducted from the public road and these buildings were not accessed to record further evidence of the size and nature of the roost.

No evidence of any other active roost site was recorded from these walkovers. In addition, no additional confirmed roost site was identified during emergence surveys carried out as part of the active bat surveys in the study area. Bridges on the River Laney (notably at 51.99658N, -8.89001W) were included in the emergence checks but no conclusive evidence of the presence of roosting bats was recorded. Given the amount of suitable features in the area, in particular some old farm buildings at the south of the study area and towards Ballinagree village, it is highly likely that there are a number of unrecorded bat roosts in the wider area. The known historical bat roost sites in the wider area are described in Section 8A.35 and mapped in Figure 8A.13 (the locations are provided to 1km resolution and anonymised as appropriate).

Walked and driven transects were used to record bat activity at and in the wider area of the study area. The coverage is biased towards areas with accessible tracks and public roads, but a wide coverage was achieved on each summer season from 2017 to 2019.

Areas with concentrations of repeated registrations (e.g. where a bat is detected repeatedly while on a regular foraging loop) can make visualizing the survey results very difficult, so clusters of registrations in a short-return period were mapped as a single bat record, where bat distributional activity recorded on each of the survey seasons is shown in Figure 8A.14, Figure 8A.15 & Figure 8A.16.

General bat activity encountered on the active surveys was relatively low, with occasional clusters of calling bats. In 2017, Common Pipistrelle was by far the most frequently recorded species and was detected at a wide number of locations in the area during the active surveys. There were encounters with Common Pipistrelle feeding along the road at Knockpogue and also near dwellings at Carrigagaulla and Ballinagree village. Elsewhere there were occasional records of foraging Common Pipistrelle along forestry tracks and at the edges of forest blocks. Two other species were recorded on the active surveys in 2017 with a small number of registrations of Soprano Pipistrelle and Leisler's Bat. In 2018, Common Pipistrelle was again, the most frequently recorded bat species during active surveys. There were similarly low numbers of registrations of Soprano Pipistrelle and Leisler's Bat as had been recorded in the previous summer. Notably, Daubenton's bat was registered at two locations along the River Laney at the centre of the study area. There were three additional *Myotis* species records, but these were either too brief or faint to be definitively identified to species. In 2019 the active surveys recorded a similar diversity and relative abundance of bats to the previous years, with Common Pipistrelle the most frequently encountered species and with much fewer and more patchily distributed registrations of Soprano Pipistrelle and Leisler's Bat. There were two records of calling Myotis sp. made from close to the River Laney.

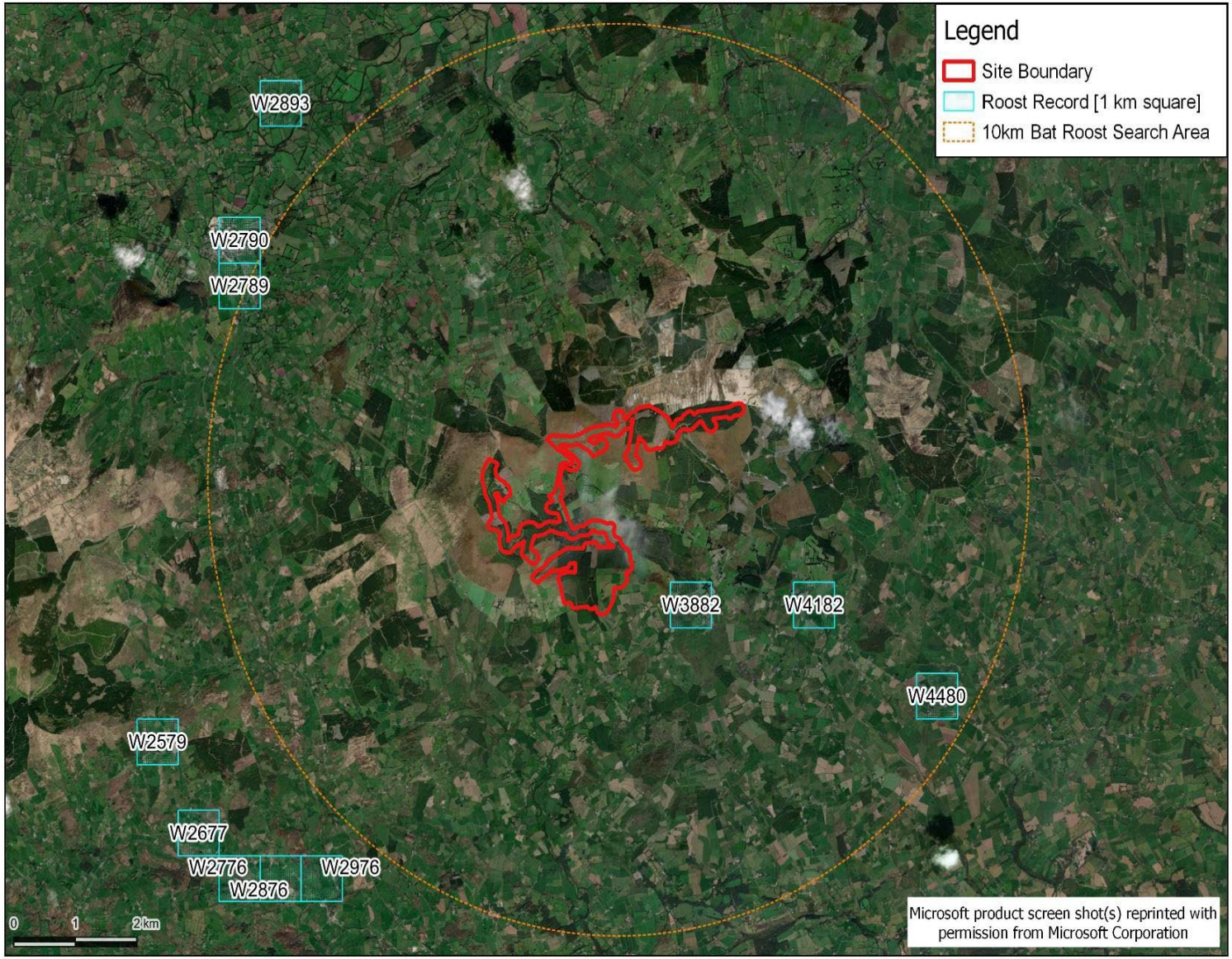

Figure 8A.13: Bat Conservation Ireland Bat Roost Record Locations

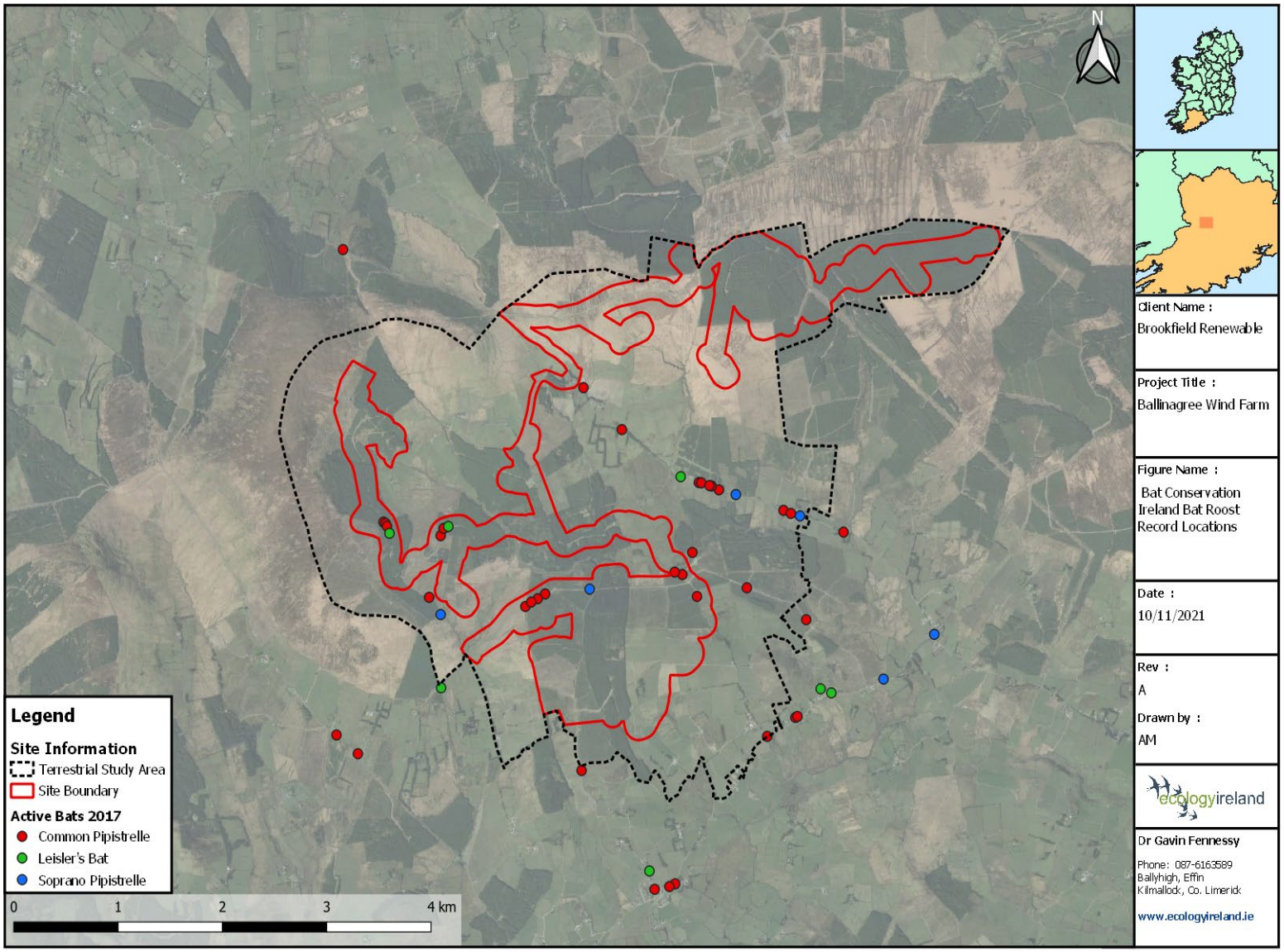

Figure 8A.14: Active Bat Survey Results 2017

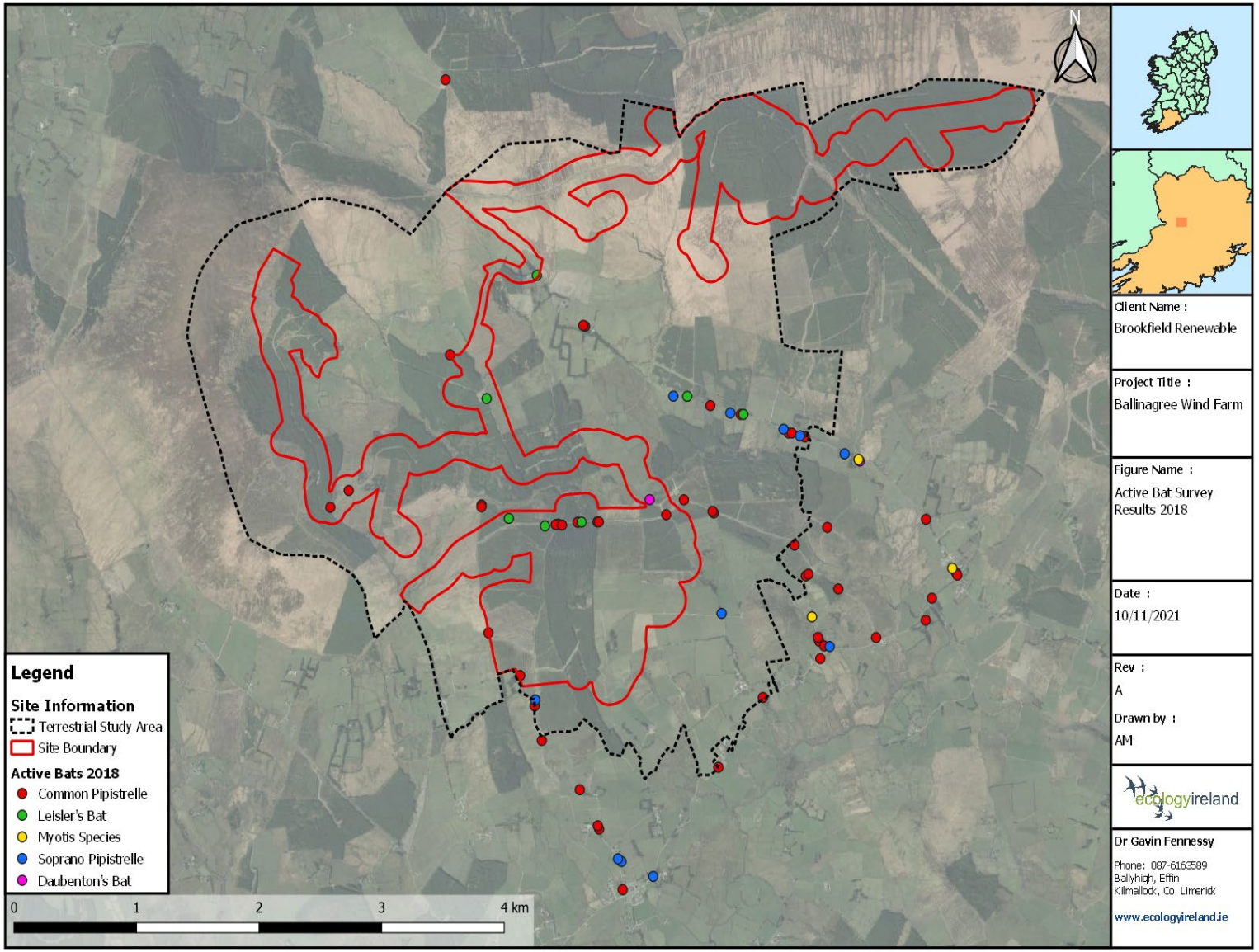

Figure 8A.15: Active Bat Survey Results 2018

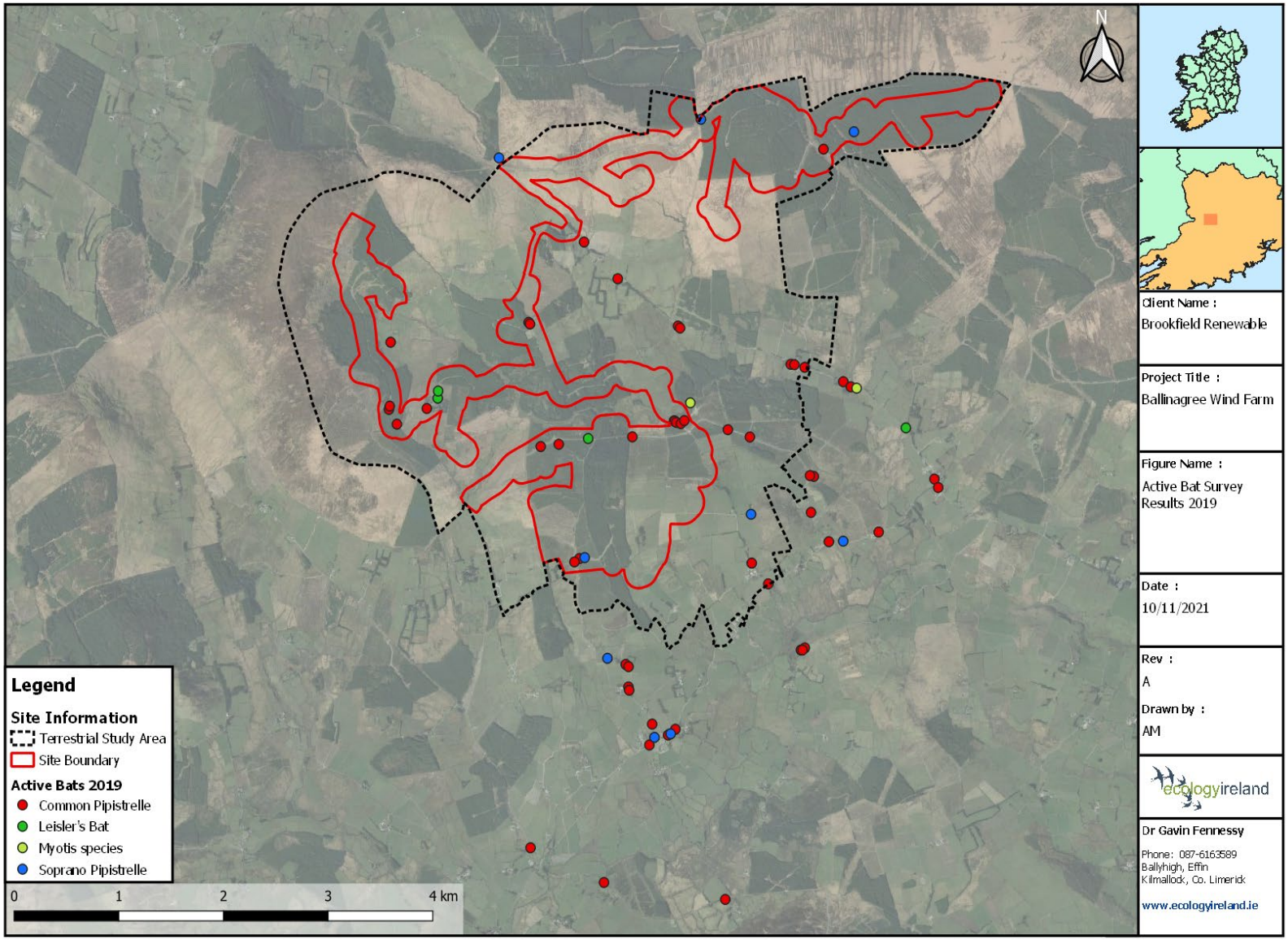

Figure 8A.16: Active Bat Survey Results 2019

General Passive Surveys

To record the multi-seasonal pattern of usage of the study area by bats an extensive program of deployment of passive bat detectors was implemented in the area commencing in 2017. The aspect of the study described in this section is the recording of bat activity across the study area without regard to potential turbine locations. The areas selected for the deployment of passive detectors (2017-2019) were chosen to represent the habitats present and key features that might support higher bat diversity (e.g. River Laney) and/or be situated on potential commuting routes (see Appendix 8A.1 and Figure 8A.4).

The long-term deployment of passive bat detectors generates a large dataset and extensive deployment allows the confirmation of the presence of species that are uncommon locally and/or are less vocal (and detectable) than other bat species. The analysis of the 26 separate deployments is summarised in Table 8A.19 below. The analysis confirmed the local presence of the following species: Common Pipistrelle (24 of 26 deployments) and Soprano Pipistrelle (22 of 26 deployments), Leisler's Bat (21 of 26 deployments), Brown Long-eared Bat (19 of 26 deployments), Whiskered Bat (14 of 26 deployments), Daubenton's Bat (12 of 26 deployments), Natterer's Bat (8 of 26 deployments) and Lesser Horseshoe Bat (3 of 26 deployments). There were additional registrations of Pipistrelle sp. and *Myotis* sp. that could not be definitively identified to species.

Common Pipistrelle was the most widespread and easily the most frequently recorded species in the passive detector study. However, there were two deployment locations (BD2 & BD12) where Soprano Pipistrelle registrations were similar to and in one case more numerous than Common Pipistrelle. Both of these deployment locations were relatively close to the known roost site at Knockpogue and it is likely that the concentration of Soprano Pipistrelle records at these deployment locations may be related to the proximity to the roost. Although, Leisler's were recorded at most of the deployment locations, numbers of registrations were generally relatively low. The deployments at BD12 and BD17 did record a greater occurrence of Leisler's Bat with especially good numbers recorded along the roadside at BD12. Brown Long-eared Bats which were not recorded during the active surveys were widely recorded during the passive detector study, albeit at a consistently low level of occurrence. Of the three Myotids identified in the passive detector study, Natterer's was least frequently registered. The results suggested only occasional and local occurrence of few individuals of the species. Whiskered Bats were well represented at a few of the deployment locations, most notably at BD2 where it was recorded almost as regularly as Common Pipistrelle. This location was close to the River Laney at a pool where bats were observed drinking on the wing. Whiskered Bats were also well represented from BD8 located close to BD2. Daubenton's Bats were also recorded from deployments close to the River Laney (e.g. BD2 & BD8) and also less predictably at BD15 towards the north of the study area.

One of the most notable findings from the passive detector surveys was the confirmation of Lesser Horseshoe Bats in the study area. Lesser Horseshoe Bat has a limited distribution in Ireland and is almost entirely concentrated in six Atlantic coast counties of Cork, Kerry, Limerick, Clare, Galway and Mayo (Roche *et al*. 2015). Ireland and Wales are home to some of the largest remaining populations of the species in Europe. It was once a widespread and abundant species but is currently one of the rarest bats in north-west Europe (Bontadina *et al*. 2008). It declined severely throughout much of its range between the 1950s and the 1980s and became locally extinct in the lowlands of Switzerland (loc cit.), and in parts of Britain (Schofield & McAney 2008). It was thought to have gone extinct in the Netherlands and Luxembourg and is critically endangered in Germany (Hutson *et al*. 2001). Due to declines in the European population, the Lesser Horseshoe Bat receives the highest level of protection under Irish and European legislation as an Annex II species of the EU Habitats Directive.

It is the only Annex II bat species in Ireland, and large roosting sites (usually with >100 individuals in summer maternity roosts or >50 individuals in winter hibernation roosts) require the Irish government to designate a Special Area of Conservation (SAC) for its protection (Roche *et al*. 2015).

The species distribution mapping on the NBDC indicates that the species has not been recorded locally, with the nearest confirmed registrations from close to Ballyvourney to the southwest of the study area. It is certain however that the species has been under-recorded based on the experience of Ecology Ireland (G. Fennessy pers obs.). Ecology Ireland has discovered a number of roost sites throughout Counties Limerick, Clare and Cork and confirmed wider distribution of the species than previously known in recent years. The availability of passive detectors that can be deployed at sites for long periods unattended has certainly helped confirm the presence of less common species that could easily be missed by more traditional survey methods.

The very small number of records identified of Lesser Horseshoe Bats in the area were spread across several seasons. There was no regular occurrence in the area and while the finding is of interest it does not indicate that the study area is of any special importance for the species. The limited number of records may relate to an individual or small number of individuals commuting through the site or said individuals at the edge of their typical foraging range.

Table 8A.19: General passive bat survey results (number of bat calls) from 2017-2019

Common Name / Detector ID	Common Pipistrelle	Soprano Pipistrelle	40/50kHz Pipistrelle	Whiskered Bat	Daubenton's Bat	Natterer's Bat	*Myotis* sp.	Brown Long-eared Bat	Lesser Horseshoe Bat	Leisler's Bat
BD1	6574	181	35	116	13	7	5	20		25
BD2	809	594	52	782	37	8		7		6
BD3	1641	23	44	3						10
BD4								13		
BD5	3240	184	4	12				4		63
BD6	3	1								
BD7	24	2						2		
BD8	4065	437	17	164	84	16	8	59		10
BD9	865	21	79	7	5		4	1		76
BD10	13	2						2		1
BD11	10			4	8			1		25
BD12	1409	1621	8	2	4			24		694
BD13	63							1		
BD14										
BD15	1520	181	28	46	43	10		46		194
BD16	4884	309	22	61	16	24	9	14	1	134
BD17	1544	66	41	48	8	10	5	21		401
BD18	2027	254	19	102	4		3	9		84
BD19	975	301			7		14	65	2	13
BD20	1435	196	24				3	28		35
BD21	3145	501	45	54	12		6	3		121
BD22	438	105	7				2			20
BD23	1004	378				4	6			77

Common Name / Detector ID	Common Pipistrelle	Soprano Pipistrelle	40/50kHz Pipistrelle	Whiskered Bat	Daubenton's Bat	Natterer's Bat	*Myotis* sp.	Brown Long-eared Bat	Lesser Horseshoe Bat	Leisler's Bat
BD24	1778	687	19							26
BD25	910	139	6				3			7
BD26	1927	222	10	36		7	9	14	8	208

8A.3.5.2 SNH Adapted Passive Detector Study

To record the multi-seasonal pattern of usage of the study area by bats an extensive program of passive bat detection was carried out in Autumn 2019 and Spring and Summer 2020, following guidelines set out in SNH (2019). The resulting information provides information on bat species composition, relative abundance and landscape usage. The survey was carried out from 28 detector locations, which were selected based on the current iteration of the project design at the time of deployment.

Overall, a moderate to high level of bat activity was recorded at the site, and a high level of species diversity. The site generally lacks suitable structures or natural bat roosting features and primarily represents a foraging habitat. A total of eight bat species were recorded (possibly nine as Whiskered Bats and Brandt's Bats are indistinguishable through ultrasonic detection). Species recorded during the 2019 and 2020 passive bat detector surveys were as follows:

- Common Pipistrelle
- Soprano Pipistrelle
- Daubenton's Bat
- Natterer's Bat
- Whiskered Bat
- Leisler's Bat
- Brown Long-eared Bat
- Lesser Horseshoe Bat

Nathusius Pipistrelle may occur in the study area but no echolocation signals which could positively identify the species were recorded. Identification of Nathusius Pipistrelle is complicated by the fact that the parameters of their echolocation calls overlap with those of Common Pipistrelle, and positive identification of echolocation signals is not always possible.

The level of activity recorded at the site varied according to season, location and species. The results of passive bat monitoring are presented in Tables 8A.20 to 8A.23 below. Overall activity was highest in the early-autumn survey period at a time when that year's young bats would be on the wing, and bats are foraging in order to prepare for winter hibernation. Activity was lowest in the late-autumn period, despite the generally suitable weather conditions which prevailed during the survey period. The number of registrations recorded in the spring were approximately double the number of registrations recorded in the summer when maternity roosts have formed and female bats are nursing young bats. The northern block which is dominated by commercial forestry and at a greater altitude than the southern block generally recorded lower levels of bat activity but some seasonal and inter-species variations did occur.

Autumn 2019

Two distinct phases of monitoring were carried out during autumn 2019 in order to investigate differences in activity levels within this season.

Early Autumn 2019

During the early Autumn 2019 monitoring period (the nights of 28th August to 6th September inclusive), a total of 15,950 registrations were recorded in 10 nights across the 13 monitoring stations (excluding the met mast location Bat_03a). Broadly separating the study area into two main blocks, there was a significant difference in the southern block (detector locations 1 to 9) versus the northern block (detector locations 10 to 15) with 63.8 registrations per location per night being recorded in the southern block, versus 321.2 registrations per location per night in the northern block.

In terms of species composition, 49.8% of registrations recorded in the southern block were identified as Common Pipistrelle, followed by Brown Long-eared Bat (13.2%), Leisler's Bat (9.6%), Whiskered Bat (9.3%), Natterer's Bat (8.1%), Daubenton's Bat (7.2%) and Soprano Pipistrelle (2.5%) while a single registration of Lesser Horseshoe Bat was recorded at monitoring station 'Bat_09a'.

91.4% of registrations recorded in the northern block were identified as Common Pipistrelle, followed by Soprano Pipistrelle (5.7%) with Leisler's Bat, Whiskered Bat, Daubenton's Bat, Natterer's Bat and Brown Long-eared Bat each comprising less than 1% of registrations recorded. In relation to the large number of Common Pipistrelle registrations recorded in the northern block, particularly at recording site 'Bat_13', investigation of the data shows a large number of files with multiple bats present simultaneously and a consistently high level of registrations over a number of nights in the survey period.

Late Autumn 2019

During the late Autumn 2019 monitoring period (the nights of 29th October 2019 to 6th November 2019 inclusive plus 10th November 2019), a total of 117 registrations were recorded in 10 nights across the 9 monitoring stations (excluding the met mast location Bat_03a). Across the overall study area activity was significantly reduced relative to other survey periods. Activity was higher in the southern block (detector locations 1 to 9) versus the northern block (detector locations 10 to 15) with 1.4 registrations per location per night being recorded in the southern block, versus 0.9 registrations per location per night in the northern block.

In terms of species composition, 39.8% of registrations recorded in the southern block were identified as Common Pipistrelle. Myotis species registrations which could not be positivity identified to species level accounted for 27.7% of registrations, followed by Daubenton's Bat (13.9%), Natterer's Bat (7.4%), Brown Long-eared Bat (4.6%) and Whiskered Bat (3.7%) with Leisler's Bat and Soprano Pipistrelle each comprising less than 1% of registrations recorded.

One detector was located in the northern block in this study period ('Bat_13') and a total of nine registrations were recorded. Common Pipistrelle, Soprano Pipistrelle, Daubenton's Bat, Natterer's Bat and Whiskered Bat were recorded. Leisler's Bat and Brown Long-eared Bat were not recorded.

Spring 2020

During the spring 2020 monitoring period, a total of 10,326 registrations were recorded in 10 nights across the 15 monitoring stations (excluding the met mast location Bat_03a).

Broadly separating the study area into two main blocks, there was a significant difference in the southern block (detector locations 1 to 9) versus the northern block (detector locations 10 to 15) with 81.8 registrations per location per night being recorded in the southern block, versus 33.1 registrations per location per night in the northern block.

In terms of species composition, 66.4% of registrations recorded in the southern block were identified as Common Pipistrelle, followed by Leisler's Bat (25.3%), Soprano Pipistrelle (4.5%) and with Daubenton's Bat, Whiskered Bat, Natterer's Bat, Brown Long-eared Bat and Lesser Horseshoe Bat all recorded occasionally.

66.6% of registrations recorded in the northern block were identified as Leisler's Bat followed by Common Pipistrelle (17.1%), Whiskered Bat (7.3%) Soprano Pipistrelle (2.9%) with Daubenton's Bat, Natterer's Bat and Brown Long-eared Bat all recorded occasionally.

Summer 2020

During the summer 2020 monitoring period, a total of 5,470 registrations were recorded in 10 nights across the 15 monitoring stations (excluding the met mast location Bat_03a). Broadly separating the study area into two main blocks, there was a significant difference in the southern block (detector locations 1 to 9) versus the northern block (detector locations 10 to 15) with 58 registrations per location per night being recorded in the southern block, versus 4.2 registrations per location per night in the northern block.

In terms of species composition, 89.6% of registrations recorded in the southern block were identified as Common Pipistrelle, followed by Soprano Pipistrelle (11.6%) and Leisler's Bat (11.2%) with Daubenton's Bat, Whiskered Bat, Natterer's Bat, Soprano Pipistrelle, Brown Long-eared Bat and Lesser Horseshoe Bat all recorded occasionally.

66.9% of registrations recorded in the northern block were identified as Common Pipistrelle, followed by Leisler's Bat (4.3%) with Daubenton's Bat, Whiskered Bat, Natterer's Bat, Soprano Pipistrelle and Brown Long-eared Bat all recorded occasionally.

8A.3.5.3 Bat Survey at Height

An 80m meteorological mast was utilised to install a microphone at 55 meters above ground level during the spring 2020 and summer 2020 bat detector surveys. A second microphone was placed at ground level to allow direct comparison of activity levels at height versus at ground level. The survey location is shown as 'Bat_3a' in Figure 8A.5.

During the 10-night survey period in spring 2020, 113 bat registrations were recorded at height, compared with 2,107 at ground level. Only Common Pipistrelle and Soprano Pipistrelle were recording at height with Common Pipistrelle accounting for 97.3% of registrations. 63% of registrations recorded at ground level were identified as Common Pipistrelle, followed by Leisler's Bat (30.6%), Soprano Pipistrelle (11.6%) and Daubenton's Bat (2.7%) with Whiskered Bat, Natterer's Bat, Soprano Pipistrelle and Brown Long-eared Bat all recorded occasionally.

During the 10-night survey period in summer 2020, no bat registrations were recorded at height while 1,623 registrations were recorded at ground level. 93.2% of registrations recorded at ground level were identified as Common Pipistrelle, followed by Whiskered Bat (3.6%) with Daubenton's Bat, Leisler's Bat, Natterer's Bat and Brown Long-eared Bat all recorded occasionally.

It should be noted that only one monitoring point was available for survey at height, and this location occurs centrally in a large area of commercial forestry. Data gathered at this location should not be interpreted as applying throughout the study area as the habitat associations of bat species vary. For example, commercial forestry is not considered to be a preferred foraging habitat for Leisler's Bat, and while strong habitat associations for the species have been difficult to identify in an Irish context, there is evidence to suggest a positive association with pasture and freshwater habitats (Roche *et al*. 2014).

8A.3.5.4 Bat Overview & Conservation Status

All bat species occurring in Ireland are legally protected under the Irish Wildlife Acts (1976 - 2012 as amended; see Marnell *et al.* 2019). Under this protection, it is an offence to hunt or interfere with or destroy their breeding or resting places (unless under statutory licence / permission). Furthermore, all bat species are listed as Annex IV species of the EU Habitats Directive as an animal species of 'community interest in need of strict protection' (see Marnell *et al.* 2019); Lesser Horseshoe Bat is also listed on Annex II of the EU Habitats Directive as a species whose core areas of habitat require designation under Special Areas of Conservation (see Marnell *et al.* 2019).

No bat species is currently of conservation concern in Ireland (Marnell *et al.* 2019). The small number of records identified of Lesser Horseshoe Bats in the area were spread across several seasons. The limited number of records may relate to an individual or small number of individuals commuting through the site or said individuals at the edge of their typical foraging range.

Table 8A.20: Results of passive bat monitoring in Early Autumn 2019 (Note: Data is presented as "average [peak]" where average is the average number of registrations per night on 10 selected nights. Peak data represents the maximum number of nightly registrations from any night in the relevant recording period.)

Recording Site	Daubenton's Bat	Whiskered Bat	Natterer's Bat	Myotis sp.	Leisler's Bat	Pipistrelle (50kHz)	Pip Sp.	Common Pipistrelle	Soprano Pipistrelle	Brown Long-eared Bat	Lesser Horse-shoe Bat
Bat_01c	-	-	-	-	-	-	-	-	-	-	-
Bat_01a	3.2 [6]	8.4 [39]	0.8 [2]	0 [0]	0.6 [3]	0 [0]	0 [0]	7.4 [24]	0.4 [2]	1.3 [6]	0 [0]
Bat_01b	4.8 [15]	3.1 [9]	13.3 [27]	0 [0]	2.4 [14]	0.1 [1]	0 [0]	12.4 [55]	1.6 [4]	14.4 [45]	0 [0]
Bat_09a	2.9 [7]	0.8 [6]	10.2 [29]	0 [0]	1.8 [7]	0 [0]	0 [0]	5.2 [17]	0.8 [2]	4.9 [11]	0.1 [1]
Bat_08b	5.3 [13]	2.9 [5]	2.8 [10]	0 [0]	1.6 [6]	0 [0]	0 [0]	4.8 [17]	1.3 [6]	13 [27]	0 [0]
Bat_03b	-	-	-	-	-	-	-	-	-	-	-
Bat_08a	2.3 [7]	1.4 [4]	0.22 [2]	0 [0]	1.6 [7]	0 [0]	0 [0]	18.8 [60]	0.8 [4]	4.7 [13]	0 [0]
Bat_06a	2.7 [8]	0.2 [1]	4.2 [10]	0 [0]	6.4 [21]	0.1 [1]	0 [0]	40.1 [95]	2.2 [11]	8.4 [17]	0 [0]
Bat_04	3.1 [11]	2.4 [8]	7.6 [16]	0 [0]	37.6 [110]	0 [0]	0 [0]	58.3 [212]	4.1 [17]	9.9 [27]	0 [0]
Bat_05b	2.3 [4]	2.1 [5]	7.6 [24]	0 [0]	5 [16]	1.7 [12]	0 [0]	157.4 [530]	3.5 [12]	18.3 [53]	0 [0]
Bat_07	19.2 [141]	37.3 [228]	4.7 [19]	0 [0]	4.1 [11]	0 [0]	0 [0]	11.8 [29]	1.1 [3]	8.8 [19]	0 [0]
Bat_11a	-	-	-	-	-	-	-	-	-	-	-
Bat_12a	2.4 [5]	0.8 [2]	0.1 [1]	0 [0]	0.2 [2]	0 [0]	0 [0]	169 [797]	17.8 [113]	0.1 [1]	0 [0]
Bat_13	5.6 [14]	1.1 [3]	7.8 [20]	0 [0]	4.4 [13]	0.7 [3]	0 [0]	710.9 [1642]	37.2 [127]	4.6 [10]	0 [0]
Bat_13b	0 [0]	0 [0]	0.2 [1]	0 [0]	0.2 [2]	0 [0]	0 [0]	0.9 [6]	0.1 [1]	0.1 [1]	0 [0]

Table 8A.21: Results of passive bat monitoring in Late Autumn 2019 (Note: Data is presented as "average [peak]" where average is the average number of registrations per night on 10 selected nights. Peak data represents the maximum number of nightly registrations from any night in the relevant recording period.)

Recording Site	Daubenton's Bat	Whiskered Bat	Natterer's Bat	Myotis sp.	Leisler's Bat	Pipistrelle (50kHz)	Pip Sp.	Common Pipistrelle	Soprano Pipistrelle	Brown Long-eared Bat	Lesser Horse-shoe Bat
Bat_01c	0.2 [2]	0 [0]	0 [0]	0.2 [1]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
Bat_01a	0.5 [2]	0 [0]	0.1 [1]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
Bat_01b	0 [0]	0 [0]	0 [0]	0.4 [3]	0 [0]	0 [0]	0 [0]	0.1 [1]	0 [0]	0.1 [1]	0 [0]
Bat_09a	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0.1 [1]	0 [0]
Bat_08b	-	-	-	-	-	-	-	-	-	-	-
Bat_03b	0.1 [1]	0 [0]	0.1 [1]	0 [0]	0 [0]	0 [0]	0 [0]	3.1 [15]	0 [0]	0.1 [1]	0 [0]
Bat_08a	0 [0]	0 [0]	0.1 [1]	0.2 [2]	0 [0]	0 [0]	0 [0]	0.1 [1]	0 [0]	0 [0]	0 [0]
Bat_06a	0.7 [6]	0.4 [2]	0.4 [3]	2.3 [11]	0.1 [1]	0 [0]	0 [0]	0.8 [5]	0.1 [1]	0.1 [1]	0 [0]
Bat_04	-	-	-	-	-	-	-	-	-	-	-
Bat_05b	0 [0]	0 [0]	0.1 [1]	0 [0]	0 [0]	0 [0]	0 [0]	0.2 [2]	0 [0]	0.1 [1]	0 [0]
Bat_07	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0.1 [1]	0 [0]	0 [0]	0 [0]
Bat_11a	-	-	-	-	-	-	-	-	-	-	-
Bat_12a	-	-	-	-	-	-	-	-	-	-	-
Bat_13	0.2 [1]	0.1 [1]	0.2 [1]	0.1 [1]	0 [0]	0 [0]	0 [0]	0.2 [2]	0.1 [1]	0 [0]	0 [0]
Bat_13b	-	-	-	-	-	-	-	-	-	-	-

Table 8A.22: Results of passive bat monitoring in Spring 2020 (Note: Data is presented as "average [peak]" where average is the average number of registrations per night on 10 selected nights. Peak data represents the maximum number of nightly registrations from any night in the relevant recording period.)

Recording Site	Daubenton's Bat	Whiskered Bat	Natterer's Bat	Myotis sp.	Leisler's Bat	Pipistrelle (50kHz)	Pip Sp.	Common Pipistrelle	Soprano Pipistrelle	Brown Long-eared Bat	Lesser Horse-shoe Bat
Bat_01c	0 [0]	0.1 [1]	0.2 [1]	0.5 [2]	59 [429]	0 [0]	0.1 [1]	0.7 [3]	0 [0]	0.9 [4]	0 [0]
Bat_01a	0.5 [2]	0.2 [1]	0.4 [2]	0.8 [3]	9.5 [41]	0 [0]	0.2 [1]	3.5 [11]	0 [0]	0.2 [2]	0 [0]
Bat_01b	0 [0]	0 [0]	0 [0]	0.7 [3]	36.2 [199]	0 [0]	0.3 [1]	3.6 [13]	0 [0]	0.1 [1]	0 [0]
Bat_09a	0.1 [1]	0 [0]	0 [0]	0 [0]	14.5 [64]	0 [0]	4.4 [13]	0 [0]	0.2 [2]	0.7 [4]	0 [0]
Bat_08b	0.5 [2]	0.2 [1]	0.2 [1]	0.4 [2]	27 [132]	0 [0]	0 [0]	0.8 [3]	0.2 [1]	0.6 [2]	0 [0]
Bat_03b	0.1 [1]	0.4 [3]	0 [0]	0 [0]	21.2 [62]	0 [0]	0 [0]	24.5 [144]	0.2 [1]	0.3 [1]	0 [0]
Bat_08a	0.3 [2]	0.3 [1]	0 [0]	0.4 [2]	8.5 [41]	0 [0]	0 [0]	10.3 [28]	0.3 [2]	0.7 [4]	0 [0]
Bat_06a	1 [5]	0 [0]	0 [0]	0.2 [1]	21.1 [80]	0.1 [1]	0 [0]	33.4 [191]	1.3 [7]	0.5 [3]	0 [0]
Bat_04	0 [0]	4.8 [27]	0.2 [1]	11.2 [66]	11.3 [44]	0.1 [1]	0 [0]	467.7 [1375]	37.2 [347]	0.1 [1]	0 [0]
Bat_05a	0.3 [1]	0.3 [2]	0 [0]	1 [2]	19 [60]	1.5 [11]	0 [0]	36.6 [122]	0.7 [3]	2.1 [7]	0.1 [1]
Bat_07	0 [0]	0 [0]	0 [0]	0.2 [1]	0.2 [2]	0 [0]	0 [0]	11.3 [48]	0.2 [2]	0 [0]	0 [0]
Bat_11a	2 [14]	8.8 [41]	0 [0]	2.6 [18]	13.7 [81]	0.2 [2]	0 [0]	5.5 [49]	0 [0]	0 [0]	0 [0]
Bat_12a	0.8 [2]	0.6 [3]	0.1 [1]	0.3 [2]	28.2 [151]	0.1 [1]	0 [0]	5.9 [47]	0 [0]	0 [0]	0 [0]
Bat_13a	0.1 [1]	0 [0]	0 [0]	0.4 [2]	32.7 [161]	0 [0]	0.1 [1]	10.6 [88]	3.5 [21]	0.8 [5]	0 [0]
Bat_13b	0.4 [2]	0.3 [3]	0.1 [1]	0 [0]	13.7 [53]	0 [0]	0 [0]	0.6 [6]	0.4 [3]	0 [0]	0 [0]
Bat_03a Met Mast [Ground]	5.7 [34]	3.7 [25]	1.8 [10]	0 [0]	64.5 [184]	0 [0]	0 [0]	133.4 [642]	0.9 [6]	0.7 [3]	0 [0]
Bat_03a Met Mast [High]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	11 [57]	0.3 [3]	0 [0]	0 [0]

Table 8A.23: Results of passive bat monitoring in Summer 2020 (Note: Data is presented as "average [peak]" where average is the average number of registrations per night on 10 selected nights. Peak data represents the maximum number of nightly registrations from any night in the relevant recording period.)

Recording Site	Daubenton's Bat	Whiskered Bat	Natterer's Bat	Myotis sp.	Leisler's Bat	Pipistrelle (50kHz)	Pip Sp.	Common Pipistrelle	Soprano Pipistrelle	Brown Long-eared Bat	Lesser Horse-shoe Bat
Bat_01	1.5 [5]	0 [0]	0.5 [2]	0.9 [4]	0.3 [1]	0 [0]	0 [0]	7.2 [32]	0 [0]	0.2 [1]	0 [0]
Bat_03	1.4 [6]	1.5 [6]	0.2 [1]	0 [0]	3.6 [19]	0 [0]	0 [0]	135.4 [835]	0.1 [1]	0.2 [2]	0 [0]
Bat_02	0 [0]	0 [0]	0.1 [1]	0.2 [1]	1.4 [8]	0 [0]	0 [0]	5.9 [15]	0.3 [2]	0 [0]	0 [0]
Bat_04	3.9 [31]	7.5 [37]	0.2 [1]	0.7 [6]	4.6 [15]	0.1 [1]	0 [0]	186.9 [779]	4.5 [31]	0.2 [2]	0 [0]
Bat_05	0.4 [3]	0.1 [1]	0 [0]	0 [0]	2.3 [9]	0 [0]	0 [0]	5.4 [18]	0 [0]	0.1 [1]	0 [0]
Bat_06	1.9 [7]	0.7 [4]	0 [0]	0.2 [1]	7.1 [33]	0 [0]	0 [0]	93.2 [268]	0.3 [2]	0.3 [2]	0 [0]
Bat_07	0.9 [9]	0.1 [1]	0.9 [5]	0.1 [1]	0.9 [4]	0.1 [1]	0 [0]	16.3 [61]	0.2 [1]	0 [0]	0.1 [1]
Bat_08	0.2 [1]	0 [0]	0.1 [1]	0 [0]	1.8 [11]	0 [0]	0 [0]	5.9 [12]	0 [0]	0.4 [2]	0 [0]
Bat_09	0.1 [1]	0 [0]	0.1 [1]	0 [0]	0.7 [5]	0 [0]	0 [0]	11.4 [54]	0.1 [1]	0 [0]	0 [0]
Bat_10	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0.1 [1]	0 [0]	0 [0]	0 [0]
Bat_11	0 [0]	0 [0]	0 [0]	0 [0]	0.4 [3]	0 [0]	0 [0]	0.5 [5]	0 [0]	0 [0]	0 [0]
Bat_12	1.2 [4]	0 [0]	0.4 [2]	0.2 [1]	0.7 [4]	0 [0]	0 [0]	11 [101]	0 [0]	0 [0]	0 [0]
Bat_13	0.2 [1]	0.2 [2]	0.1 [1]	0.1 [1]	0.9 [8]	0 [0]	0 [0]	4.4 [33]	2.9 [17]	0.1 [1]	0 [0]
Bat_14	0 [0]	0 [0]	0 [0]	0 [0]	0.3 [3]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
Bat_15	0 [0]	0 [0]	0.1 [1]	0 [0]	0.5 [1]	0 [0]	0 [0]	0.8 [6]	0 [0]	0 [0]	0 [0]
Bat_03a Met Mast [Ground]	2.3 [11]	5.8 [48]	1 [7]	0 [0]	1.8 [6]	0 [0]	0 [0]	151.2 [764]	0 [0]	0.2 [1]	0 [0]
Bat_03a Met Mast [High]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]

8A.3.6 Other Protected Fauna

8A.3.6.1 Marsh Fritillary

Marsh Fritillary larval webs were confirmed at two of the seven areas subject to dedicated survey, MF1 and MF7. Key survey results are summarised below with survey schedule provided in Appendix 8A.1.

At survey area MF1, active larval webs were noted at an overall total of 25 locations along all six transects combined. The number of active webs varied from 1-5 at any one location. Larvae were generally basking with some feeding and web weaving also noted. Larval webs at MF1 were concentrated in wet flushed areas downslope where Devil's-bit Scabious was more frequent and vegetation height varied from low to knee-high in parts. There was evidence of cattle grazing with access for sheep and horses also available. The webs were generally located around 20-30 cm above ground.

At survey area MF7, active larval webs were noted at an overall total of two locations along all two transects combined. While one location comprised of one active web, the other comprised of three active webs. Larvae were basking at both locations. Larval webs at MF7 were associated with patches of Devil's-bit Scabious at damp/wet areas with purple moor grass/rush tussocks knee to waist height also present.

Three casual Marsh Fritillary observations were noted from other terrestrial biodiversity surveys. One involved an adult on the wing in early June 2018 near a small borrow pit when undertaking a bird transect. The second comprised of active larval webs in late October 2019 at the MF1 survey area during habitat and flora surveys. There was also a record of an adult Marsh Fritillary on the wing recorded from south of Turbine 16 in MF1 during walkovers in June 2021. Two historical Marsh Fritillary records are known for the W38 10km national grid square overlapping the terrestrial biodiversity study area (after NBDC database accessed on 10th May 2021). Both relate to adults noted at Musheramore summit on June 1992, adjoining the terrestrial biodiversity study area here.

Marsh Fritillary is currently considered to be of Vulnerable conservation status nationally (see Regan *et al.* 2010). While no butterfly species is currently listed on the Irish Wildlife Acts (1976 - 2012 as amended), Marsh Fritillary is legally protected through its listing on Annex II of the EU Habitats Directive as a species whose core areas of habitat require designation under Special Areas of Conservation (see Regan *et al.* 2010).

The historical and contemporary records for Marsh Fritillary suggest that this legally protected butterfly species has persisted at the study area and locality for at least several decades despite the pressures it faces nationally through habitat loss/fragmentation and habitat quality decline where the overall status and future prospects of its habitats are considered as either poor or bad (see Regan *et al.* 2010).

8A.3.6.2 Other Taxa

A total of 33 'other taxa' fauna species were recorded on a casual basis during terrestrial biodiversity surveys at the study area (see Table 8A.24). The species list includes one reptile species (Common Lizard) and one amphibian species (Common Frog) that are not currently of conservation concern in Ireland, but which are legally protected under the Irish Wildlife Acts (1976 - 2012 as amended) (see Marnell *et al.* 2019). Under this protection, it is an offence to hunt or interfere with or destroy their breeding or resting places (unless under statutory licence/permission).

The remaining species comprise 14 species of butterfly, seven moth species, seven bee species, a damselfly species and four other insect species (Table 8A.24). No 'other taxa' species of conservation concern were recorded in the study area during the four years of survey work at the study area, where the conservation status of all species recorded is of 'Least Concern' or 'Not Evaluated' on the relevant Red List (after King *et al*. 2011, Regan *et al*. 2010, Nelson *et al*. 2011, Allen *et al*. 2016 and Fitzpatrick *et al*. 2006). None of the 'other taxa' recorded (apart from Common Lizard and Common Frog) are currently listed on the Irish Wildlife Acts (1976 - 2012 as amended).

Only one additional protected 'other taxa' species has been recorded historically within the W38 10km national grid square surrounding the study area (after NBDC database accessed on 10th May 2021); Kerry Slug, *Geomalacus maculosus*. This species is listed on Annexes II and IV of the EU Habitat's Directive and is protected under the Wildlife Acts. The record dates from 2015 and is located over 4km southwest of the study area in the Knockraheen area. This species has a restricted range in Ireland and is generally associated with Devonian Old Red Sandstone geology in south-west Ireland (although a localised population is also known at mature conifer plantation on granite near Oughterard, County Galway; see Reich *et al*. 2012). Within its range the species primarily occurs in woodland, open heath and blanket bog and appears to require the presence of rocky outcrops (NBDC species profile, NPWS 2010). No observations of this species were recorded during the four years of terrestrial biodiversity surveys at the study area, which would not be expected if the study area was in fact a stronghold for this species given the amount of survey effort undertaken and associated site presence across the four years by the experienced field team.

Table 8A.24: Other species recorded on a casual basis during terrestrial biodiversity surveys in the study area 2017-2021.

Common Name	Scientific Name	Conservation Status
Amphibians & Reptiles		
Common Lizard	*Zootoca vivipara*	Least Concern*
Frog	*Rana temporaria*	Least Concern*
Lepidoptera		
Clouded Yellow Butterfly	*Colias croceus*	Least Concern^
Green Hairstreak Butterfly	*Callophrys rubi*	Least Concern^
Green-veined White Butterfly	*Pieris napi*	Least Concern^
Meadow Brown Butterfly	*Maniola jurtina*	Least Concern^
Orange-tip Butterfly	*Anthocharis cardamines*	Least Concern^
Painted Lady Butterfly	*Cynthia cardui*	Least Concern^
Peacock Butterfly	*Inachis io*	Least Concern^
Red Admiral Butterfly	*Vanessa atalanta*	Least Concern^
Ringlet Butterfly	*Aphantopus hyperantus*	Least Concern^
Small Copper Butterfly	*Lycaena phlaeas*	Least Concern^
Small Tortoiseshell Butterfly	*Aglais urticae*	Least Concern^
Small White Butterfly	*Pieris rapae*	Least Concern^
Speckled Wood Butterfly	*Pararge aegeria*	Least Concern^
Angle Shades Moth	*Phlogophora meticulosa*	Least Concern^^

Common Name	Scientific Name	Conservation Status
Beautiful Yellow Underwing Moth	*Anarta myrtilli*	Least Concern^^
Emperor Moth	*Saturnia pavonia*	Least Concern^^
Fox Moth	Macrothylacia rubi	Least Concern^^
Latticed Heath Moth	*Chiasmia clathrata*	Least Concern^^
Oak Eggar Moth	*Lasiocampa quercus*	Least Concern^^
Silver Y Moth	*Autographa gamma*	Not Evaluated^^
Vestal Moth	*Rhodometra sacraria*	Not Evaluated^^
Hymenoptera		
Common Carder Bee	*Bombus pascuorum*	Least Concern***
Early Bumblebee	*Bombus pratorum*	Least Concern***
Four Coloured Cuckoo Bumblebee	*Bombus Sylvestris*	Least Concern***
Garden Bumblebee	*Bombus hortorum*	Least Concern***
Heath Bumblebee	*Bombus jonellus*	Least Concern***
Honeybee	*Apis mellifera*	Not Evaluated***
White-tailed Bumblebee	*Bombus Lucorum*	Least Concern***
Odonata		
Large Red Damselfly	*Pyrrhosoma nymphula*	Least Concern**
Other Insects		
Seven Spot Ladybird	*Coccinella 7-punctata*	n/a
Grasshopper	*Caelifera sp.*	n/a
Spined Shieldbug	*Picromerus bidens*	n/a

*after King *et al.* 2011, ^after Regan *et al*. 2010, **after Nelson *et al*. 2011, ^^after Allen *et al*. 2016, ***after Fitzpatrick *et al*.2006

8A.3.7 Existing Environment: Turbine Delivery Route

The full suite of works required at POIs on the TDR, as described in Chapter 13 of this EIAR, were assessed, with the following POIs identified as having potential for ecological impacts;

- POI29: N72 Dromtarriff Bends within the townland of Dromagh, Co. Cork works consist of the removal of hedgerow and placement of temporary load bearing surface.
- POI 30: N72/R583 Junction within the townland of Dromskehy, Co. Cork, works consist of removal of trees and vegetation and temporary removal of wall.
- POI 36: R583 Drishane Castle within the townland of Drishane More, Co. Cork, works consist of construction of a temporary staging area comprising aggregate hard standing and associated access track to and from the public road R583 in the grounds of Drishane Castle. Removal of masonry wall to facilitate temporary access from public road R583 and placement of temporary load bearing surface.
- POI 38: R583/L1123 Junction within the townland of Lackabane, Tullig and Drominahilla, Co. Cork, works include removal of walls, placement of load bearing surface and temporary removal of parking.

- POI 40: L1123 Left bend south of Millstreet within the townland of Tullig, Co. Cork, works include placement of temporary load baring surface and temporary removal of parking.
- POI 43: River Owenbawn Left Bend; within the townland of Tullig, Co. Cork, works include temporary removal of wall.
- POI 44: Auhane West of Tullig, within the townland of Tullig, Co. Cork works include ground reprofiling and placement of load bearing surface.
- POI 46: Junction between unnamed local road and L1123/L2758 within the townland of Ballinagree East, Co. Cork, works include ground reprofiling and placement of load bearing surface on third party land. Removal of hedge.

All POIs and associated areas marked as nodes on the Figure 8A.7 were checked to see if anything of ecological potential or interest including potential nest sites for birds and/or invasive species were present. Results of the TDR survey can be seen in Table 8A.25 below. The majority of POIs had no need for further assessment as the type and location of the proposed works have negligible potential to impact upon protected habitats or species. At any of the POIs where clearance of woody vegetation is required the commitment to only remove this vegetation outside of the bird breeding season will apply. In addition, all of the POIs will be subject to pre-works visits by an ecologist. (See Mitigation Measure 8A.6). POIs 2, 6, 7, 32 and 38 had some interest due to the nature of the proposed works and the receiving environment at these locations.

POI Number 2

The works at POI 2 involve temporary removal of street furniture and overrun of the splitter traffic island. There will also be overrun and oversail of public road verge. To facilitate the work there will be placement of temporary load bearing surface at the road margin. A short section of stone wall will also be removed and there will be some vegetation trimming. No invasive species were recorded at this location.

POI Number 6

At POI number 6 (539469, 651537) located on the N69, works are to consist of "*Trimming of tree canopy*". During the survey this area was observed as having some potential for nesting birds (Figure 8A.17 and Plate 8A.10). No invasive species were recorded at this location.

Figure 8A.17: POI 6 and surrounding area

Plate 8A.10: POI Number 6.

POI Number 7

POI number 7 (540781, 652295) on the N69 is approximately 1.5km east of POI 6. The proposed works for this area are stated as "*Trimming of tree canopy*". No invasive species were found at this location, but the area may be suitable for nesting birds.

Figure 8A.18: POI and surrounding area

POI Number 32

POI number 32 is located on the R583 (530634, 595731). The designated works for this area are to consist of "*Overrun and oversail of public road verge. Placement of temporary load bearing surface. Trimming and removal of trees and vegetation*". No invasive species were present at this location and no other ecological features were found to be of note. This can be seen in Figure 8A.19 (and Plate 8A.11) below.

Figure 8A.19: POI 32 and surrounding area

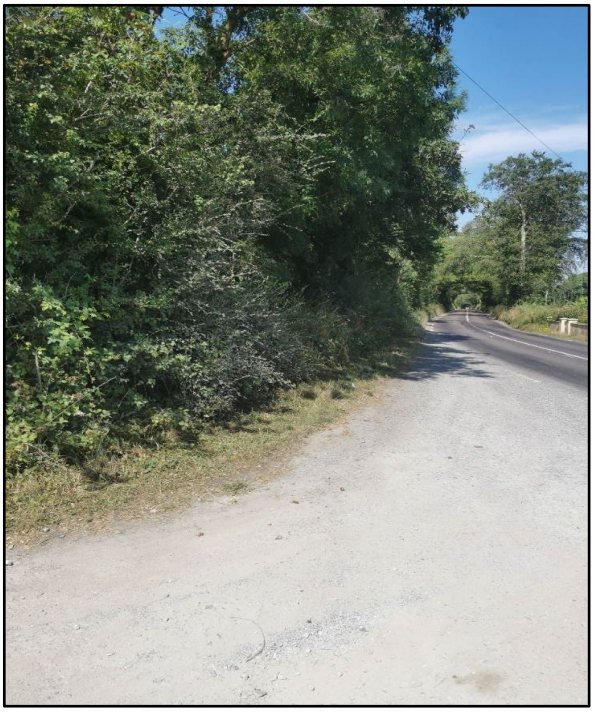

Plate 8A.11: POI Number 32

POI Number 38

POI number 38 is located on the R583 (527891.9, 590415.4). The proposed works for this area are to consist of "*Removal of utility poles and overhead lines. Removal of walls. Temporary removal of street furniture. Placement of load bearing surface on third party land. Overrun and oversail of public road footpaths. Suspension of parking*". No invasive species were found at this location or in the vicinity. The temporary removal of utility poles which could interfere with the surrounding trees, works will be carried out outside of nesting season. The location of this POI is shown in Figure 8A.20 (Plate 8A.12).

Figure 8A.20: PO 38 and surrounding area

Plate 8A.12: POI 38

Table 8A.25: TDR Results and Notes (July 2021).

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	Observations and Notes
2	Foynes Port Access Road/N69	Temporary removal of street furniture. Overrun of splitter island. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Section of stone wall to be removed. Vegetation trimming.	No invasive species recorded. Removal of section of wall with some ivy cover.
6	N69 West of Toreen	Trimming of tree canopy	No invasive species present. Electricity cables running along the tree line, small bit of overhang.
7	N69 Toreen	Trimming of tree canopy	Nettles growing along road edge, no invasive species.
9	N69 Clarina Roundabout	Temporary removal of street furniture. Overrun and oversail of northern edge of roundabout island. Placement of temporary load bearing surface. Removal of trees and vegetation.	Small amount of grass in middle of roundabout, no invasive species present.
10	N69/N18 Dock Road West Roundabout	Temporary removal of street furniture. Overrun and oversail of northern edge of roundabout island. Placement of temporary load bearing surface. Removal of trees and vegetation.	No invasive species present.
11	N69/N18 Dock Road East Roundabout	Temporary removal of street furniture. Overrun and oversail of public road verge. Placement of temporary load bearing surface.	No invasive species present.
19	N20 Ballybeg bends	Public road verge oversail. Temporary removal of street furniture. Removal of trees and vegetation.	No invasive species present.

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	Observations and Notes
20	N20 Kilcloosha bends	Public road verge oversail. Temporary removal of street furniture. Removal of vegetation.	No invasive species present.
23	N20/R883 Roundabout, Mallow	Overrun and oversail through roundabout island. Ground reprofiling and placement of temporary load bearing surface. Removal of trees and vegetation.	No invasive species present.
24	N20/N72 Roundabout Mallow	Overrun and oversail through roundabout and footpaths. Placement of temporary load bearing surface. Temporary removal of street furniture. Removal of tree.	No invasive species present.
26	N72 Dromcummer Beg	Vegetation trimming. Temporary removal of street furniture.	No invasive species present.
27	N72 Coolclough Bends	Temporary removal of street furniture. Removal of telegraph pole. Removal of vegetation.	No invasive species present.
28	N72 Dromagh	Trimming of trees and vegetation.	No invasive species present.
29	N72 Dromtarriff Bends	Trimming and removal of trees and vegetation. Temporary removal of street furniture. Overrun and oversail into third party lands. Placement of temporary load bearing surface.	No invasive species present.
30	N72/R583 Junction	Removal of trees and vegetation. Temporary removal of street furniture.	No invasive species present.
31	R583 Killetragh	Trimming of trees and vegetation.	No invasive species present.
32	R583 Minehill	Overrun and oversail of public road verge. Placement of temporary load bearing surface. Trimming and removal of trees and vegetation.	Telegraph pole at bend on the right-hand side of the road, no invasive species.

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	Observations and Notes
36	R583 Drishane Castle	Construction of a temporary aggregate hard standing and access tracks. Removal of section of masonry wall to facilitate temporary access from public road. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Removal of telegraph pole. Trimming of trees and vegetation.	Bend is gradual in this area, works may not need to cut down as much vegetation as thought. No invasive species.
37	R583 Right Bend Entering Millstreet	Temporary removal of utility poles and overhead lines.	No invasive species present.
38	R583/L1123 Junction	Removal of utility poles and overhead lines. Removal of walls. Temporary removal of street furniture. Placement of load bearing surface on third party land. Overrun and oversail of public road footpaths. Suspension of parking.	No invasive species present. Artificial plants along side of road. Rook spotted in trees, if being cut try outside of nesting season.
40	L1123 Left bend south of Millstreet	Removal of utility poles and overhead lines. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Suspension of parking.	No invasive species present. Road very narrow in places.
41	Tulig road right bend	Removal of utility poles and overhead lines. Trimming of vegetation.	No invasive species present.
42	Tulig Road left/ right bend	Trimming of trees and vegetation. Removal of utility poles and overhead lines.	No invasive species present.
43	River Owenbawn Left Bend	Removal of trees and vegetation. Removal of utility poles and overhead lines. Removal of wall.	No invasive species present.

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	Observations and Notes
44	Auhane West of Tullig	Ground reprofiling and placement of load bearing surface on third party land. Removal of utility poles and overhead lines. Temporary removal of street furniture. Removal of hedge.	No invasive species present.
46	Temporary widening of existing junction between Butter Road (L1123/L2758) and unnamed local road on approach to main site entrance.	Ground reprofiling and placement of load bearing surface on third party land. Removal of hedge.	No invasive species present.
47	Local Road on approach to main site entrance	Placement of temporary load bearing surface to roadside verges.	No invasive species present

8A.3.8 Existing Environment: Grid Connection Route

The proposed grid connection route will be 110kV underground cable ca. 11.4 km in length, with 9.4 km to be constructed within the existing forestry tracks and in the public road corridor. The proposed grid connection arrangement is illustrated in Figure 8A.7 (see also Figure 3.4). The grid connection will largely be contained within the public road corridor throughout its length with the exception of start and finish points where the cables shall be terminated in the existing network substation and proposed onsite substation which is located within the wind farm site.

The grid connection does not pass through any villages or towns. There are a number of recorded archaeological sites located along the grid connection route which will be avoided. There is a 19th century masonry bridge over a section of the River Laney in Bawnmore townland, which is known locally as Awboy Bridge (COO60-002). This bridge is being avoided through directional drilling which will require no works to the bridge or channel. Further details on the grid route are contained in Chapter 3 of the EIAR. The grid connection is located within the Sullane_SC_020 sub-catchment in its entirety.

There are no Annex I habitats present within the proposed grid connection route works footprint. The dominant habitat is buildings and artificial surfaces BL3 (*i.e.* tarmacked roads) with typical grassy roadside verges. The grid connection route will start from the proposed substation location, within conifer plantation WD4 traveling westerly along the forestry access track (Gravel Surface: buildings and artificial surfaces BL3) and then along the track adjacent to wet heath HH3 (Annex 4010) and wet heath (HH3/4010) and historic cutover bog PB4 (these adjacent habitats are described in detail in Section 8A.3.2 above) up until it meets the public road. The route will follow the public road south from here (comprising of buildings and artificial surfaces BL3). The typical roadside verges are grassy (wet grassland GS4 and/or dry humid acid grassland GS3) with occasional scrubby areas and Sitka spruce treelines WL2 or scrub WS1. The dominant adjacent habitats are initially upland heathland before being replaced by improved grassland GA1 and occasional conifer plantation WD4 habitat, with occasional residential dwellings (*e.g.* buildings and artificial surfaces BL3, amenity grassland GA2 and non-native/ornamental shrubberies WS3).

For the vast majority of the route the grid cable will be buried in the tarmacked road surface and as such the dominant habitat along the proposed route is buildings and artificial surfaces BL3. Travelling southerly the adjacent road verge are generally comprised of narrow grassy verge (wet grassland GS4, dry-humid acid grassland GS3 and/or occasional dry grassy verge GS2) with bramble and Willow scrub WS1, hedgerow WL1 or occasional treeline WL2. The dominant adjacent land-use is improved agricultural grassland GA1 or occasionally conifer plantation WD4.

A total of 13no. watercourse crossings have been identified along the proposed grid connection route. The grid connection cable route contains 3 No. bridge watercourse crossings and one large culvert crossing which will be completed using horizontal directional drilling (HDD). A detailed method statement with site specific mitigation measures for this activity is included in the CEMP (Appendix 3.1) and Appendix 3.3. In the case of HDD operations within the public road corridor, the works shall be carried out in accordance with measures described in the Traffic Management Plan contained within the CEMP in Appendix 3.1.

A full list of watercourse crossings along the grid connection route including their locations and crossing methods can be found in Chapter 10 of the EIAR. Further details of watercourse crossings along the proposed grid connection cable route and associated construction methodologies are provided in the CEMP (Appendix 3.1).

Overall, the dominant habitat of buildings and artificial surfaces is of no particular ecological value at present, while adjacent verges, hedgerows and occasional treelines are of higher local importance. Improved or semi-improved fields associated with the river crossings are of lower local importance.

Potential impacts of the proposed GCR on terrestrial habitats is discussed in section 8A.6.2.2 and 8A.6.3.2. The potential impact of the proposed GCR on aquatic species and habitats is considered in detail in the Aquatic Ecology component of the Biodiversity Chapter (Chapter 8B). The BEMP (Appendix 3.4) contains commitments that will yield slight short term positive impacts upon local biodiversity (e.g. through land management and installation of bat and bird boxes) and in the longer term are predicted to have moderate positive impacts on local biodiversity through improving ecological connectivity (e.g. through creating corridors and planting a large amount of new hedgerow) and by providing areas of high resource value habitat (e.g. hedgerow, native woodland, wildbird cover).

8A.4 Limitations and Difficulties Encountered

No major site-specific difficulties were encountered in the completion of the field surveys for the terrestrial biodiversity assessment.

8A.5 Do Nothing Scenario

In the 'do nothing' scenario the areas of conifer plantation would continue to be managed as rotational forestry. Areas would be felled on reaching a particular yield class and replanted in accordance with the felling licence and provisions of the Forestry Act. Similarly, it is reasonable to assume that the existing agricultural lands in the area would continue to be managed in a similar fashion as they are at present. It is likely that some of the marginal farmland will continue to be 'improved' through drainage and application of fertiliser. This pattern of intensification may of course be slower than in the past as a result of changes in agricultural policy (e.g. in relation to Climate Change). However, in the foreseeable future it is likely that the current pattern of local land use and any associated environmental pressures are likely to remain similar to the existing scenario. The continuing agricultural land use, including occasional burning, use of fertilisers and herbicides will be maintained and most probably extend areas of pasture for sheep and cattle. The agricultural grassland in the area has a typically low hedgerow density, typical of upland sheep dominated pasture. Improved agricultural grassland, as well as mature conifer plantation is considered of low biodiversity value. Periodically, areas of clearfell and young open-canopy conifers may be attractive to nesting and roosting Hen Harrier. It must be noted however, that Hen Harriers were not observed using existing similar young forestry where it occurred in the wind farm study area during the extensive surveys carried out as part of this project.

8A.6 Potential Impacts on Biodiversity

8A.6.1 Constraints Led Design Approach

A constraints led design approach was taken to siting of the principal features of the development to avoid areas of high sensitivity for key habitats and species occurring or likely to occur at the Ballinagree site. The potential impacts on the Natura 2000 sites and their qualifying interests are considered in detail in the NIS that accompanies the planning application. The assessment concludes that with the implementation of the environmental controls and reinstatement plans in the construction phase, including those set out in the accompanying BEMP for the site, that there will be no significant adverse impacts upon any of the Natura 2000 sites, or their qualifying interests, arising from the development of the 20-turbine development in Ballinagree.

8A.6.2 Potential Construction Phase Impacts

8A.6.2.1 Potential Construction Phase Impacts on Designated Sites

The proposed windfarm site is not located within the bounds of any Natura 2000 sites; i.e. Special Areas of Conservation of Special Protection Areas. However, several watercourses draining to the north of the site shared downstream hydrological connectivity with the Blackwater River SAC (Site code: 002170) via the Nadanuller Beg Stream (EPA code: 18N05) and Glen River (18G04). The western boundary of the windfarm site adjoins the Mullaghanish to Musheramore Mountains SPA (Site Code: 004162), a site designated for Hen Harrier. The north-eastern boundary of the windfarm site also adjoins the Boggeragh Mountains NHA, a site designated for the presence of upland blanket bog.

The Boggeragh Mountains NHA is directly located to the north of the site. 16.3Ha of this NHA extends into the proposed project planning boundary in the north-west part of the site. 760m of existing access track, which is proposed to be used as part of the construction and operation of Ballinagree wind farm, passes through the NHA. This track has previously been used for the construction of the existing Boggeragh wind farm project (Planning Ref: 011248, 085944, 108067) and is currently used for forestry and agricultural activities. No new works are proposed within the NHA as part of this development with the exception of proposed electrical and communications cabling which will follow the wind farm access tracks and shall be buried within this section of road. The road surface shall be improved in the form of the placement of compacted granular aggregate on the surface following cable trench reinstatement.

As the proposed windfarm site is not located within the bounds of any Natura 2000 site designated for nature conservation, there is no risk of potential direct effect. However, the proposed windfarm site is located within proximity to Mullaghanish to Musheramore Mountains SPA (Site Code: 004162) and supports hydrological connectivity with Blackwater River SAC, resulting in potential indirect impacts to these European Sites and their associated features of qualifying Interest. A precautionary approach has seen the inclusion of the Gearagh SPA in the NIS based on occasional sightings of Mallard during the VP surveys. Mallard is an SCI (special conservation interest) species of the Gearagh SPA and the distance between the proposed wind farm site and the SPA is within the published foraging range for the species (see NIS).

Following an initial screening exercise, it was considered that there was some likelihood that there could be negative effects on the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) cSAC, and the Gearagh SPA as a result of indirect effects from the proposed project either alone or in-combination with other plans and projects. In the absence of mitigation measures (which were not considered at the screening stage), likely significant effects on the qualifying interests of the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) cSAC, and The Gearagh SPA cannot be excluded on the basis of objective scientific information.

A Natura Impact Statement has been completed in respect of:

- Mullaghanish to Musheramore Mountains SPA (004162),
- Blackwater River (Cork/Waterford) SAC (002170), and
- The Gearagh SPA (004109).

No pathways for likely significant effects on any other European sites, were identified. Thus, it can be excluded beyond reasonable scientific doubt, in view of best scientific knowledge on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed project (main wind farm site, grid connection, TDR and biodiversity enhancement areas) individually or in combination with other plans and projects, will have a significant effect the following sites:

- The Gearagh SAC (000108)
- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365)
- Mullaghanish Bog SAC (001890)
- St. Gobnet's Wood SAC (000106)
- Lower River Shannon SAC (002165)
- Barrigone SAC (000432)
- Curraghchase Woods SAC (000174)
- Askeaton Fen Complex SAC (002279)
- River Shannon and River Fergus Estuaries SPA (004077)

Therefore, these sites were 'Screened Out' at Stage One of the AA process.

The potential for significant effects result from:

- Blackwater River (Cork/Waterford) SAC,
    - Land-take / Excavations of the Site and BEMP
    - Physical changes to the environment / change in existing environmental pressures
    - Emissions to Air (dust)
    - Noise Emissions

- Emissions to Water
- Waste emissions
- Duration of construction, operation, decommissioning
- In-combination

- Mullaghanish to Musheramore Mountains SPA

  - Land-take / Excavations of the Site and BEMP
  - Physical changes to the environment / change in existing environmental pressures
  - Noise Emissions
  - Waste emissions
  - Transportation Requirements
  - Duration of construction, operation, decommissioning
  - In-combination

- The Gearagh SPA

  - Land-take / Excavations of the Site and BEMP
  - Physical changes to the environment / change in existing environmental pressures
  - Noise Emissions
  - Waste emissions
  - Duration of construction, operation, decommissioning
  - In-combination

It has further determined the TDR will not have likely significant effects on any European site and that the grid connection has no hydrological connectivity to the Blackwater River (Cork/Waterford) SAC. Therefore, the TDR was not carried forward within the Natura Impact Statement.

The BEMP measures associated with the implementation of the plan are considered to be equivalent to standard agricultural activities that will be carried out and maintained by the landowners involved as well as licensed commercial forestry activities. The NIS further determined the TDR will not have likely significant effect on any European site and that the grid connection has no hydrological connectivity to the Blackwater River (Cork/Waterford) cSAC.

Elements of the proposed project which were identified as posing a pressure on the qualifying interests of the European designated sites within the ZoI are identified in the accompanying NIS and summarised as follows:

Surface water runoff

Tree felling, new access tracks and upgrade of existing tracks, turbine hardstanding areas, stream crossings, the on-site substation and all other new hard surfaces have the potential to contribute to the increase in runoff.

Suspended solids / nutrients

Potential sources of sediment laden water include:

- Standing water in excavations could contain an increased concentration of suspended solids as a result of the disturbance of the underlying soils.
- Haul roads passing close to watercourses could allow the migration of silt laden runoff into watercourses.
- Silt carried on the wheels of vehicles leaving the main wind farm site could be carried onto the public road.
- A blockage in the proposed roadside drains could allow a breakout of silt laden runoff to reach adjacent watercourses or streams.
- Runoff from the borrow pit area could be silt laden, with the risk of draining into receiving watercourses, given the exposed nature of the borrow pit areas due to the excavation and haulage of stone from the area.
- Overland flow entering excavations could increase the quantity of surface water to be treated for sediment removal.
- Tree felling could lead to an increase in sediment and nutrients in the surface water runoff, if the brash is left in place in the riparian buffer zones.
- Runoff from felled areas and incorrect management of brash (if left in the riparian zone) could result in sediment release and nutrient (especially phosphorus) run-off
- Inappropriate management of excavations could lead to loss of suspended solids to surface waters.
- Inappropriate management of the excavated material could lead to loss of suspended solids to surface waters.
- Surface water inflows and minor groundwater seepages may occur in turbine base excavations. Pumped water from the excavations will most likely contain suspended solids.
- To accommodate the access to the locations of the proposed turbines, a total of 1 new crossing over the wind farm site watercourses will be constructed. During the construction there is a potential to release suspended solids into the watercourse. Works leading to erosion of the river banks/bed could result in the release of suspended solids.
- Exposure of soil and subsoil (particularly peaty soils) following felling vehicle tracking, skidding and extraction methods also has the potential to release nutrients to surface waters

Release of hydrocarbons

- Refuelling activities could result in fuel spillages which could pollute underground and surface water, especially during the construction of new culverts/bridges.
- There is the potential for fuel spill/leaks from storage tanks which will be stored on main wind farm site for plant machinery. Fuel spill/leaks could infiltrate underground and pollute underground water. Fuel spills/ leaks could be drained to watercourses and pollute them.
- Tree felling process require trafficking of heavy machinery which can lead to pollution of watercourses due to spillage of fuels and hydrocarbons

Release of Cement-Based Products

Cement-based products could lead to contamination of receiving waters and groundwaters.

Spread of Invasive Non-native Species (INNS)

High impact invasive plant species Japanese Knotweed and Rhododendron have been recorded within the study area of the proposed project. Both species have also been identified as being present in the wider environment, therefore, a risk that machinery associated with tree felling could act as a vector for introducing or dispersing non-native invasive species within the proposed project working areas (including intersecting watercourses) and to adjacent lands / watercourses.

Collision Risk

Potential for collision with turbine towers, blades (moving or stationary) and/or associated infrastructure; and barrier to dispersal during the operational phase. The assessment has fully assessed all combinations within the range of turbine specifications.

Disturbance / Displacement

Potential displacement of birds due to loss of suitable feeding and/or breeding/wintering habitat. Potential displacement of Otters due to lie-up sites being disturbed.

Habitat Loss

The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss. If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur.

Indirect impacts

Reduction in prey due to impacts from emissions to water.

8A.6.2.2 Potential Construction Phase Impacts on Habitats and Flora

Two habitats listed on Annex I of the EU Habitats Directive: northern Atlantic wet heaths with *Erica tetralix* (4010) and European dry heath (4030) are present within the study area boundary. Both habitats occur together as a complex upland mosaic along the western boundary of the study area and areas of northern Atlantic wet heaths with *Erica tetralix* (4010) are found within upland habitat to the north and south of the study area and in a low-lying area of farmland towards the centre/east of the study area. While included in the study area boundary, through the process of constraints led design confirmed Annex I habitats are located outside the proposed development works footprint. One eroding upland stream FW1 is present within the study area boundary and supports water crowfoot vegetation, which may correspond to the Annex I habitat; Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260).

This habitat is also outside the development works footprint. Potential impacts on aquatic habitats and vegetation is considered in detail in Chapter 8B.

No rare or protected flora were recorded for the study area. There are no documented records for vascular plant species as held by the NBDC for the relevant 10km Grid Square (W38) that overlaps the proposed windfarm development footprint. No Bryophytes protected under the Flora (Protection) Order 2015 are documented for the study area (Flora Protection Order Map Viewer NPWS). The dominant habitats within the proposed windfarm development footprint such as commercial plantation and improved farmland are unlikely to support these protected moss species and, in the upland habitat under consideration as part of the windfarm design, quadrats were completed for relevant habitats and none of the above species were documented.

Habitats associated with the windfarm development footprint and associated infrastructure include Commercial Conifer Plantation WD4, Improved Agricultural Grassland GA1, Semi-natural to semi-improved Wet Grassland GS4 (incl. Wet Grassland/Poor Fen and Flush GS4/PF2), Wet Heath and Cutover bog HH3/PB4 Mosaic, Wet Heath HH3 and Buildings and Artificial Surfaces BL3. These habitats are considered to be of low local to higher local ecological importance, due to their botanical diversity. The CEMP includes for replanting of the reinstated borrow pits and for some screening planting

There will be a slight permanent increase in modified habitat; buildings and artificial surfaces (BL3), as a result of the proposed development, associated with the construction and installation of turbines and associated infrastructures and the construction of new access tracks which will lead to a **slight negative impact** on semi-natural habitats and flora species at the site and in the surrounding locality.

The direct impacts upon habitats within the proposed windfarm layout will be largely confined to habitats of commercial conifer plantation (WD4) and improved agricultural grassland (GA1). The permanent loss of sections of such habitats, which are of **Local importance (Lower value)**, as a result of the proposed project will lead to a **neutral - imperceptible impact** at the **local scale**. The proposed windfarm development will also require the removal of smaller sections of partially degraded semi-natural habitats considered to be of higher local importance; i.e. Semi-natural to semi-improved Wet Grassland GS4 (incl. Wet Grassland/Poor Fen and Flush GS4/PF2), Wet Heath and Cutover bog HH3/PB4 Mosaic and Wet Heath HH3.

The area of semi-natural habitats to be removed is much smaller in area than the areas of improved grassland and conifer plantation habitats that will be lost. However, the removal of these semi-natural habitats will have a **long-term significant negative impact** at the **local scale** due to permanent loss of a habitat type that is of Local Importance (higher value). These habitats (when compared to areas of improved grassland and conifer plantation) support greater botanical biodiversity and have the potential to support a wider range of fauna in the local area including ground nesting birds and invertebrates.

Indirect Loss/ Disturbance to nearby peatland and wetland habitats

Where proposed access roads and turbine bases adjoin or are located in proximity to peatland and heathland habitats, in particular T17, T12 and T02, there is the risk of indirect impacts to these habitats during the construction phase. Excavations, infilling of excavated areas and the construction of haul and access routes could impact drainage patterns and the hydrological functionality of adjacent peatland and heathland habitats, leading to drying out of peat soils with consequent reduction in species diversity and the deterioration of habitat quality and potential indirect habitat loss.

Such impacts are considered to be indirect and would affect habitats of higher local importance to National Importance, contributing to a **significant negative impact** at the **Local Scale**. In the absence of mitigation there is some potential for dust arising from the construction activities to impact upon botanical species and habitats. However, it is likely that any such impacts would be highly localised and temporary in nature.

Invasive Species

High impact invasive plant species, Japanese Knotweed *Fallopia japonica* was recorded within a farmland holding towards the centre/east of the study area and just off-site to the south of the study area. The Knotweed stands were not in the construction footprint of the windfarm, along the GCR or at POIs requiring work along the TDR. No Third Schedule Invasive Species were recorded within the proposed BEMP lands.

Japanese Knotweed is present in the wider environment and is present along roadsides in the locality. Rhododendron *Rhododendron ponticum* is also occasionally present within conifer plantation WD4 towards the centre of the study area and to the south.

Construction works, can potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material and cause them to spread onsite. Construction plant can also potentially carry seeds or viable plant material from other works sites if not adequately cleaned. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations. Construction works could therefore result in the spread of invasive plant species both in-situ and ex-situ. The most common ways that these species can be spread are:

- Site and vegetation clearance, mowing, hedge-cutting or other landscaping activities;
- Spread of seeds or plant fragments during the movement or transport of soil;
- Spread of seeds or plant fragments through the local surface water and drainage network;
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas;
- Importation of soil from off-site sources contaminated with invasive species plant material.

The potential impact from the spread of invasive alien plant species during the project construction phase is considered to be **long term significant negative** at the **Local Scale** and could impact in-situ and adjacent habitats such as conifer woodland, high quality and degraded peatland and heathland habitats.

A watercourse can act as a potential impact-receptor pathway allowing the transit of invasive species resulting in the indirect habitat loss/damage to downstream habitats in the wider area including designated nature conservation sites that are present e.g Blackwater River SAC. In this case there are potential hydrological pathways that link the proposed project site to the Blackwater River SAC through the onsite drainage ditches and streams. Run-off from traffic, deposition of spoil from the wheels of vehicles or accidental spillage of soil from the trailers may result in the inadvertent spread of invasive plant species to nearby aquatic habitats downstream. Machinery, equipment and material (including soil) which may be transported onto the site for construction could lead to the introduction of further invasive species to the site with potential to displace local natural biodiversity. Given the location of the site with hydrological connections and proximity to Natura 2000 sites, the potential impact from the spread of non-native invasive plant species could lead to a **significant negative impact** at the **local to international scale**.
The potential for impacts on aquatic ecology are considered in detail in Chapter 8b and the potential impacts upon designated Natura 2000 sites and their conservation objectives arising from the development are assessed in the NIS which accompanies this application for planning permission.

Grid Connection Route (GCR)
The dominant habitats along the grid connection route comprise buildings and artificial surfaces of no particular ecological value at present, while adjacent verges, scrub, hedgerows and occasional treelines are of higher local importance. Improved or semi-improved fields associated with the river crossings are of lower local importance. For the vast majority of the route the grid cable will be buried in the tarmacked road surface or forestry tracks and as such the installation of the grid cable will have an **imperceptible to neutral impact** on terrestrial habitats and flora along the grid route. Potential impacts on aquatic habitats and flora are considered in the Aquatic Ecology Chapter (Chapter 8b).

Turbine Delivery Route (TDR)

The works at the POIs have been assessed and the habitats present are not particularly sensitive. The required works are relatively minor in nature, highly localised, and largely temporary in nature. Although no invasive plant species were recorded at the POIs, there is the potential for introducing or spreading invasive species in the event that such species become established at these sites in the interim, or even if adequate biosecurity protocols are not employed by the contractors responsible for enablings works at the POIs.

8A.6.2.3 Potential Construction Phase Impacts on Avifauna

There are a number of potential construction phase impacts of wind farms on birds, including habitat loss or degradation and disturbance. The likely significance of each of these impacts at the proposed wind farm site and associated elements (*e.g*. TDR, GCR) is discussed below. An overall assessment of the likely impact of the proposed wind farm as a whole on the local avian community is also presented.

The terrestrial biodiversity study area lies immediately east of the Mullaghanish to Musheramore Mountains Special Protection Area which has been designated for the protection of breeding Hen Harrier. Three of the proposed turbine locations are located within 1km of the SPA boundary (T1, T2 & T3; Closest T2 at 0.5km). Potential impacts on the conservation objectives of this SPA are considered in detail in the NIS associated with this application (see NIS which accompanies this planning application).

Of key consideration in terms of the impact assessment are impacts on the target Annex I species observed to use the terrestrial biodiversity study area on a regular basis: Hen Harrier, Golden Plover, Peregrine Falcon and Merlin. A number of other Annex I avian species have been recorded on, or in the vicinity of the study area on a 'once-off' basis during the intensive field surveys; Marsh Harrier, Red Kite and White-tailed Sea Eagle. The study area is not considered to be of ecological significance for these species because they do not regularly occur and no impact assessment will be completed in relation to these species. Potential Impacts on the *Red-listed* Red Grouse will also be assessed here given the presence of this species in the terrestrial biodiversity study area and the reliance of this species on upland bog/heath habitat.

Habitat Loss or Change Impacts

Direct habitat loss or change is inevitable in the development of any wind farm, especially when the development of access roads, turbines, substation buildings and other associated construction is considered. This can result in reduced feeding, nesting and roosting opportunities for birds.

Direct habitat loss due to the development of wind farms tends to be relatively small (Drewitt & Langston 2006). The permanent land take is largely limited to the area of the turbine bases, crane hard standing, the new access tracks, borrow pits and the electrical sub-station, with minor construction at the met masts, amenity car park etc. The grid access cable will be undergrounded from the proposed new on-site 110kV Ballinagree substation to the Clashavoon substation via access tracks and public roads and will involve relatively little habitat disturbance or permanent habitat loss. With the application of environmental monitoring and management and appropriate mitigation (see CEMP, Appendix 3.1), the laying of the cable route has very little potential to negatively impact upon the bird community occurring along the cable route.

As described earlier in Section 8A.3.2, the Ballinagree wind farm footprint is dominated by conifer plantation (WD4) of mixed ages and rotations, as well as improved agricultural grassland (GA1), with 16 of the 20 proposed turbines and associated access tracks being located in these habitats and with up to 11.8km of existing access tracks (buildings and artificial surfaces BL3) being utilized and upgraded at the site. The proposed site substation, Met masts and construction compounds are also located in conifer plantation habitat. These habitats are highly modified and are not of ecological value to the target Annex I species under consideration here (with the exception of young second rotation forestry which can be used by Hen Harrier but which is limited in extent at the site). Indeed, Hen Harriers in particular are unable to hunt effectively in closed canopy woodlands or agriculturally improved grassland habitats (Madders 2000; Arroyo *et al.* 2009) and although they are known to nest and forage within pre-thicket forestry, this habitat is sub-optimal in terms of prey availability (McCarthy *et al*. 2021) and nesting success (Carravaggi *et al*. 2019, Wilson *et al*. 2012) and forestry in general can harbour nest predators such as Pine Marten *Martes martes* (McCarthy *et al*., 2021).

A total of c. 88 ha of tree-felling within the site will be required to facilitate construction of Ballinagree Wind Farm, with c. 18ha to be felled as part of the Biodiversity Enhancement Management Plan (where strategic felling will provide corridors between patches of attractive foraging habitat for Hen Harrier. The loss of conifer plantation (including compensatory replanting off site) and improved agricultural grassland as a result of the proposed project is expected to have a neutral impact on the target Annex I species under consideration here.

A total of four of the proposed turbines will be located in other habitat types as described in Section 8A.3.2; i.e. T2 is located in wet/acidic grassland GS3/GS4, T3 is located in degraded dry heath HH3 and T13 & T17 are located in cutover bog/wet heath mosaic habitat HH3/PB4. These turbine locations have been micro-sited to avoid high value Annex I habitat. Areas of open wet grassland/heath/bog habitat are of ecological value for a range of avifauna, including the target Annex I species under consideration here. The loss of this habitat will be discussed further below in relation to each target species.

Hen Harriers are traditionally associated with open upland bog/heath habitats as well as rough/wet grassland and scrub (and more recently pre-thicket forestry) during the breeding season. Hen Harriers were recorded during all eight vantage point survey seasons (c. 188 hours of VP survey effort between March 2017 and March 2021) and were present in the area in both the breeding and wintering season.

Activity levels were consistently low on site however (< 1.5% of the total survey time in the breeding season and < 0.7% in the winter) and related to foraging and commuting flights, with no nest sites recorded at the site or within 2km of the site boundary in any of the survey years. There was no clear pattern to the Hen Harrier activity recorded at the site, with no areas of concentrated or regular activity observed. Relatively frequent flightlines were noted off-site in the Dooneen Hill area to the southeast of the site, outside of the study area boundary, in association with a known nest site in the wider area to the south. There will be no impacts to this area as a result of the proposed wind farm development. In relation to winter activity, there are no known historical Hen Harrier roost sites in the area of County Cork where the proposed project site is located (see O'Donoghue 2010). No nest sites are located within 2km of the study area and there were low levels of activity at the site and the proposed turbine locations are not located along regular Hen Harrier flightpaths. Therefore, the loss of wet grassland/cutover bog/heath habitat associated with four turbines (T2, T3, T13 & T17) and associated access tracks is considered likely to have an **imperceptible impact** on Hen Harrier.

Golden Plover have been consistently recorded on the study area during all survey years, particularly in winter and up until April (when they are considered likely to be commuting between wintering and breeding areas). The study area is not within the known breeding range of Golden Plover, where the breeding population is largely restricted to northwest Ireland (and where significant population decline and range contraction has occurred, Balmer *et al*. 2013). In winter a large influx of Golden Plover of the *altifrons* race (a separate population to the Irish breeding birds) arrive from breeding sites in Iceland (Wernham *et al*. 2002) and recent evidence confirms that the wintering numbers of Golden Plover in Ireland, which are in excess of 150,000, are relatively stable (Balmer *et al*. 2013, Boland & Crowe, 2012).

Golden Plover was the most commonly recorded species during the winter VP study, with flocks present throughout the survey period in most survey months. The number of flightlines ranged from nine (in 2018/2019) to 98 (in 2020/2021 following expansion of the site boundary) and flock size ranged from single individuals to c. 500 birds.

This species was typically recorded resting on heath/bog or flying over bog, pasture and conifer plantation associated with upland areas of the site (i.e. the northern and northwestern portion of the site in association with Musheramore Mountain and Seefin Hill) as well the southwestern area of the site around VP4. Golden Plover were recorded 'on-site' for a maximum of 12.1% of the total survey time (2019/2020 winter season) and significant activity was also noted 'off-site' (mainly to the north of the site near VP 10/Boggeragh Wind Farm and to the northeast around Knocraugh Mountain/VP9) where this species was present for 26% of the total survey time in the 2020/2021 winter season survey. The VP survey results indicate that upland bog/heath/wet grassland habitats within the study area are of ecological significance to wintering and migrating Golden Plover. This habitat is also present in the wider area to the north and northeast of the study area where significant Golden Plover activity was concentrated. It should be noted that the potential impacts relate to the large and stable wintering Golden Plover population and not to the declining and range-contracting Irish breeding population. The loss/fragmentation of sections of bog/heath/wet grassland within the study area as a result of the proposed project (i.e. turbines T2, T3, T13 & T17 and associated access tracks) will have a **slight negative** impact on the highly mobile wintering population of this species, where large areas of alternative suitable habitat are present in the wider area to the north/northwest of the study area.

Peregrine Falcon (both adult and immature birds) have been consistently recorded on the study area during all survey years, however activity levels were generally low (< 1% of the total survey time) apart from the winter 2019/2020 survey when an individual was present/stationary on the site for over four hours (resulting in a total of 12.7% of the total survey time). This Annex I species was recorded at several locations in the study area and was recorded predominantly flying/commuting and foraging over heath/bog and conifer plantation. No particular areas of importance were noted for this species, although a cluster of sightings was present in the southwest of the site in 2019/2020 and this species was regularly sighted in association with Musheramore Mountain. Peregrine Falcon were not recorded breeding at the study area and no suitable breeding habitat (cliffs/tall buildings) are present at the study area. Given the absence of any nest sites within the study area and the low levels of activity at the site - where the proposed turbine locations under consideration here are not located along regular Peregrine Falcon flightpaths or any area of preferential use by this species, the loss of wet grassland/cutover bog/heath habitat (i.e. turbines T2, T3, T13 & T17 and associated access tracks) as well as the loss of conifer plantation and improved agricultural grassland associated with the remaining infrastructure is considered likely to have an **imperceptible** impact on Peregrine Falcon.

Merlin were sporadically recorded at the study area during the eight-season VP survey, where recorded activity levels were low (<0.01% of the total survey time during the breeding season and <1% of the total survey time in the winter season). This species is notoriously elusive and difficult to survey however (Lusby *et al*. 2011, Hardey *et al*. 2013) and activity levels may therefore have been underestimated. Much of the flightline activity was recorded off-site (in the Dooneens area to the southeast of the study area or in bog/heath habitat to the northeast of the development site near VP10). The only on-site activity was recorded in the west (in association with the lower slopes of Musheramore Mountain) and southwest of the development site, typically in association with heath/bog habitat. Both male and female/immature birds were recorded in the 2020/2021 winter season (the female in January and male in March) and it is possible that this species breeds on or near the study area, although it is considered likely that sighting rates would have been higher if this was the case.

This species is typically associated with upland moorland (heath/bog) habitat during the breeding season, with nest sites typically located in trees/forestry edge adjacent to suitable heath/bog habitat in Ireland (Lusby *et al*. 2011). As mentioned previously, conifer plantation is the dominant habitat at the development site and this will continue to be the case post-development such that ample suitable nesting habitat is available for Merlin at the study area. Given the low levels of recorded activity at the site, the loss/fragmentation of sections of upland heath/bog/wet grassland habitat within the study area as a result of the proposed project (i.e. turbines T2, T3, T13 & T17 and associated access tracks) will have an **imperceptible negative** impact on the local population of this species, where large areas of alternative suitable upland bog/heath habitat are present in the wider area to the north/northwest and northeast of the study area (and to the south at Dooneens Hill).

Red Grouse was confirmed to occur at the terrestrial biodiversity study area during the VP study (although the dedicated tape lure survey did not record any Red Grouse activity) with a total of 11 sightings being casually noted over the eight survey seasons. This species is generally associated with open bog/heath habitats that have suitable heather cover (Cummins *et al.* 2010). Such habitats at the study area here are associated with Musheramore Mountain and upland areas in the north and northeast of the study area (both on and off site). Red Grouse observations occurred primarily in the winter months between January 2019 and March 2021, with a concentration of activity off-site in the vicinity of VP9 and VP10. It is considered likely that 1-2 pairs of Red Grouse bred off site in the vicinity of VP9 and VP10, as pairs of birds were observed in suitable habitat at both locations.

Red Grouse were also heard calling and signs were noted (i.e. pellets, feathers) in the vicinity of VP3 and VP7 on a number of occasions – with some of the observations occurring within the study area boundary (i.e. pellets found to the southwest of VP7). While there will be a loss of sections of heath/bog habitat in association with the proposed project (i.e. turbines T2, T3, T13 & T17 and associated access tracks), these locations are not within areas identified as being used by Red Grouse. In particular, the likely breeding sites identified in the vicinity of VP9 and VP10 are off site and there will be no habitat loss in this area as a result of the proposed development. Given the absence of any proposed wind farm infrastructure within known Red Grouse habitat, the proposed project in these areas is considered likely to have an **imperceptible impact** on this species.

General bird surveys have established that the study area is used by a diversity of breeding and wintering species typical of the range of habitats present at the terrestrial biodiversity study area (i.e. conifer plantation, bog/heath, rough grassland and improved agricultural grassland). Common raptor species such as Buzzard, Kestrel and Sparrowhawk are present and forage within and over the site and are likely to nest in the development site or nearby. Raven were frequently recorded flying over the site and are also likely to nest nearby. The development footprint is dominated by conifer plantation of mixed ages and improved agricultural grassland GA1. These habitats are of relatively low value for breeding or wintering birds of conservation interest. Existing roads and access tracks will be upgraded where possible and this will minimise the habitat loss within the development site. It is not expected that there will be any significant reduction of breeding species diversity within the proposed development site as a result of the clearance and construction activities within the conifer plantation. The introduction of open spaces or 'edge-effect' into a previously closed canopy can in fact increase the abundance of some species and could benefit the overall species diversity of the plantation (Fuller 2003).

Indirect habitat loss can occur where construction activities in areas of deep peat result in changes in hydrology and or geomorphological processes or cause a peat slippage event. The design of the wind farm has sought to minimise the amount of peat excavated at the site. Any new access tracks in areas of deep peat will be constructed as floating roads. Following detailed site investigations, it was determined that the wind turbine foundations at Ballinagree will be standard shallow reinforced concrete foundations. Turbine foundations will be circular in shape and will be 22m in diameter and 4m in depth. The turbine foundations shall be constructed using standard reinforced concrete construction techniques. Detailed construction methodologies for turbine foundations are provided in the CEMP in Appendix 3.1.

A total of three borrow pits will be required within the proposed project site, however these are not located in areas of deep peat. Post extraction of rock the borrow pit will be infilled with surplus subsoil and replanted.

The potential for a peat/soil slippage event has been assessed in Chapter 9 (Land, Soils & Geology) of the EIAR it has been concluded that there was a low residual risk of peat instability at the proposed site. No impacts on avifauna as a result of indirect habitat loss resulting from changes in hydrology and or geomorphological processes or a peat slippage event are therefore deemed likely in this case.

The presence of a wind farm can also lead to indirect habitat loss for the local bird community through displacement of the birds from the wind farm site as a result of disturbance effects (Langston & Pullan 2004, Drewitt & Langston 2006, Percival 2003). This is dealt with in the following section.

Disturbance Impacts (Construction Phase)

Wind farms can cause disturbance to the bird community through displacement due to construction activities, increased human presence and noise. Studies on bird displacement due to disturbance have yielded somewhat inconsistent and inconclusive results (Langston & Pullan 2004, Drewitt & Langston 2006, Kingsley & Whittam 2005). These studies have indicated that the scale of disturbance varies greatly between and within species (*loc cit*., Langston & Pullan, 2003). Disturbance effects can result in reduced numbers of birds within a particular distance from a source of disturbance.

In terms of the target species under consideration here (i.e. Hen Harrier, Golden Plover, Peregrine Falcon, Merlin and Red Grouse), no nest sites or breeding activity have been recorded at the study area during the eight seasons of VP surveys (c. 188 hours of VP survey effort between March 2017 and March 2021). Recorded activity levels of all target species (apart from Golden Plover which will be discussed below) were also generally low at the study area in both the breeding and winter seasons (<1.5% of the total VP survey time), with no regular flight paths or areas of high importance identified within the study area boundary. As described above, the main habitats impacted by the proposed project will be conifer plantation and improved agricultural grassland, which are not of ecological value for these target species. While a number of sections of open bog/heath/wet grassland habitats will be impacted by the proposed development, the scale of the proposed works in these areas is relatively small (i.e. four turbines and associated access tracks, hard stands) and the construction works will be temporary. Potential disturbance impacts on Hen Harrier, Peregrine Falcon, Merlin and Red Grouse as a result of the proposed construction works are therefore considered to be **negligible** at the proposed project site.

As mentioned previously, the upland bog/heath/wet grassland habitats within the study area have been shown to be of ecological significance to wintering and migrating **Golden Plover**. This habitat is also present in the wider area to the north and northeast of the study area where significant Golden plover activity is concentrated. Construction works taking place within bog/heath/wet grassland habitats at the site (i.e. turbines T2, T3, T13 & T17 and associated access tracks) as well as within areas adjacent to known concentrations of Golden Plover (i.e. turbines 14-20 in the north and northeast of the study area) have the potential to cause disturbance/displacement impacts on this wintering/migrating species. There is a significant amount of similar open upland habitat in the hinterland of the proposed wind farm at Ballinagree and this is considered sufficient to compensate for any temporary displacement of the highly-mobile flocks of Golden Plover during the construction phase of the proposed development, which is expected to take 18 to 24 months. It should be noted that the potential impacts relate to the large and stable wintering Golden Plover population which occurs at the study area and not to the declining and range-contracting Irish breeding population (which is restricted in range to northwest Ireland). Given the presence of suitable alternative habitat in the wider area, the construction phase of the proposed project will have a **temporary slight negative** disturbance/displacement impact on the local population of this species.

Disturbance to the local breeding and wintering bird community will largely occur at the development stage of the wind farm. Birds associated with the conifer plantation will be the most affected group as this habitat will be subject to the greatest loss and damage. The conifer plantation will also screen the construction compounds and attenuate any wider disturbance impacts.

Displacement and disturbance will have a lesser impact on the local bird population if alternative habitats with sufficient carrying capacity are widely available in the surrounding landscape (Kingsley & Whittam 2005). There is a significant amount of similar conifer plantation and open upland habitats in the hinterland of the proposed wind farm at Ballinagree and the surrounding areas and this is considered sufficient to offset for displacement to the general breeding and wintering birds the commonly occur throughout the conifer forestry.

The GCR route will be undergrounded within existing forestry tracks and public roads to the south of the study area, where the dominant habitat is buildings and artificial surfaces. The proposed GCR does not pass through any areas identified as being of ecological importance for the Annex I species under consideration here. The installation works shall be undertaken on a rolling basis with short sections of road closed for short periods before moving onto the next section. Given the short duration of the phased installation works, the location of the works areas within already-disturbed environments (i.e. public roads) and the absence of any important bird habitats along the route, the installation of the GCR is expected to have a **negligible disturbance** impact on avifauna.

In the absence of appropriate mitigation the works at POIs along the TDR could potentially disturb and displace nesting birds and other species. Such impacts would be expected to be minor, temporary and localised in nature.

As turbines are erected, the potential impacts more associated with the operational phase become relevant – these operational phase impacts are discussed in detail in Section 8A.6.3.3.

8A.6.2.4 Potential Construction Phase Impacts on Non-Volant Mammals

Potential construction phase impacts on non-volant mammals include habitat loss, disturbance/displacement and direct mortality of individuals.

The terrestrial biodiversity study area was found to have relatively low non-volant mammal abundance, reflecting the dominance of highly modified habitats at the site (i.e. conifer plantation and improved agricultural grassland). The non-volant mammal assemblage is dominated by common and widespread species such as Fox and Irish Hare and no breeding sites of any protected non-volant mammal species was found within 50m of the proposed turbine locations. While Badger was confirmed to breed in the southern part of the study area, no setts were located within 50m of any proposed wind farm infrastructure. While there are historical records of the Annex II Otter from the wider area, no evidence of this species was found at the study area, where the River Laney provides some suitable habitat. The proposed project will not result in any habitat loss within the Laney River or its banks. It should be noted that, although Red Deer have been confirmed to occur at the study area, this is due to stocking that was carried out in the past century for hunting purposes. The only native Red Deer population in Ireland is located in Killarney National Park.

Habitat Loss Impacts

Direct habitat loss due to the development of wind farms tends to be relatively small. The permanent land take is largely limited to the area of the turbine bases, crane hard standing, the new access tracks, borrow pits and the electrical sub-station, met-masts and amenity car park area.

The grid access cable will be undergrounded from the proposed new 110kV Ballinagree substation to the Clashavoon substation via access tracks and public roads and will involve relatively little habitat disturbance or permanent habitat loss. With the application of appropriate monitoring, environmental management and mitigation the laying of the cable route has very little potential to negatively impact upon the mammal community occurring along the cable route.

As described above in relation to avifauna impacts (Section 8A.6.2.3), the Ballinagree wind farm footprint is dominated by conifer plantation (WD4) of mixed ages and rotations, as well as improved agricultural grassland (GA1). These habitats are highly modified and are not of high ecological value to most non-volant mammal species. While conifer plantation may provide cover for species such as Red Deer, Red Squirrel, Irish Hare and Badger, it is generally of low foraging value and there is significant remaining area of conifer plantation at the study area to accommodate displaced individuals (where the total quantity of tree felling will be c. 88ha). Similarly, improved agricultural grassland may be of foraging potential to Badger, however this habitat is widespread at the study area and wider area and the loss of small areas of this modified habitat is not expected to have any negative impacts on the local Badger population. The remaining habitats affected include wet/acidic grassland GS3/GS4, degraded dry heath HH3 and cutover bog/wet heath mosaic habitat HH3/PB4, where a total of four turbines will be located in these habitats. These relatively open habitats are not of high ecological value to most protected non-volant mammal species. It is considered that the small permanent loss of predominantly highly modified habitat such as conifer plantation and improved agricultural grassland is unlikely to impact negatively on the local non-volant mammal community.

Furthermore, the opening up of roads and areas within the conifer plantation to accommodate the proposed development, could also have a positive impact on the mammal community by creating more commuting routes, habitat diversity, and complexity within the development site where large expanses of conifer plantation currently dominates.

Mammals associated with aquatic habitats (e.g. Otter) in the wider area could potentially be subject to indirect negative impact through activities associated with the project, such as siltation, run-off and fuel spills. Environmental controls and measures that are appropriate to the site and project are outlined in Chapter 8B, Aquatic Ecology, which will minimise the occurrence of such impacts. Otters were not recorded during the surveys carried out in the study area and along the GCR. In addition, the aquatic ecology surveys did not record any evidence of Otter on the rivers which they surveyed (see Chapter 8B). However, as the habitat appears suitable for Otter and other semi-aquatic mammals there is a likelihood that such species occur locally, at least occasionally.

A planning phase Construction & Environmental Management Plan collating all of the mitigation measures recommended to ensure that there is no significant impact on the receiving waters has also been prepared (see Appendix 3.1). This document will be a key construction contract document, which will ensure that all mitigation measures considered necessary to protect the environment are implemented with the oversight of the on-site Ecological/Environmental Clerk of Works (ECoW).

Disturbance/Displacement Impacts

During the construction phase of the development, there is likely to be a certain amount of disturbance to fauna occurring on/near the site and along the grid access route and at POIs on the TDR, however this will be temporary in duration, and much of the construction activity will take place within conifer plantation which will provide screening between the works areas and more open habitats.

Given the habitats present in the wider environment, affected mammals will be able to move to other locations in the wider area and return when disturbance has lessened.

No breeding sites of protected non-volant mammal species were found within 50m of proposed turbine locations or other infrastructure and as such, no disturbance/displacement or mortality of breeding individuals is expected to occur during the construction of the proposed project (where a pre-construction survey will also be carried out immediately prior to construction to confirm that this is still the case).

It is possible that the increase in site traffic might lead to an increase risk of road casualties of Badgers and other mammals occurring in the area. However, given the bulk of construction traffic and movement of machinery and personnel will occur during daylight hours and the relatively low site speed limits which will be imposed the risk of any significant increase in fatalities of Badger and other mammals is considered insignificant.

In the event that some mammals are displaced through disturbance or direct loss of habitat, there are extensive areas of conifer plantation and similar suitable habitat in the vicinity of the site and affected or disturbed individuals may move into the surrounding area. Given the relatively small footprint of the development, any displacement or disturbance that may occur is likely to be highly localised, both temporally and spatially.

Considering the low abundance of non-volant mammals at the study area, the widespread availability of similar habitat in the wider area and the small scale of the construction works areas, potential construction phase disturbance/displacement and mortality impacts are considered to have an imperceptible impact on the local non-volant mammal population.

Considering the above, potential impacts on non-volant mammals from the construction of the proposed wind farm are considered **imperceptible neutral** overall.

8A.6.2.5 Potential Construction Phase Impacts on Bats

Wind energy developments present four potential risks to bats (SNH, 2019):

- Collision mortality (vehicles and above ground infrastructure)
- Loss or damage to commuting and foraging habitat
- Loss of, or damage to, roosts
- Displacement of individuals or populations

For each of these four risks, the detailed knowledge of bat distribution and activity within the study area gained during the current assessment is used to predict the potential effects of the wind farm on bats. Several bat species were noted in the vicinity of the site and grid route all of which are legally protected under the Irish Wildlife Acts (1976-2012 as amended) and listed on the EU Habitats Directive.

Expansive open (heathland and peatland) habitats and improved grassland habitats within the proposed development site boundary are considered to be of low value, local importance for bats, given their elevated terrain and the relative shortage of suitable foraging, commuting and roosting habitats.

The site also supports extensive conifer woodland blocks that have somewhat greater potential to support bats, particularly as foraging and commuting habitats. These areas are considered to be of **moderate to high value**, **local importance** for bats, particularly in their capacity to provide large, contiguous foraging and commuting habitat.

Construction phase activities will result in the loss of c. 88ha of commercial conifer plantation, to facilitate turbine footprint, hard standing and access tracks and associated infrastructure. The impact of this loss will be to reduce foraging and commuting habitat for bats locally. This has the potential to disturb or displace bats that forage at the site or commute through the site. While extensive commercial conifer plantations are common in the wider landscape, the loss of commuting habitats could potentially displace some bats in the immediate locality of works and marginally reduce local habitat connectivity. Felling is also carried out to reduce the likelihood of occurrence of bats in the immediate proximity of operational turbines. A 'worst case' scenario was used in the calculation of the appropriate felling area around turbines set within forestry, according to the SNH Guidance (√((50+BL)^^{2}-(HH-FH)^^{2}; SNH 2019) using the lowest hub-height and longest blade length under consideration for this project.

This provided a recommended clearance radius of 101.2m which was incorporated into the design process for the wind farm and is reiterated as construction stage mitigation to minimise the impact on bats throughout the operational lifetime of the wind-farm.

One confirmed bat roost was located in an old farmhouse at Knockpogue). An emergence check of this structure on June 18th in 2018 recorded several Pipistrelles (both Common & Soprano Pipistrelle) departing from the roof-space around dusk. This roost is not located within the footprint or the immediate environs of the proposed windfarm infrastructure. The nearest proposed turbine (T10) is located ca. 700m south-west of this confirmed bat roost. As a result, there will be no direct impacts to this bat roost from the proposed windfarm development. Potential indirect impacts may occur to the bat species associated with this roost due to loss of foraging and commuting habitat. This is unlikely to be a significant effect, given the extent of habitat loss that will be required to construct the wind farm, as well as the nature and extent of these habitats.

While no other bat roost was located in the study area, there are many structures in the wider area with good potential for roosting bats. It is possible that individual bats or small groups of bats may roost in trees or existing structures within the study area, at least occasionally and mitigation measures will be applied to minimise the potential impacts on bats associated with construction related disturbance. No tree roost locations were noted and the suitability of the available trees (dominated by commercial conifers) for roosting bats is considered low.

Construction phase lighting has the potential to attract certain bat species and displace others and floodlighting can be a significant source of disturbance for all nocturnal mammal species. However, this impact will be temporary in nature and localised to areas around the site compound. Night-time lighting will be limited in extent (both static lighting, and vehicle headlights) as standard construction works will be carried out mostly during daylight hours.

Construction related run-off or degradation of aquatic habitats through hydrological links could potentially lead to a deterioration of the feeding resource for bats associated with aquatic habitats in the wider area.

However, the design of the wind farm has ensured that there will be no turbines within 75m of watercourses and no other infrastructure (*e.g.* access tracks, compounds, other areas of hard standing etc.) within 50m of watercourses (bar stream crossing points, works associated with the improvement to the access track and the undergrounding of the cable route).

The Aquatic Ecology Assessment (Chapter 8B) has concluded that with the application of the recommended mitigation measures that there will be no significant residual impacts on sensitive aquatic habitats and species.

Considering the above, potential impacts on bats, in the absence of mitigation during construction of the proposed new wind farm are considered **slight to moderate negative short-term impacts at the local scale**.

8A.6.2.6 Potential Construction Phase Impacts on Other Protected Fauna

Marsh Fritillary, an Annex II species of the EU Habitats Directive which is currently considered to be of Vulnerable conservation status nationally (see Regan *et al.* 2010) has been confirmed to occur at the two locations within the terrestrial biodiversity study area. Specific concerns about potential impacts on this species have been raised by Butterfly Conservation Ireland during consultation process for the proposed project (see EIAR Chapter 5). No other taxa of conservation concern were found at the study area. A number of other taxa were noted within and adjacent to the wind farm site and along the cable route, none of which are of conservation concern in Ireland at present. Common Frog is listed on Annex V of the EU Habitats Directive and is also legally protected by the Irish Wildlife Acts (1976 – 2012 as amended) along with Common Lizard.

The construction phase could lead to habitat loss or disturbance of other taxa present such as Marsh Fritillary, Common Frog and Common Lizard. As mentioned previously, the Ballinagree wind farm footprint is dominated by conifer plantation (WD4) of mixed ages and rotations, as well as improved agricultural grassland (GA1) and only small areas of other habitat will be impacted. In the case of Marsh Fritillary, wet heath habitat with suitable larval food plant (Devil's Bit Scabious) is required in order for this species to breed (see Figure 8A.6 for location of suitable habitat). The design of the proposed wind farm has taken account of important areas for fauna such as Marsh Fritillary. There will be no direct loss of suitable Marsh Fritillary habitat at the study area as a result of the proposed project as the proposed new infrastructure does not overlap with areas of suitable habitat (see Figure 8A.6). While the main wind farm access track and grid route crosses one area of confirmed Marsh Fritillary habitat (site MF-7, Figure 8A.6) this will be via an existing access track, which will be upgraded and marginally widened by up to 1m. The proposed road widening/upgrade will not result in the loss of suitable Marsh Fritillary habitat as the track-side margins comprise modified habitat that does not currently support this species.

Indirect habitat loss of suitable wet heath habitat is also possible as a result of the construction of the proposed wind farm through changes in hydrology/drainage patterns on the site or a peat slippage event. Turbine 17 is located c. 80m from an area of confirmed Marsh Fritillary habitat, where the edge of the hard standing is c. 55m from this habitat and where the landscape slopes down towards the habitat in question. The proposed new infrastructure will not result in indirect hydrological impacts on suitable Marsh Fritillary habitat as the tracks and hard-standing areas will be constructed with permeable paving and the scale of the excavation required will be small (i.e. confined to turbine foundations and cable trenches and new access tracks).

Site drainage, including silt traps and stilling ponds, will be put in place in parallel with or ahead of construction, such that excavation for new infrastructure will have functional drainage system in place. Environmental monitoring, management and appropriate mitigation will be implemented during construction which will ensure that no changes to hydrology in areas adjacent to new infrastructure take place (see CEMP, Appendix 3.1) and the development site has not been identified as being at risk of a peat slippage event

The remaining other taxa species at the study area are not currently of conservation concern in Ireland. Frogs occur widely at the site and probably breed in bog pools, drains etc. across the site. Track widening and construction of hard-standing areas and turbine bases could potentially reduce the amount of suitable breeding habitat for Frogs at the site.

The footprint of the proposed development is small however and the main habitats present are modified and not of high ecological value for Frogs and other taxa in general. The design of the wind farm has avoided, insofar as possible, areas close to watercourses, flushes, lakes and bog pools. This species has been shown to be adaptable (utilising man-made drainage ditches) and relatively tolerant of disturbance (Reid *et al.*, 2013). It is predictable therefore, that potential localised disturbance associated with the construction phase, will be offset by the availability of settlement ponds and other drainage features associated with the proposed wind farm infrastructure.

Construction activities have the potential to impact upon aquatic habitats at and downstream of the site and grid access route through hydrological links from the works areas. Potential impacts on aquatic habitats and species are considered in detail in Chapter 8B (Aquatic Ecology).

In summary, the construction phase could potentially lead to the disturbance of, or losses to other taxa (e.g. Common Frog). However, these impacts will be temporary in duration and localised to the development footprint and it is predicted that many of the affected taxa will be able to move into similar habitats in the wider area. No impacts on the Annex II Marsh Fritillary habitat are expected as a result of the proposed project due to the constraints led design approach. Considering the above, potential impacts on other taxa from the proposed new wind farm are considered **imperceptible neutral** overall.

The grid access cable will be undergrounded from the proposed new 110kV Ballinagree substation to the Clashavoon substation via access tracks and public roads and will involve relatively little habitat disturbance or permanent habitat loss. With the application of standard environmental controls (CEMP, Appendix 3.1), the laying of the cable route has very little potential to negatively impact upon other protected fauna occurring along the cable route.

8A.6.3 Potential Operational Phase Impacts

8A.6.3.1 Potential Operational Phase Impacts on Designated Sites

Sites designated for nature conservation potentially impacted during the project operational phase include Mullaghanish to Musheramore Mountains SPA (Site Code: 004162) the River Blackwater SAC (002170) and the Gearagh SPA (004109). Potential impacts and consequent effects to Hen Harrier, the SCI species for which the Mullaghanish to Musheramore Mountains SPA are designated include disturbance, displacement or collision impacts. The likelihood and associated significance of such potential effects are considered further in **Section 8A.6.3.3** below and in the accompanying NIS.

The elements of the operational phase of the proposed project which were identified as posing a pressure on QI / SCI species in the NIS were as follows:

<u>Collision Risk</u>

- Potential for collision with turbine towers, blades (moving or stationary) and/or associated infrastructure; and barrier to dispersal during the operational phase.

Disturbance / Displacement

- Potential displacement of birds due to loss of suitable feeding and/or breeding/wintering habitat.
- Potential displacement of otters due to lie-up sites being disturbed

Indirect impacts of the proposed project which were identified as posing a pressure on QI / SCI species identified as having connectivity

- Reduction in prey due to impacts from emissions to water as identified above.

In relation to the River Blackwater SAC, downstream connectivity and the contamination of in-situ watercourses may contribute to downstream effects. However, operational wind farms are not normally considered to have the potential to significantly impact on the aquatic environment. The main risk to watercourses is via water quality impacts, when oils and lubricants are used on the site (e.g. infrastructure maintenance). If such substances leaked from the turbines or maintenance areas, or were disposed of inappropriately, there is a risk of water contamination and subsequent impacts to aquatic ecology. However, the likelihood of this occurring is very low, and the potential significance of this impact can be mitigated through effective mitigation appropriate management.

Increases in the surface water run-off volume as a result of less-permeable surfaces of the wind farm (e.g. hardstands, access tracks etc.) are predicted to be <1% of the average daily/monthly volume in comparison to the baseline pre-development conditions (see Chapter 10 of the EIAR).

Spills of any oil or fuels from site vehicles onto access tracks may leach to adjacent watercourses. However, this is unlikely to be a significant impact considering the low volumes of vehicular traffic involved in typical wind farm operations and the paucity of watercourses or surface water pathways within the proposed wind farm site and adjacent to access tracks.

Maintenance in the form of upgrading of the site track/road network within the wind farm boundary could present the risk of silt-laden run-off resulting from excavations required for underground cable maintenance.

As outlined in earlier sections of this Chapter, the progressive replacement of the vegetated surface with less permeable surfaces within the site boundary (e.g. hardstands, access tracks etc.) could potentially result in an increase in the proportion and velocity of surface water run-off reaching the surface water drainage network and receiving watercourses. During storm rainfall events, additional run-off coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and impact on aquatic ecosystems. This could lead to potential impacts on aquatic receptors, most notably through sedimentation of instream habitats through increased erosion rates.

There is a potential risk of some hydrocarbons polluting the watercourses following run-off from the impermeable trafficked areas associated with the wind farm layout (e.g. hardstand areas). During the operation stage, small quantities of oil will be used in cooling the transformers associated with the facility. A back-up generator at the sub-station may be used (and refuelled). There is, therefore, a potential for small oil spills which may enter surface waters and cause impacts to aquatic ecology.

8A.6.3.2 Potential Operational Phase Impacts on Habitats and Flora

There will be no additional removal of habitat during the operational phase of the proposed development. As a result, there is no potential for direct negative impacts to habitats and flora arising from the operational phase of the development and grid connection cable or TDR.

Operational stage maintenance works has the potential to introduce silt, hydrocarbons and other chemicals into watercourses. Where maintenance of site infrastructure, or the existing drainage network (e.g. drain clearance, turbine repairs) over the operational lifetime is required, measures will be implemented to prevent pollution (*e.g.* fuels, turbine fluids, and silty water) through the appropriate and temporary use of silt fences, spill kits, cut-off drains, silt traps, check dams and drainage to vegetated areas where appropriate; any indication of failing water treatment measures entering any water-feature at/near site will be reported immediately to the Operational Site Manager and other external agencies as necessary in the event of a pollution incident e.g. Inland Fisheries Ireland. Any environmental incidents which result in pollution of the local water courses will be followed up with appropriate remedial measures in consultation with Inland Fisheries Ireland and other relevant agencies where needed e.g. NPWS, the local authorities. A Construction Environmental Management Plan (CEMP; Appendix 3.1) has been produced for the proposed project and includes the environmental control measures and mitigation to protect aquatic habitats and which will be applied as appropriate for the operational and decommissioning stages of the proposed development.

There is the potential for ongoing degradation of adjacent peatland or heathland habitats during the project operational phase. Such degradation may arise as a result of ongoing drainage patterns associated with the windfarm hard standing areas, especially the access tracks, turbine hard standing and met masts. Drainage patterns that redirect or deflect water from down gradient peatland or heathland habitats could contribute to indirect impacts, resulting in the desiccation of the underlying organic substrates and consequent reduction of plant species diversity and habitat quality.

Due to the design led constraints approach the likelihood of such impacts has been minimised and any deterioration of adjoining peatland is likely to slight permanent and localised.

There will be no additional removal of any habitat during the operational phase of the proposed grid connection and TDR route and there is no potential for impacts on habitat and flora arising for the operational phase.

Considering the above, potential impacts on habitats during the windfarm's operational phase are considered **imperceptible neutral** overall.

8A.6.3.3 Potential Operational Phase Impacts on Avifauna

Operational phase impacts on birds can be related to disturbance, displacement or collision impacts.

Disturbance/Displacement Impacts

Wind farms can cause disturbance to the bird community through displacement related to increased human presence (e.g. post construction maintenance), turbine presence and turbine noise. As mentioned previously, the literature on bird displacement due to wind farm disturbance has provided somewhat inconsistent and inconclusive results (Langston & Pullan 2003 & 2004, Drewitt & Langston 2006, Kingsley & Whittam 2005). These studies have indicated that the scale of disturbance varies greatly between and within species (*loc. cit.*). Disturbance impacts depend on a range of issues including seasonal bird use, diurnal bird use, location, availability of alternative habitats, bird life cycle, flock size, habituation and turbine and wind farm specifications (*loc. cit.*).

Wind farms can also cause displacement of birds by creating a barrier effect to migration or local flight paths, which could result in disruption of ecological links between feeding, breeding and roosting areas (e.g. Drewitt & Langston 2006, Kingsley & Whittam 2005). In Ireland, this potential problem is more likely to occur with migrating wildfowl populations (Percival, 2003), however, no such species were recorded at the study area during the eight-season VP survey.

Published research on disturbance and displacement impacts of wind farms on birds (e.g. Pearce-Higgins *et al*. 2012) has reported significant declines in the population densities of certain species at wind-farm sites from pre- to post-construction and there are indications from other research that the presence of turbines may result in lower nest success for Hen Harrier, although this impact was only evident for nest sites located within 1 km of wind turbines (Fernández-Bellon *et al*. 2015**)**. There are no Hen Harrier nests within 2km of the study area and no impact on Hen Harrier nest success is therefore considered likely as a result of the proposed development. Furthermore, a review of available literature on wind turbine avoidance by Hen Harriers from wind farm sites across their range (Madders & Whitfield, 2006) ranked this species' sensitivity to displacement as low-medium. The majority of the studies included in this review showed no indication of Hen Harrier displacement at wind farm sites across Europe and North America (*loc cit*.).

In terms of the target species under consideration here (i.e. Hen Harrier, Golden Plover, Peregrine Falcon, Merlin and Red Grouse), no nest sites or breeding activity have been recorded at the study area during the eight seasons of VP surveys (c. 188 hours of VP survey effort between March 2017 and March 2021).

Recorded activity levels of all target species (apart from Golden Plover which will be discussed below) were also generally low at the study area in both the breeding and winter seasons (<1.5% of the total VP survey time), with no regular flight paths or areas of high importance identified within the study area boundary. The main habitats impacted by the proposed project will be conifer plantation and improved agricultural grassland, which are not of ecological value for these target species. While a number of sections of open bog/heath/wet grassland habitats will be impacted by the proposed development, the scale of the proposed land-take in these areas is relatively small (i.e. four turbines and associated access tracks) and these areas are not located along any regular flight paths or areas of preferential use by the target species under consideration here.

Potential disturbance/displacement impacts on Hen Harrier, Peregrine Falcon, Merlin and Red Grouse as a result of the operation of the proposed wind farm are therefore considered to be **negligible** at the proposed development site.

As mentioned previously, the upland bog/heath/wet grassland habitats within the study area have been shown to be of ecological significance to wintering and migrating **Golden Plover.** This habitat is also present in the wider area to the north and northeast of the study area where significant Golden plover activity is concentrated. Wind Farm infrastructure located within bog/heath/wet grassland habitats at the site (i.e. turbines T2, T3, T13 & T17 and associated access tracks) as well as within areas adjacent to known concentrations of Golden Plover (i.e. turbines 14-20 in the north and northeast of the study area) have the potential to cause disturbance/displacement impacts on this wintering/migrating species. As described previously, the wintering population which occurs at the study area is large and stable as compared to the breeding population, which is declining and is restricted in range to northwest Ireland. This species was regularly recorded to the north of the study area in association with the nearby Boggeragh Wind Farm and as such already displays a large degree of habituation to operational turbines. Indeed, while there is some evidence that Golden Plover can initially be displaced from the area immediately around an active turbine (Pearce Higgins *et al*. 2009), a subsequent study by the same author has reported that, following the construction period, populations may become habituated to operational wind farms (Pearce Higgins *et al*. 2012). Post construction monitoring at 15 upland windfarms showed no significant decline in Golden Plover numbers (Pearce Higgins *et al*. 2012). Similarly, there was no decline in Golden Plover populations recorded during 3-years of post-construction surveys at one UK windfarm site (Douglas *et al*. 2011). It is therefore considered likely that Golden Plover will continue to use the wind farm site at Ballinagree post construction and no significant disturbance/displacement impacts on the local wintering/migrating Golden Plover population are therefore considered likely as a result of the operation of the proposed development.

All other bird species recorded at the site are not regarded as being particularly sensitive to disturbance displacement and/or barrier to movement arising from wind farm development (Langston & Pullan 2003 & 2004, Percival, 2003 and Stewart *et al.* 2004).

Collision Impacts

Bird mortality or injury at wind farms can occur through collision with rotors, towers, nacelles, cables, power lines and meteorological masts (Drewitt & Langston, 2006, Kingsley & Whittam, 2005). While most wind farm collision studies indicate low levels of bird mortality per turbine, these levels could still be significant for some bird species populations such as those with a low annual productivity, slow maturity and in cases of very large wind farms with tens of turbines (Langston & Pullan 2003, Drewitt & Langston, 2006). This scenario has occurred on a number of inappropriately located wind farms such as those at Altamount Pass in California and Tarifa in Spain (*loc cit*., Percival, 2003). It should be noted that the Altamount Pass wind turbines were only of c. 30m in height and the rotor envelope is therefore not comparable to the current wind farm layout. In contrast the proposed turbines at Ballinagree will have a blade tip height range of between 179m and 185m, a hub height range of between 102.5 and 110.5m and a rotor diameter range of between 149m and 155m; giving a maximum hub height of 110.5 (max. 185m blade-tip height with a max. rotor diameter of 155m).

Collisions with wind turbines are most likely to occur where birds fly regularly at turbine blade height and do not demonstrate an effective avoidance response. Hen Harriers typically fly below the height of wind turbine rotor blade sweep at heights of less than 25m (Smallwood & Thelander, 2004, Drewitt & Langston, 2006, Whitfield & Madders, 2006). This typically low flight height coupled with the observed avoidance of wind turbines shown by Hen Harriers, suggests that collision risk will be low for this species (Whitfield & Madders, 2006). No breeding site was located in the vicinity of the wind farm development study area during the 4 years of surveys and no displaying ('sky dancing') was observed on or adjacent to the proposed development site. In fact, as previously mentioned, activity levels were consistently low on site (< 1.5% of the total survey time in the breeding season and < 0.7% in the winter) and related to foraging and commuting flights.

In general, large/heavy species such as swans/geese are more susceptible to collision mortality as they are less manoeuvrable than raptors such as Hen Harrier. No flightlines of protected wildfowl species such as Whooper Swan or Greenland White-fronted Goose were recorded over the study area during the VP surveys and there is no evidence that the site is located on regular commuting or migration route for any such bird species.

The overflying rate of the proposed wind farm area by most target bird species, (with Golden Plover being the exception), was found to be consistently low throughout the eight-season survey period (<1.5 % of the total survey time). The potential collision risk for such target species (i.e. Hen Harrier, Peregrine Falcon, Merlin and Red Grouse) at the proposed wind farm is therefore very low. Golden Plover activity was found to be relatively high on, and in the immediate vicinity of, the study area during the winter season and up until the end of April (where this species was present on site a maximum of 12.1% of the total survey time and off-site for a maximum of 26% of the total survey time during the survey period). The number of flightlines ranged from nine (in 2018/2019) to 98 (in 2020/2021) and flock size ranged from single individuals to 500 birds. Flight heights were typically <100m, although ranged as high as 200m on occasion and as such a proportion of flightlines took place within the proposed rotor swept height (for the range of tower heights and blade lengths under consideration). However, Golden Plover are highly mobile and are considered to have an avoidance rate of 98% (SNH 2018), making them less susceptible to turbine collision.

This supposition is supported by post construction monitoring at 15 upland windfarms where no significant decline in Golden Plover numbers occurred (Pearce Higgins *et al*. 2012) and also during 3-years of post-construction surveys at one UK windfarm site (Douglas *et al*. 2011) where no decline in Golden Plover populations were recorded.

It should also be noted that much of the Golden Plover activity recorded during the VP surveys here occurred off site and as such these flightlines would not be at risk of collision with turbines. Pearce Higgins *et al*. (2012) produced a detailed analysis of the observed impacts at wind farm and control sites to examine any significant impacts on the abundance of key bird species using these sites. They found little evidence for differences in population trends between operational wind farms and reference sites which they state implies that any increase in mortality through collision with operating turbines, or other changes associated with wind farm operation, has little effect on local populations. In the same paper they also state that there is little evidence for consistent post-construction population declines in any species using wind farm sites.

Given the regular occurrence of Golden Plover within the study area and the potential for large flocks of this species to fly within the rotor swept area (for the range of tower heights and blade lengths under consideration), there is some potential for turbine collision to occur at the study area.
The available research shows that Golden Plover are relatively adept at navigating around operational turbines however and collision fatalities are unlikely to have any measurable impact on the local wintering Golden Plover population (Pearce Higgins *et al*. 2012). Potential collision impacts on the local Golden Plover population as a result of the operation of the proposed wind farm are therefore considered to be negative but not significant.

The installation of warning lights on turbines can help to increase their visibility, and thereby reduce the risk of bird collision. The proposed turbines will be fitted with aviation warning lights in accordance with standard industry practice. Furthermore, the evidence from the available literature and field studies at several other operational wind farms in Ireland (Gavin Fennessy pers obs.) indicates that the risk of significant fatalities of birds at the operational wind farm is extremely low.

The grid-connection will be installed underground and will not pose any collision risk to avian species. The TDR is not applicable to the operational phase (construction phase only), while the BEMP does not involve erection of structures of potential collision risk to avian species.

8A.6.3.4 Potential Operational Phase Impacts on Non-Volant Mammals

There is very limited potential for operational phase impacts on the local non-volant mammal community. The maintenance requirement of wind farms is relatively low and there will be no permanent staff presence. The establishment of new walking trails may result in an increased level of human and vehicular disturbance over pre-construction levels. Mammals will use the site tracks to commute to and from feeding areas and there is some increased potential for interaction between people (and their dogs) with locally occurring mammals. Red Deer and possibly other Deer species occur at the site. Visitors to the site will need to be made aware of the presence of these large mammals and take care to avoid approaching them closely, particularly in the rutting period (Autumn) when negative interactions are more likely. It should be noted that the majority of the non-volant mammals that occur at the site are nocturnal or crepuscular and as such will be active at times when human activity at the site will be absent or very low.

No breeding sites of any protected non-volant mammal species are known to occur within 50m of the proposed turbine locations and as such no loss of breeding sites is expected and no significant disturbance of breeding individuals is expected. Badgers, Foxes and other mammals will utilise the access tracks to traverse the site and the operational windfarm will not present any barrier to movement of the locally occurring mammals.

Any edible or putrescible wastes generated by visitors to the site (e.g. at the substation or along walking trails) could potentially attract mammalian scavengers. Such impacts are amenable to mitigation as described in the mitigation measures outlined below.

With the exception of aviation warning lights, required by the Irish Aviation Authority, the wind farm will not be lit at night (apart from emergency maintenance works) and switchable lighting around the substation building and there will be no impacts on nocturnal non-volant mammal species as a result of light pollution from the operational wind farm.

Taking the above into consideration, the potential impacts on non-volant mammals as a result of the operation of the proposed wind farm are considered imperceptible neutral overall.
There are no operational phase works proposed on the TDR and GCR and these project elements do not have any potential to impact upon non-volant mammals in the operational phase. The likely positive operational phase impacts on local biodiversity associated with the implementation of the BEMP, is described in Section 8A.8.

8A.6.3.5 Potential Operational Impacts on Bats

Habitat loss experienced during the construction phase (described above) will continue to persist through the operational phase. Proposed roadways through existing forestry will continue to provide some additional foraging and commuting opportunities for most bat species throughout the operational phase.

The operation of the wind farm at this site has the potential to result in disturbance to commuting and foraging bats. Bat activity at the site was moderate overall, with low levels of activity for much of the year. Bats will forage and commute through the site and it is considered that connectivity throughout the afforested areas of the site may be enhanced through the provision of additional roadways through forestry. The additional woodland edge habitat (along site tracks) proposed is considered likely to have a slight positive impact on ease at which bats commute and forage through the site.

Increased connectivity to proposed turbine locations could result in increased risk of fatality or injury as a result of contact with rotating turbine blades. Collision risk is discussed further below.

Collision Risk

There is little or no published evidence available on prevalence of bat fatalities at wind farms in an Irish context. Where fatalities have been monitored at wind farms in the USA, most losses have been related to periods of migration (www.nationalwind.org).

Both direct collision with turbine blades and barotrauma resulting from close contact with blades have been reported as an issue for bats at wind farms (e.g. Cryan & Barclay, 2009).

The susceptibility of bat species likely to be at risk of impacts from wind turbines is partly associated with the likelihood of different species flying at rotor blade height. In an Irish context, Leisler's Bat is considered to have a somewhat greater mortality risk at wind farms than the other species recorded on (or adjacent to) the site, as this species is a relatively large and high-flying species. Leisler's Bats typically do not follow landscape features such as treelines or woodland edges when foraging.

Assessment of Collision Risk

A general assessment of vulnerability of bat populations to collision with wind turbines, based on best available scientific information, is provided in Table 8A.26 below. This adapts for use in an Irish context a collision risk scheme provided in SNH (2019). SNH (2019; and as revised NatureScot 2021) provides a generic assessment of bat collision risk for UK species, based on species behaviour and flight categorisation as well as evidence of casualty rates in the UK and Europe. This bat species collision risk assessment is considered to represent best available information for use in an Irish context.

This species collision risk categorisation is used in combination with relative abundance to indicate the potential vulnerability of bat populations.

Relative abundance for Irish species was determined in accordance with a scheme for rarity of bat species provided in Wray *et al*. (2010) in combination with best available population data provided in recent Article 17 reports (NPWS, 2019; www.npws.ie). The limitations in terms of Irish bat population data is acknowledged in the latter report.

Table 8A.26: Scheme for estimation of Irish bat species' population vulnerability to wind energy development.

Relative Abundance	Collision-Risk		
	Low	Medium	High
Common (100,000 plus)			Common Pipistrelle Soprano Pipistrelle
Rarer (10,000 – 100,000)	Daubenton's Bat Brown Long-eared Bat Lesser Horse-shoe Bat		Leisler's Bat
Rarest (under 10,000)	Natterer's Bat Whiskered Bat		Nathusius Pipistrelle

Population vulnerability: yellow = low, orange = medium, red = high.

In determining the project specific potential risk to bats, SNH (2019) recommends a two-stage process as follows:

- Stage 1: Indicatively assess potential site risk based on consideration of habitat present and development related features (i.e. number of turbines, size of turbines and proximity to other wind farms).
- Stage 2: Overall assessment of risk for high collision-risk species, considering bat activity site survey results and the relative vulnerability of species.

Initially an assessment of the general site risk based on habitats present was carried out following the scheme presented in SNH (2019). Although the proposed wind farm site generally lacks potential roosting features (PRFs), and the quality of the foraging habitat is variable, the site is well connected to attractive roosting and foraging habitats in the hinterland and therefore a habitat risk of 'Moderate' is conservatively applied. The proposed project is 'Medium' (i.e. between 10 and 40 turbines, although with relatively large turbines, and some other wind energy development within 5km).

Based on the above initial site risk assessment, the proposed project is considered to be 'Medium Risk' to bats and a 'Site Risk Level' of 3 is applicable (see Table 8A.27 below).

The next stage of the process is applicable to 'high collision-risk' species only and utilises information on the activity level recorded on site in each monitoring period. This assessment is intended to identify projects which are of greatest concern in terms of bat collision risk. The following high collision-risk species have been recorded at the current site:

- Leisler's Bat
- Common Pipistrelle
- Soprano Pipistrelle

A species-specific indication of risk is provided below for each of these species.

Leisler's bats are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. While Leisler's Bat is rare in a European context, Ireland is a stronghold for the species. The minimum population range for the species in Ireland is estimated at 60,000 to 110,000 (NPWS, 2019; www.npws.ie) and therefore the species is conservatively considered here to be 'Rarer'. The Mammal Red List for Ireland (Marnell *et al.* 2019) categorises the status of the species in Ireland as 'least concern' due to its improving European status, widespread distribution in Ireland and recent data showing continuing population increase here. Leisler's Bats were recorded during activity surveys across the site (see Table 8A.27).

Overall collision risk for Leisler's Bat in the context of the proposed wind farm is considered to be 'Low' in autumn, 'Moderate to High' in spring and 'Moderate to Low' in Summer (Table 8A.27).

Collision risk may be influenced during the operational lifetime of the proposed wind farm in certain areas by the rotational cycles of the surrounding forestry. Where turbines are 'key-holed' into mature forestry edge effects can occur attracting greater levels of bat activity locally. This additional risk may apply particularly to species which fly above the forest canopy, such as Leisler's Bat.

Common Pipistrelle are a common and widespread species in Ireland which are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. The minimum population estimate for the species in Ireland is 1m to 2m individuals (NPWS, 2019) and therefore the species is considered here to be 'Common'.

The Mammal Red List for Ireland (Marnell *et al.* 2019) categorises the status of the species in Ireland as 'least concern' due to its widespread range across Ireland, no evidence of decline and the European status of 'least concern'.

Common Pipistrelles were the most regularly recorded species across the site, including at height. Overall collision risk for Common Pipistrelles in the context of the proposed wind farm is considered to be 'Moderate' autumn, and 'Moderate to High' in spring and summer.

Soprano Pipistrelle are a common and widespread species in Ireland which are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. The minimum population estimate for the species in Ireland is 500,000 to 1.2m individuals (NPWS, 2019) and therefore the species is considered here to be 'Common'.
The Mammal Red List for Ireland (Marnell *et al.* 2019) categorises the status of the species in Ireland as 'least concern' due to its widespread range across Ireland, no evidence of decline and the European status of 'least concern'.

Soprano Pipistrelles were recorded during activity surveys across the site. Overall collision risk for Soprano Pipistrelles in the context of the proposed wind farm is considered to be 'Low' for all three seasons of bat activity (i.e. spring, summer and autumn).

Table 8A.27: Overall collision risk assessment of relevant (high-risk) species.

	Species	Site Risk Level	Activity Category	Overall Assessment
Autumn 2019	Leisler's Bat	3	Low (1)	3
	Common Pipistrelle	3	Moderate (3)	9
	Soprano Pipistrelle	3	Low (1)	3
Spring 2020	Leisler's Bat	3	Moderate to High (4)	12
	Common Pipistrelle	3	Moderate to High (4)	12
	Soprano Pipistrelle	3	Low (1)	3
Summer 2020	Leisler's Bat	3	Low to Moderate (2)	6
	Common Pipistrelle	3	Moderate to High (4)	12
	Soprano Pipistrelle	3	Low (1)	3

Overall collision risk assessment: Low (green), medium (amber), high (red).

While activity levels of the above species varied between survey locations it is not possible to determine with any accuracy the different levels of collision risk presented by individual turbines. Changes made to landscape locally as a result of the proposed project may significantly alter flight patterns and foraging opportunities (positively and negatively) post-construction compared with pre-construction. This is particularly the case in the context of commercial forestry, and different blocks of forestry will progress through planting and felling at different times.

As per SNH (2019) guidance there is no requirement to complete an Overall Risk Assessment for low-risk species.

The low-risk species that were recorded were Brown Long-eared Bat, Natterer's Bat, Whiskered Bat, Daubenton's Bat and Lesser Horseshoe Bat. Overall activity levels varied for these above species but by virtue of their low potential vulnerability to wind energy developments, no significant collision related risk is likely. No other significant impacts are likely to occur on bats during the operations phase of the proposed wind farm.

8A.6.3.6 Potential Operational Phase Impacts on Other Protected Fauna

The operational phase is not likely to lead to any significant impacts on other taxa (e.g. Lepidoptera including Marsh Fritillary, Odonata, amphibians and reptiles) that occur at or in the immediate vicinity of the site.

As discussed above, mammals, bats and other taxa are not of conservation concern with regard to a wind farm development at the study area. In fact, potential impacts are considered to be **imperceptible neutral** overall.

8A.6.4 Potential Impacts during Decommissioning

No other potential impacts other than those already discussed above for the construction and operational phases are likely to occur during decommissioning. Turbine design renders the decommissioning process as a straightforward process. In the decommissioning phase, cranes disassemble each turbine section which is then removed from the site. The upper sections of the foundations projecting above ground will be removed, and the remainder of the foundations and hardstands will be covered over with topsoil previously stripped and used for landscaping purposes during the construction stage and left to revegetate naturally. Underground cables will be cut back at the turbine termination and either be recycled or left buried in situ (de-energised). Site materials will be recycled where practicable, or disposed of in accordance with current waste legislation and best practice guidelines. Based on current commodity prices, principally steel and copper, material costs achieved through recycling will exceed current financial costs associated with site decommissioning. Decommissioning activities are assumed to be similar to construction activities, having similar type risks and sensitive receptors associated with them. However, they are considerably less intrusive. No additional measures other than those outlined for the construction or operational phase will be required.

The environmental control, monitoring and mitigation measures applied during the construction phase detailed in the sections below will also be applied as appropriate for the decommissioning of Ballinagree Wind Farm.

8A.6.5 Potential Cumulative Impacts

As described in Chapter 1 of the EIAR a planning search was carried out to identify permitted and constructed projects in the wider receiving environment.

Projects in the wider hinterland were identified using various online resources including:

- Cork County Council planning viewer https://www.corkcoco.ie/en/planning/planning-enquiry-online-submissions;
- An Bord Pleanála (Strategic infrastructure development (SID) applications, Strategic Housing Development (SHD) applications and major project applications including wind farms) https://www.pleanala.ie/en-ie/home;
- Irish Wind Energy Association (IWEA) https://www.iwea.com/
- Department of Department of Housing, Local Government and Heritage's EIA Portal https://www.gov.ie/en/publication/9f9e7-eia-portal/.

The majority of consent applications pertain to one-off residential dwelling or farm buildings/structures along the regional roads. The scale of these applications will not have an effect on the Mullaghanish to Musheramore Mountains SPA and The Gearagh SPA, therefore as stated in the accompanying NIS there is no potential for significant in-combination/cumulative effects with the proposed development arising from such developments.

This list of projects and plans was reviewed and the potential for cumulative impacts on terrestrial biodiversity was considered. Highlighted under the following headings are a selection of the projects that were deemed to have greatest potential to act cumulatively or in combination with the proposed wind farm project.

8A.6.5.1 Cumulative Impacts on Designated Sites

The potential cumulative and in-combination impacts on designated Natura 2000 sites arising from the proposed project is discussed in detail in the NIS which accompanies this planning application.

Potential cumulative and in-combination impacts on aquatic habitats and species associated with designated sites are discussed in Chapter 8B of this EIAR.

No projects were identified which are considered likely to act cumulatively upon the local terrestrial ecology (habitats and species) during the construction phase of Ballinagree Wind Farm. Given the nature of the proposed project and the terrestrial species that are mobile and most likely to be subject to cumulative and in-combination impacts from other projects in the wider area, developments such as other wind farms are highlighted as those of key relevance to the operational and decommissioning phase impact assessment. Impacts upon bird species through cumulative loss of habitat, displacement effects, collision mortality and barrier impacts were considered.

There are 8 operational wind farms exist within 20km of the main wind farm site including Boggeragh Wind Farm, Carriganima Wind Farm, Carraigcannon Wind Farm and Esk Wind Farm. Each of the individual wind farms in the wider area operates and will be decommissioned on their own schedule in accordance with their planning permissions. There are no proposed wind farms adjoining the project currently within the planning application system. These were assessed for potential cumulative effects with the entire wind farm project.

The nearest operational wind farm to the Site is the neighbouring Boggeragh Wind Farm (1 and 2) directly to the north. Boggeragh Wind Farm consists of 39 wind turbines with rotor diameters of 90m. The windfarm underwent an appropriate assessment which concluded that with the implementation of mitigation measures, the residual impacts on birds associated with the wind farm development at Boggeragh are not expected to be significant.'
No significant residual impacts on hen harrier are identified. Therefore, potential effects during the operation of the Boggeragh wind farm in combination with the proposed project will not occur on the SCI bird species (Hen Harrier) of the Mullaghanish to Musheramore Mountains SPA.

There are no permitted extant wind farms that are likely to be under construction in the wider area concurrent with Ballinagree Wind Farm. The operational wind farms in the wider hinterland have all been subject to their own detailed biodiversity impact assessments and mitigation measures.

The proper planning and implementation of environmental controls, monitoring and mitigation at such large-scale projects greatly minimises the risk of significant residual impacts upon species and habitats of elevated conservation importance. Consequently, the risk of significant cumulative and in-combination effects on terrestrial biodiversity is also unlikely to be significant, for the vast majority of terrestrial habitats and species.

The ecological impact assessments and reports in support of the AA process for the wind farms in the wider area were reviewed. For example, the Esk windfarm underwent an appropriate assessment which concluded that with the implementation of mitigation measures, the residual impacts on birds associated with the proposed six turbine wind farm development at Esk are not expected to be significant.' No significant residual impacts on Hen Harrier were identified. The results of the assessments carried out as part of the planning applications for the other wind farm sites in the wider hinterland were also reviewed.

Carraigcannon Wind Farm is c. 6km north of the Site and consists of 10 wind turbines already in operation. The infrastructure has been in place for a number of years allowing ample time for bird species to acclimatise (alter, if needed, their breeding, foraging and commuting habits due to the presence of the wind farm). Although the wind farm is within the core foraging range (Core range of 2km, with maximum range of 10km) of the SCI bird species (hen harrier) of the Mullaghanish to Musheramore Mountains SPA, hen harriers typically fly below the height of wind turbine rotor blade sweep at heights of less than 25 m (Smallwood & Thelander, 2004, Drewitt & Langston, 2006, Whitfield & Madders, 2006). This low flight height coupled with the small-scale avoidance of wind turbines shown by Hen Harriers, suggests that collision risk will be low for this species (Whitfield & Madders, 2006). Therefore, potential effects during the operation of the wind farm in combination with the proposed project will not occur on the SCI bird species of the Mullaghanish to Musheramore Mountains SPA.

Carriganimmy Wind Farm is c. 5km west of the Site and consists of 6 wind turbines already in operation. Gneeves Wind Farm is c. 9.5km west of the Site and consists of 18 wind turbines already in operation. There is appropriate distance and habitats (including the Mullaghanish to Musheramore Mountains SPA) between the developments and the proposed project to prevent a cumulative effect of potentially obstructing migratory flightpaths and 'disturbance' to birds utilising foraging grounds whilst on migration. Therefore, potential effects during the operation of the wind farm in combination with the proposed project will not occur on the SCI bird species (hen harrier) of the Mullaghanish to Musheramore Mountains SPA.

Bawnmore Wind Farm is c. 5km south of the Site and consists of 7 wind turbines already in operation. The only potential impact pathway with regards to the wind farm and The Gearagh SPA was identified to be via a hydrological pathway. As there is no hydrological pathway between the proposed project and the SPA, cumulative effects on the SCI bird species of The Gearagh SPA via a migratory species pathway will not occur with the proposed project.

Continuance of use for existing 30m telecommunications structure c. 1.1km south of the site. Structure has been in place for a number of years, allowing ample time for bird species to acclimatise to the structure. No potential for significant in-combination / cumulative effects with the proposed development will occur on the SCI's of the Mullaghanish to Musheramore Mountains SPA and The Gearagh SPA.

Permission for the development associated with the uprate of a section of the existing Clashavoon to Tarbert 220kV overhead line (planning reference: 167216). The proposed project pertains to the length of existing overhead line between mast structure number 63 (south-east of the Knockanure 220kV substation, Co. Kerry) and mast structure number 233 (north of the existing Ballyvouskill 220kV substation, Co. Cork). The overall length of this section of overhead line is approximately 60.4 km, of which 21.2 km is located in Co. Cork and 39.2 km is located in Co. Kerry. The application underwent an appropriate assessment which highlighted there would be no risk of collision with towers or cables as Hen Harriers are adept at flying and highly unlikely to collide with static structures. Furthermore, the uprating involves the existing powerlines that have been in place for over 40 years. Therefore, no potential for significant in-combination/cumulative effects with the proposed development will occur with the proposed project on the SCI of the Mullaghanish to Musheramore Mountains SPA. There will be no potential for significant in-combination/cumulative effects with the proposed development on the SCI's of The Gearagh SPA as it is greater than the foraging range of all the SCI species.

Retention of existing 20-metre high telecommunications support structure carrying telecommunications equipment together with existing equipment container and associated equipment within a fenced compound as previously granted under local authority reference 12/06523 (planning reference: 185230). Structure has been in place for a number of years, allowing ample time for bird species to acclimatise to the structure. As no new works are proposed within the development, no potential for significant in-combination / cumulative effects to occur with the proposed development.

Construction of a battery storage compound including 2 no. battery storage buildings with associated plant and equipment, an ancillary 110kV electricity substation with 2 no. control buildings, associated electrical plant & equipment and fencing, underground electricity cabling, surface water drainage, site entrance and access track, security fencing and all ancillary site works (planning reference: 185686).

The location of the development is c. 5.6km west of the proposed project. The development has undergone an appropriate assessment which concluded there will be no significant impacts to the hen harrier population of the Mullaghanish to Musheramore Mountains SPA. There is appropriate distance and habitats (including the Mullaghanish to Musheramore Mountains SPA) between the development and the proposed project to prevent a cumulative effect of potentially obstructing migratory flightpaths and 'disturbance' to birds utilising foraging grounds whilst on migration. Hen harriers are also adept at flying and highly unlikely to collide with static structures. Therefore, no potential for significant in-combination / cumulative effects with the proposed development.

The development of an extension to the existing Ballyvouskill ESB substation and the overall site area (within the planning application boundary) of 0.73ha c. 5.8km west of the proposed project. The development will comprise the construction of one (1) no. ± 100 Mvar STATCOM transformer, one (1) no. auxiliary transformer, three (3) no. reactors, one (1) no. outdoor cooling bank, control and valve building (268m²), underground connection to existing ESB substation. It further includes security fencing, security gate, four (4) no. 25m high lightning masts, permeable surfacing, and an internal access road (planning reference: 186438).
The development underwent an appropriate assessment screening which concluded 'The assessment based on the source, pathway, receptor model has shown that there is no potential for likely significant effect to breeding hen harrier or the habitats upon which it depends as they pertain to the Mullaghanish to Musheramore Mountains SPA.'

The development is also c. 5.8km west of the proposed project with an appropriate distance and habitats (including the Mullaghanish to Musheramore Mountains SPA) between the development and the proposed project and hen harriers are also adept at flying and highly unlikely to collide with static structures. Therefore, no potential for significant in-combination / cumulative effects with the proposed development.

A battery energy storage facility which will comprise of rechargeable battery units contained within up to 39 No. 40 foot containers on site and the associated development of unit substations, a 110 kV substation, security fencing, security cameras, lightning mast, new site roads and the upgrading of the existing vehicular access. The facility will connect into the adjoining Ballyvouskill ESB substation via underground cable. All associated site development, landscaping and boundary treatment works above and below ground (planning reference: 184182). The project underwent an appropriate assessment screening which concluded that there is no potential for significant effects from the development with regards to the Mullaghanish to Musheramore Mountains SPA. Therefore, no potential for significant in-combination / cumulative effects with the proposed development.

Permission for the development of a small-scale quarry with the extraction of rock using ripping and rock breaker and the on-site crushing and screening with mobile plant, and open storage of crushed rock. The development is located c. 9.1km south of the site. No appropriate assessment has been undertaken at the site, however, due to the distance from the Mullaghanish to Musheramore Mountains SPA and no records of SCI species from The Gearagh SPA, no potential for significant in-combination / cumulative effects with the proposed development.

The NIS that accompanies this planning application did not identify any risk of significant cumulative or in-combination impacts upon terrestrial species and habitats associated with the construction, operation or decommissioning of Ballinagree Wind Farm.

8A.6.5.2 Cumulative Impacts on Habitats and Flora

The BEMP measures are designed to see a biodiversity gain in the area during the lifetime of the wind farm project through the management of over 320 hectares for the benefit of wildlife and ecological connectivity. These measures are outlined in Section 8A.8 below. Due to the constraints led design approach and the avoidance of direct impacts on high-value habitats and flora there is no significant potential for cumulative impacts on habitat and flora associated with this proposed wind farm project.

8A.6.5.3 Cumulative Impacts on Avifauna

Existing or proposed projects in the hinterland of this project have the potential to cumulatively impact on the local ecology, particularly through increased fragmentation of the landscape, increased habitat disturbance, barrier effects, and through intensification of collision or displacement impacts on sensitive bird species.

There are several consented and proposed projects in the study area that could potentially interact with a wind farm development at Ballinagree (e.g. Boggeragh Wind Farm: constructed 39-turbine development).

The potential cumulative and in-combination impacts on Hen Harrier are discussed above and in the NIS that accompanies this planning application.

Each additional turbine erected in the landscape can potentially increase the cumulative risk of collision for birds foraging and commuting through a landscape. For most species their ecology and in particular their pattern of movement means that they will not experience an incremental increase in collision risk for each turbine erected (e.g. territorial passerines). For species with large home ranges, or those commuting long distances, there is a potential for individuals to experience a cumulative collision risk. Information from recovery of ringed and tagged birds indicates that losses associated with collision with road traffic and buildings, along with hunting and predation fatalities, are the most significant source of bird mortality (Wernham *et al*. 2002). Observations of flightlines of key target species made during the breeding and wintering VP surveys indicates that the site is not situated along any regular commuting route for these species. Golden Plover may be an exception however as concentration of this species were noted to the north and northeast of the study area including a section of the nearby Boggeragh Wind Farm, where this species appears to be habituated to the presence of the wind farm infrastructure. It is possible that the erection of 20 turbines at Ballinagree would contribute to an increased collision risk, or disruption of movement of wintering/migrating Golden Plover however any such cumulative impacts are considered to be negative but not significant given the presence of extensive upland bog/heath habitat outside the wind farm boundaries and the apparent habituation of this species to wind farm infrastructure.

8A.6.5.4 Cumulative Impacts on Mammals and Other Taxa

The constraints led design approach has minimised the risk of disturbance, displacement and loss of such species and the habitats of importance for these species. The BEMP measures are designed to see a biodiversity gain for a wide range of species including mammals and invertebrates in the area during the lifetime of the wind farm project through the management of over 320 hectares for the benefit of wildlife and ecological connectivity. These measures are outlined in Section 8A.8 below.

No permitted or operational projects in the wider receiving environment were identified which were likely to act cumulatively or in combination with the proposed wind farm to impact upon the mammal and other taxa present in the area. No likelihood of cumulative impacts on mammals or other taxa (e.g. amphibians, Lepidoptera) has been identified in relation to the construction, operation or decommissioning of the proposed project.

8A.7 Mitigation Measures

From the outset an iterative process of constraints led design was employed for the proposed windfarm whereby independent ecological expertise was utilised at an early design stage in identifying the constraints and designing the site layout to take account of these constraints. The siting of the turbines and associated infrastructure was informed by the environmental constraints.

The mitigation measures described below are designed to address and minimize the risk of impact arising from each phase of the proposed development. Section 8A.9 describes the predicted residual impacts of each phase of the development with the application of the proposed mitigation and BEMP measures.

8A.7.1 Mitigation Measures During Construction

8A.7.1.1 Construction Phase Mitigation Measures – Designated Sites

Mitigation measures for Mullaghanish to Musheramore Mountains SPA (004162) species of Special Conservation Interest are outlined in Section 8A.7.1.3 below and in the accompanying NIS. In addition, mitigation measures required for the downstream sections of the River Blackwater SAC during the construction phase are presented in **Chapter 8B** (Aquatic Ecological Assessment) and in **Chapter 9** (Geology, Soils & Peat Stability) and **Chapter 10** (Hydrology & Water Quality) of this EIAR and the accompanying NIS. Mitigation for the construction phase is detailed in the NIS (accompanying the planning application) and designed to eliminate the risk of significant adverse impacts on the integrity of the three Natura 2000 sites 'screened in' - Mullaghanish to Musheramore Mountains SPA, the River Blackwater SAC and The Gearagh SPA.

Mitigation measures are detailed in the CEMP and in the following sections will be effective in eliminating the risk of any significant impacts on the Boggeragh Mountains NHA.

8A.7.1.2 Construction Phase Mitigation Measures – Habitats and Botanical Species

All turbines were sited based on avoidance of high sensitivity habitats. A minimum 75m buffer was applied from natural waterbodies to turbines with a minimum 50m buffer for all other project infrastructure (except at stream crossing points, works associated with the improvement to the access track and the undergrounding of the cable route), where wind turbine foundation excavations will not extend to within 50m of a watercourse. While the TDR does traverse the River Blackwater SAC, instream works are not required. Any potential impacts will be minimised by implementing the following mitigation measures, such that residual construction related effects will be **negligible in magnitude** overall for the proposed windfarm development.

The below best practice and mitigation measures will be undertaken during the project construction phase:

- No removal/clearance of habitats or movement of construction machinery will occur outside of the development works area/footprint during the construction phase, where the works area/footprint will be clearly marked for associated site staff.
- In the absence of any mitigation to protect existing trees during the construction phase, there is potential for retained scattered trees and treelines in the lands to be damaged by construction activity. This would arise from damage to roots of trees if they remain unprotected and are within the proposed construction corridors. Additionally, there is potential for machinery strike to damage tree limbs. In a worst-case scenario, the damage inflicted on the scattered trees and treeline habitats would result in their degradation and removal from the lands. Measures to protect trees include the installation of tree protection barriers around the root protection zones of retained trees in the development site. Where essential works are required within the root protection zones, ground protection (such as a cellweb membrane) will be installed following consultation with a qualified and experience arborist and/or engineer, to minimise risks of damage to roots.
- Existing hedgerows and trees being retained at/near the site will be protected and retained in line with current guidelines and the advice of a suitably qualified arborist (e.g. NRA 2006)
- The construction of the proposed project will be implemented in accordance with the planning phase Construction Environmental Management Plan (CEMP) for the proposed project to ensure environmental protection of the site in accordance with best practice controls (e.g. CIRIA 2015 & 2001; see Appendix 3.1). This will be effective in addressing potential indirect impacts on habitats and species such as those associated with dust emissions.

Invasive Plant Species

Prior to the development works and landscaping/reinstatement activity begins, a survey by an appropriately experienced ecologist will be carried out to confirm the full extents of the invasive plant species within the proposed development site boundary. The Contractor's will implement an Invasive Species Management Plan (ISMP) for the works. A planning phase ISMP has been prepared (Appendix 8A.8).

The Plan will be clearly communicated to all site staff and will be adhered to. Any further invasive species identified during the preconstruction survey will also be managed in accordance with best practice (refer to Appendix 8A.8). The control of some species may require the use of herbicides, which can pose a risk to human health, to non-target plants or to wildlife. In order to ensure the safety of herbicide applicators and of other public users of the site, a qualified and experienced Contractor will be employed to carry out all work. The contractor will refer to and implement the following, which provides detailed recommendations for the control of invasive species and noxious weeds: Chapter 7 and Appendix 3 of the TII Publication The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2008).

Maintaining site hygiene at all times in an area where invasive non-native species are present is essential to prevent further spread.

The following site hygiene measures will be implemented onsite during the construction and/or for maintenance works during the operational stage where applicable:

- Fence off the infested areas prior to and during construction works where possible in order to avoid spreading seeds or plant fragments around or off the construction site.
- Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk.
- Avoid if possible using machinery with tracks in infested areas.
- Clearly identify and mark out areas where contaminated soil is to be stockpiled on site and cannot be within 75m of any watercourse or within a flood zone.
- If soil is imported to the site for landscaping, infilling or embankments, the contractor will gain documentation from suppliers stating that it is free from invasive species.
- Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan.
- Erection of adequate site hygiene signage in relation to the management of non-native invasive material as appropriate.

8A.7.1.3 Construction Phase Mitigation Measures -Avifauna

During the construction phase there will be vegetation clearance and disturbance associated with movement of plant, materials and personnel. The mitigation as described below and in the accompanying CEMP will be effective in minimizing the potential residual impacts on birds. However, certain construction phase impacts such as localized disturbance and displacement of birds are likely to be slight negative (highly localised) and temporary in nature.

- Construction operations will largely take place during the hours of daylight to minimise disturbances to roosting birds or any active crepuscular/nocturnal bird species.
- A Toolbox Talk will be prepared and incorporated as part of the construction phase site induction. A wildlife register will be maintained by the environmental site staff during the construction phase. Site staff will be encouraged to report any bird sightings of note made during the construction phase and this information will be logged by the environmental site staff. The site manager will continue to maintain a wildlife register throughout the operational phase.
- The construction compound, substation and wind farm will not be lit at night (with the exception of aviation warning lights and low-level switchable safety lighting). All lighting systems will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.
- All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled at prescribed locations and all waste materials will be disposed of to licensed facilities.

- Mitigation measures outlined in Chapter 9 (Geology, Soils & Peat Stability) and Chapter 10 (Hydrology & Water Quality), of this EIAR will be implemented to minimise and prevent the potential indirect impacts described in the Chapter on aquatic and Annex I habitats and associated bird species at the site and in the surrounding area. For instance, detailed measures are specified to ensure peat stability and to reduce the risk of sediment run-off during construction (e.g. silt fences). In addition, tree felling will be undertaken in accordance with the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000), to ensure a tree clearance method that reduces the potential for sediment and nutrient runoff.
- Tree-felling and removal of mature vegetation will be undertaken outside of the bird breeding season (March 1st – August 31st). Hedgerows and mature trees will be retained insofar as possible along the TDR and grid access route. To avoid impacts on nesting birds and potentially small mammals the vegetation and ditch/wall removal on the TDR will be undertaken outside of bird nesting season (March 1st to August 31st) the works are being first checked by a suitably qualified ecologist to ensure that no protected species are present.
- An appropriately qualified and experienced Ecological/Environmental Clerk of Works (ECoW) will be appointed to monitor the day-to-day construction activity and implementation of the environmental and ecological mitigation measures.
- Standard Vantage Point Monitoring in accordance with the Survey Methods for Use in Assessing the Impacts of Onshore Wind farms on Bird Communities (Scottish Natural Heritage. 2014) will be carried out during the construction year by a competent experienced ornithologist. A VP survey will be carried out between mid-March and mid-August. If construction activity extends into the winter period (October-March) a winter VP survey will be carried out to monitor the occurrence of waders, wildfowl and raptors in the vicinity of the Land Boundary Site. The survey shall cover the development footprint and all areas within 500m of the works.
- A total of 30 bird nest boxes (woodcrete and/or recycled plastic) will be erected within the application site during the year of construction with the selection of boxes and suitable deployment locations decided by a suitably qualified ecologist.

8A.7.1.4 Construction Phase Mitigation Measures – Mammals

The following mitigation measures are designed to minimise construction phase risks of impact upon mammals. These will be effective in ensuring that there are no risks of significant residual impacts upon non-volant mammals and bats arising during the construction phase of the development.

A buffer area around turbines located in commercial forestry has been applied as recommended where trees will be felled to reduce the likelihood that bats will be present in the immediate vicinity of the operational turbines. Given the extent of vegetation clearance and construction work involved there is likely to be some slight and localised residual disturbance of mammals during the construction phase.

Any such impacts are likely to be limited in scale, temporally and spatially.

- A pre-construction mammal survey will be carried out immediately before the commencement of vegetation clearance. This will include an active and passive bat survey. Where any existing stone walls or structures are scheduled for removal (on-site, along the GCR or TDR) these will be first checked for evidence of the presence of roosting bats. There are no known mammal resting/roosting or breeding sites which will be directly impacted by the proposed development.
- An ecologist will supervise/check areas where tree-felling and vegetation removal will occur prior to and during construction. This will ensure that any site-specific issues in relation to wildlife will be highlighted and appropriate mitigation measures (e.g., NRA guidelines) are applied.
- Construction operations will largely take place during the hours of daylight to minimise disturbances to nocturnal mammal species. Mitigation measures outlined in Chapter 8B Aquatic Ecology, Chapter 9 (Soil, Geology and Hydrogeology) and Chapter 10 (Hydrology and Water Quality) of this EIAR will be implemented to minimise and prevent the potential indirect impacts described in this Chapter on aquatic and Annex I habitats and associated bird species at the site and in the surrounding area.
- All lighting systems will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.
- All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled according to the CEMP (Appendix 3.1)
- Any sightings of mammals on-site will be logged on the wildlife register. This includes any fatalities recorded during construction phase.
- Bat activity will be monitored at the site in the year(s) of construction with two active detector night-time surveys between May and October. A passive detector will be deployed at several locations close to the construction footprint for the duration of the construction period to monitor the pattern of bat activity in the area throughout the tree felling and construction period. The locations chosen for the deployment of the passive detector(s) will include a number of locations at or adjacent to turbine locations and a number of other locations remote from turbines. These locations will be used for pre-, during- and post-construction bat activity monitoring.
- A total of 30 bat boxes (woodcrete and/or recycled plastic) will be erected at suitable locations in the area, with the type of boxes and the deployment locations selected by a suitably qualified ecologist.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species, and be advised of appropriate behaviour around such habitats and species.

8A.7.1.5 Construction Phase Mitigation Measures - Other Protected Taxa

The following mitigation measures are designed to minimise construction phase risks of impact upon other taxa e.g. Frogs. These will be effective in ensuring that there are no risks of significant residual impacts such taxa arising during the construction phase of the development.

- Areas where peat is to be stored temporarily, or permanently, will be checked in advance for the presence of Frogs (and spawn). If protected species are present, the environmental staff will translocate these, if possible (under licence if applicable). The same measure will be applied for any drains or areas of standing water forded by construction machinery. These areas will be checked on an ongoing basis by the ECoW and any areas with breeding frogs, spawn or tadpoles will be mapped and if possible fenced off temporarily to allow Frogs to metamorphose. If such areas cannot be avoided by site traffic the environmental staff will translocate the frogs (adults/young) under licence if applicable.
- An updated survey for adult Marsh Fritillary, *Euphydras aurinia*, will be carried out in the year of construction (May/June) ideally before construction commences. Locations with Devils Bit Scabious within the site and along the turbine delivery and grid access route will be checked in September/October for the presence of larval webs. Marsh Fritillary butterfly is the only Irish insect listed under Annex II of the EU Habitats Directive. In the event that larval webs are recorded within the proposed works area, mitigation measures will follow best practice guidelines as outlined in the '*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*' (NRA, 2008).
- If other taxa such as other species of Lepidoptera, Common Viviparous Lizard etc. are recorded within or adjacent to the site, or the turbine delivery and grid access routes, these sightings will be logged on the wildlife register.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

8A.7.2 Mitigation Measures during Operation

8A.7.2.1 Operational Phase Mitigation Measures – Designated Sites

Mitigation measures for Mullaghanish to Musheramore Mountains SPA (004162) and The Gearagh SPA species of Special Conservation Interest are outlined in the accompanying NIS. In addition, mitigation measures required for the downstream sections of the River Blackwater SAC during the construction phase are presented in **Chapter 8B** (Aquatic Ecological Assessment) and in **Chapter 8** (Geology, Soils & Peat Stability) and **Chapter 9** (Hydrology & Water Quality) of this EIAR, the CEMP (Appendix 3.1) and the accompanying NIS.

There will be no particular risks to the Boggeragh Mountains NHA related to the operational phase and no dedicated operational phase mitigation is required in relation to this or any other nationally designated site in the wider hinterland.

8A.7.2.2 Operational Phase Mitigation Measures – Habitats and Botanical Species

There will be no additional removal of habitat during the operational phase of the proposed development. As a result, there is no potential for direct negative impacts on habitat and flora arising from the operational phase of the development.

All operational-phase monitoring and mitigation commitments provided herein and elsewhere in the EIAR and NIS in relation to the proposed wind farm development will be fully implemented to ensure environmental protection of the site and receiving environment throughout the operation phase and onto decommissioning and reinstatement.

Where maintenance of site infrastructure or the existing drainage network (e.g. drain clearance)over the operational lifetime is required, measures will be implemented to prevent pollution (e.g. fuels, turbine fluids, and silty water) through the appropriate and temporary use of silt fences, cut-off drains, silt traps, check dams and drainage to vegetated areas where appropriate; any indication of failing water treatment measures entering any water-feature at/near site will be reported immediately to the Operational Site Manager and other external agencies as necessary in the event of a pollution incident e.g. Inland Fisheries Ireland. Any environmental incidents which result in pollution of the local water courses will be followed up with appropriate remedial measures in consultation with Inland Fisheries Ireland and other relevant agencies where needed e.g. NPWS, the local authorities.

Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

8A.7.2.3 Operational Phase Mitigation Measures – Avifauna

During the operational phase mitigation measures will be applied to monitor avian diversity at the site, the pattern of usage of the wind farm by birds and any collision fatalities in the early years of operation. While some bird displacement and collision fatalities do occur at wind farms, the scientifically informed siting of turbines in areas less used by species of elevated conservation importance, effectively minimises such risks in the operational phase of a development. Residual impacts on birds are likely to be slight negative and localized during the operational phase of the development. That is without consideration of the implementation of the BEMP (see Section 8A.8 and Appendix 3.4). Included in the mitigation measures below is also a commitment to erect and maintain bird nest boxes throughout the operational phase of the wind farm.

- Bird activity will be monitored in the year(s) of construction and for three years post construction by a suitably qualified ecologist. Upland breeding bird surveys will be carried out and winter VP surveys will be undertaken with reference to standard methodology (e.g. SNH, 2017, Gilbert *et al*. 2011). Annual reports will be prepared and submitted for the attention of NPWS and the planning authority.

- The installation of warning lights on turbines can help to increase their visibility, and thereby reduce the risk of bird collision. A number of the turbines will be fitted with aviation warning lights in accordance with the requirements of the Irish Aviation Authority in advance of project construction.
- A fatality monitoring programme will be instigated for the first three years of operation of the wind farm. At least a portion of the fatality searches will be carried out using specially trained cadaver dogs and their handlers. This will involve monthly searches around each turbine base during the winter period (October-March) and three further breeding season (April-August) carcass searches. All feather spots and bird (and bat) carcasses will be photographed and logged and an annual fatality search report will be prepared and submitted for the attention of NPWS and the planning authority. Any fatalities noted by site staff or maintenance crews will be logged on the wildlife register and this register will be made available to the ecologist carrying out the monitoring program.
- Bird boxes will be checked and maintained annually for the first three years of operation, and every other year for the lifetime of the wind farm and by a suitably qualified ecologist.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

8A.7.2.4 Operational Phase Mitigation Measures – Mammals

The mitigation measures to minimise impacts on mammals during the operational phase of the wind farm are detailed below. There is no significant potential for any significant disturbance or displacement of non-volant mammals during the operational phase. The mitigation measures described below will also ensure that there will be no significant negative residual impacts on the locally occurring bat population throughout the operational phase. The mitigation commitments include the erection and maintenance of bat boxes throughout the lifetime of the proposed wind farm.

- All lighting systems at the site, including at the entrance and around the substation will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.
- All edible and putrescible wastes will be stored and disposed of in an appropriate manner.
- Any sightings of mammals on-site will be logged on the wildlife register – these logs will be maintained and available for inspection at the site office/substation. Any records of mammal fatalities within the wind farm site will be logged and photographed.
- As a precautionary mitigation measure, in addition to the creation of buffers between the proposed turbines and surrounding vegetation (discussed above) reduced rotation speed will be implemented when turbines are idling. Automatic 'feathering' of idling blades will be implemented (through SCADA) to reduce rotation speed of blades to below 2 RPM while idling. Feathering blades has been shown to be effective in reducing fatality rates of bats by up to 50% and does not result in a significant loss of energy output (SNH, 2019). No additional control measures to avoid/reduce collision related bat fatalities are considered warranted in this instance.

- Bat boxes will be inspected by a suitably qualified ecologist for the first three years of operations of the wind farm and inspected every other year for the lifetime of the windfarm. Any boxes requiring maintenance or replacement will be identified and removed/replaced under the supervision of an ecologist.
- Monitoring of the site is recommended based on the proposed Bat Conservation Ireland Wind Farm Guidelines (November 2012), as several bat species were recorded within and adjacent the proposed project site. Under these Guidelines and EUROBATS (Rodrigues *et al*., 2008) guidelines, it is recommended that monitoring of bats be implemented for at least 3 years once the wind farm is operational. Surveys will be conducted from March/April to October/November inclusive, during temperate weather conditions (i.e. air temperatures not lower than 10°C, calm, dry and overcast conditions). This monitoring will include detector surveys of bat activity near all turbines and the continuing status of any nearby potential roosts. Passive detector(s) will be deployed at several locations, a number of these close to turbines and others remote from turbine locations, within the wind farm site during the summer/autumn months. These deployment locations will be the same used in the pre- and during-construction bat monitoring. An annual report of operational phase bat activity will be prepared and submitted for the attention of NPWS and the Planning Authority.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

8A.7.2.5 *Operational Phase Mitigation Measures - Other Protected Taxa*

The following mitigation measures will ensure that there is no risk of significant residual impacts on other protected taxa during the operational phase of the proposed wind farm.

- Any sightings of rare or protected invertebrates, amphibians etc. made in the course of operational phase monitoring will be recorded and if appropriate this information will be submitted to the National Biodiversity Data Centre.
- Mitigation measures outlined in Chapter 9 (Soil, Geology and Hydrogeology) and Chapter 10 (Hydrology and Water Quality) and the CEMP (Appendix 3.1) of this EIAR will be implemented to minimise and prevent the potential indirect impacts outlined in this Chapter and in Chapter 8B on aquatic and Annex I habitats and other faunal species at the site and in the surrounding area.
- Sightings of other taxa recorded within or adjacent to the site during the operational phase will be logged on the wildlife register.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

8A.7.3 Mitigation Measures during Decommissioning

The potential for impacts during decommissioning are similar in nature, if not in scope, to those assessed for the Construction Phase. All decommissioning works will be governed by the same requirements to control run-off or potential pollution to watercourses as have been implemented during the construction phase. The site compound will need to conform to the construction phase mitigation measures including those related to lighting design and proper treatment of edible and putrescible wastes. All plant removed during decommissioning of the site will be re-used at other wind farm sites whenever possible. All remaining materials which cannot be re-used will be recycled. This is likely to include scrap metal, plastic and other waste materials. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor in the most environmentally appropriate manner available at the time of the decommissioning by an appropriately licenced contractor.

Following reinstatement, the site will be monitored on a regular basis to determine the progress of revegetation and if necessary to look at introducing supplementary planting with native species. A reassessment of the site will be carried out at the end of year 1 to assess the sites progression over the previous year and to take photographic evidence of the site vegetation status, drainage management and general site appearance at the end of year 1.

8A.8 Biodiversity Enhancement and Management Plan

The overall objectives of this plan are manifold but may be summarised as follows:

- To improve the ecological connectivity between patches of attractive habitat in the wider area
- To significantly increase the amount and quality of hedgerow across a number of landholdings
- To establish a number of high resource value habitats including the hedgerows, small areas of native woodland and wildbird cover across the BEMP lands.
- To commit to biodiversity friendly farming practices through control of stocking densities, minimising the use of herbicides and pesticides and to protect watercourses from livestock.
- To erect and maintain bird and bat boxes and night roosts for Lesser Horseshoe Bats.
- Monitoring of local biodiversity and the implementation of the biodiversity prescriptions through the lifetime of the wind farm.

The BEMP is not designed to mitigate or address particular potential impacts associated with the construction, operation or decommissioning of the proposed wind farm. It is instead a commitment provided to yield a lasting biodiversity benefit to the area around Ballinagree. The measures will benefit a range of habitats and species through prescriptions that have been developed with the agreement and input of all participants in the BEMP. The commitments herein are wide-ranging but built upon established land management measures that have been developed as part of agri-environmental and biodiversity management schemes.

A critical part of a Biodiversity Enhancement and Management strategy is to commit to strategies to manage the land that will promote the maintenance of the high value features and improve the overall biodiversity through active management and monitoring of the lands. To achieve this there are lots of possible management actions that can be considered. Some are focused on a particular species (e.g. erection a nest box) or habitat (e.g. preventing livestock entering watercourses) and other measures have a more general focus e.g. limiting stocking density.

There shall be none of the following allowed on the lands included in the BEMP:

- Burning areas of vegetation.
- Removal of hedgerows.
- Planting of Conifers.
- New land drainage.
- Organising, allowing or engaging in recreational activities involving off-road or racing vehicles.
- Turf-cutting.
- Unapproved use of Herbicides.
- Unapproved of pesticides/rodenticides.

Common Management Measures:

For all of the BEMP areas, the following measures are to be applied:

- Removal of all self-sown conifer saplings
- Removal of all invasive non-native species, notably *Rhododendron*
- Control of Bracken (according to Sears/Natural Scotland (2008). Bracken Control: Guide to Best Practice).

Coillte will fell c. 18ha of commercial plantation under licence from the Forest Service to create wildlife corridors between areas of open heathland and bog. The use of these corridors by bats, birds and non-volant mammals will be monitored.

In addition, four private landowners with a combined total of c. 304 ha of lands in the vicinity of the wind farm, but beyond 250m of any proposed turbine, have agreed to a long-term commitment to detailed land management measures designed to maintain and enhance local biodiversity. The measures include those designed to protect watercourses, prevent overgrazing and to clear invasive and site inappropriate plants. Higher value habitats will be actively managed to maintain and improve their value and lower value habitats will see specific interventions designed to improve their attractiveness for a wide range of species. The measures proposed take into account the habitats present and their current condition and importance in the local landscape.

The plan when implemented will see a considerable length of new hedgerow (>15km) established. It will also involve the establishment of several hectares of native woodland and the establishment and maintenance of c. 20ha of wildbird cover.

Stocking density will be limited and dropped dramatically in sensitive habitats under pressure from grazing. A large number of bird (including Barn Owl boxes) and bat boxes will be erected, maintained and monitored.

The BEMP programme represents a significant commitment to enhance the biodiversity value and ecological connectivity across a large land bank. The programme will run for the lifetime of the windfarm and many of the proposed features (e.g. tree and hedgerow planting) will have a longer-lasting biodiversity benefit to the lands included in this plan. The lands included in the BEMP are shown in Figure 8A.20.

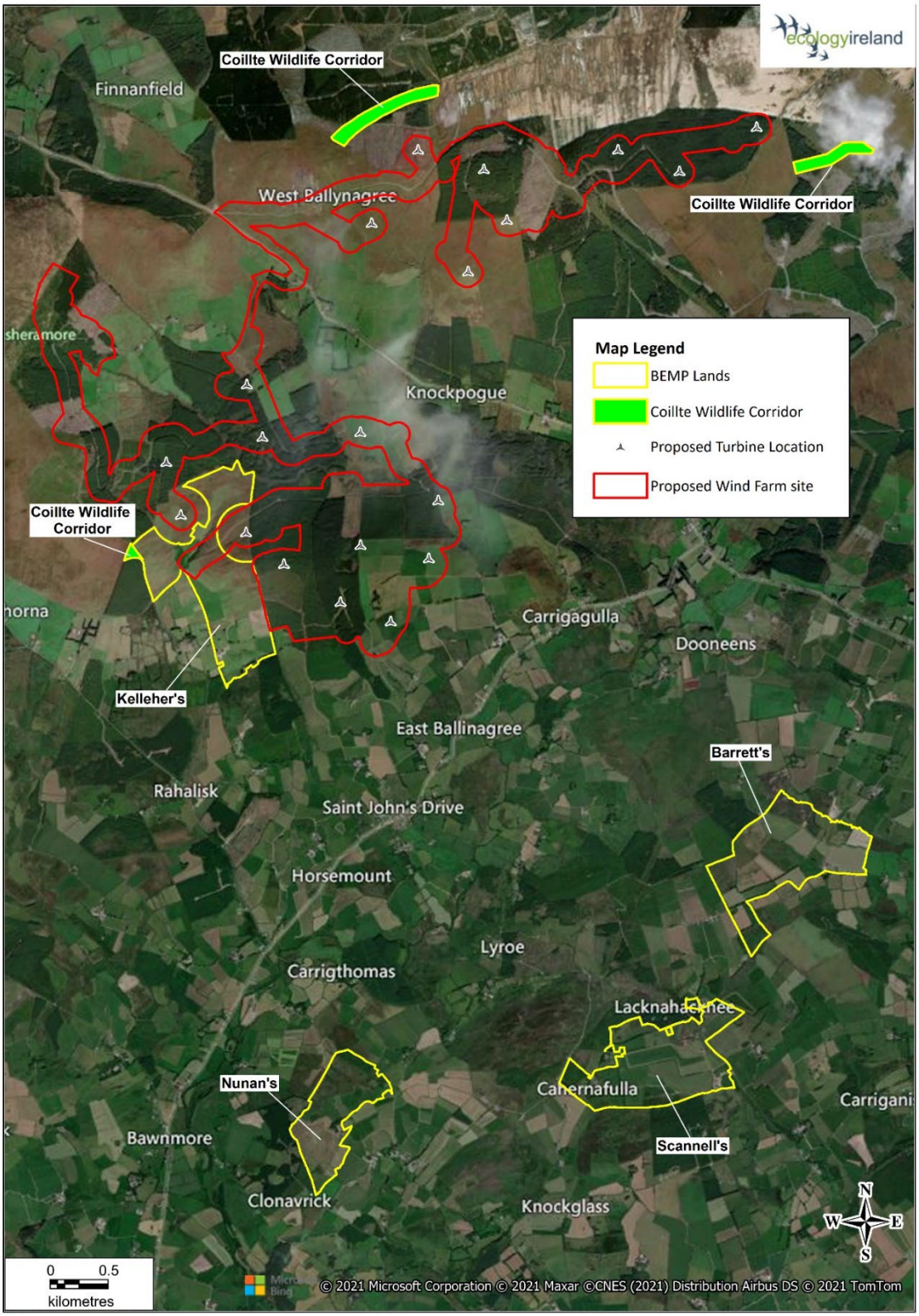

Figure 8A.21: Location of the BEMP lands

8A.9 Residual Impacts

The mitigation measures described for the proposed Ballinagree wind farm development have been designed to minimise the impact of the development, from the construction of the wind farm infrastructure including the grid connection and turbine delivery, through the operational phase and onto decommissioning. The constraints led design approach followed has been effective in identifying and insofar as possible avoiding potential risks of impacts to the receiving environment. The mitigation measures set out in the EIAR are comprehensive and backed by a detailed planning phase CEMP.

Taking cognisance of measures incorporated into the project design and mitigation measures to avoid effects which are considered in the preceding sections, the NIS which accompanies this planning application concludes that the proposed project will not have any residual adverse effect on the integrity of the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) cSAC, and the Gearagh SPA in light of the site's conservation objectives and status. With the implementation of mitigation measures the proposed project will not contribute to the potential in-combination impacts of agriculture and silviculture on the Blackwater River (Cork/Waterford) SAC or to shared watercourses (Glen River) with the Esk wind farm. The NIS contains information which the competent authority, may consider in making its own complete, precise and definitive findings and conclusions and upon which it is capable of determining that all reasonable scientific doubt has been removed as to the effects of the proposed project on the integrity of the relevant European sites. In the light of the conclusions of the assessment which it shall conduct on the implications for the European sites concerned, the competent authority is enabled to ascertain that the proposed project will not adversely affect the integrity of any European site.

The monitoring and mitigation commitments will in our opinion be effective in ensuring that the residual impacts will likely be **slight negative (local) in the temporary to short-term** upon the terrestrial habitats and species that occur in the receiving environment. With the implementation of the Biodiversity Enhancement and Management Plan (BEMP) there will be a predictable local gain for biodiversity in the area. The commitments provided are designed to yield a number of positive outcomes for species and habitats in the area, throughout the lifetime of the wind farm and into the future. The residual terrestrial biodiversity impacts are therefore considered to be likely **significant positive at the local level** in the long-term.

The residual impacts associated with each stage of the project are summarised in Table 8A.28 below:

Table 8A.28: Summary of predicted residual impacts of the project phases.

Project Stage	Residual Impact (Terrestrial Biodiversity)
Construction stage – into early years of operation	Slight-Negative (local)
Operational Stage (beyond early years, with implementation of BEMP measures)	Significant Positive (local)
Decommissioning Stage (maturation of BEMP measures such as planted hedgerows/treelines)	Significant Positive (local)

8A.10References

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