

Ballinlee Green Energy Ltd.

## Chapter 6 Biodiversity

### Appendix 6D: Baseline Report on Habitat & Mammal Surveys

Woodrow Ref: P00012353

Date: September 2025

COMMERCIAL IN CONFIDENCE



woodrow  
APEM Group

**Client:** Ballinlee Green Energy Ltd.  
**Address:** Station Road, Adare, Co. Limerick

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**Project reference:** P00012353  
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## **1. INTRODUCTION**

All surveyors and authors of this report are suitably qualified ecologists. See Appendix I for qualifications and experience of each. As required by CIEEM, all APEM Group Woodrow staff are required to abide by a strict code of professional conduct in all aspects of their work.

### **1.1. Background**

APEM Group Woodrow was commissioned by Ballinlee Green Energy Ltd. to conduct habitat and mammal surveys at the site of the proposed Wind Farm at Ballinlee, Co. Limerick, as well as along the Turbine Delivery Route (TDR) and Grid Connection Route (GCR).

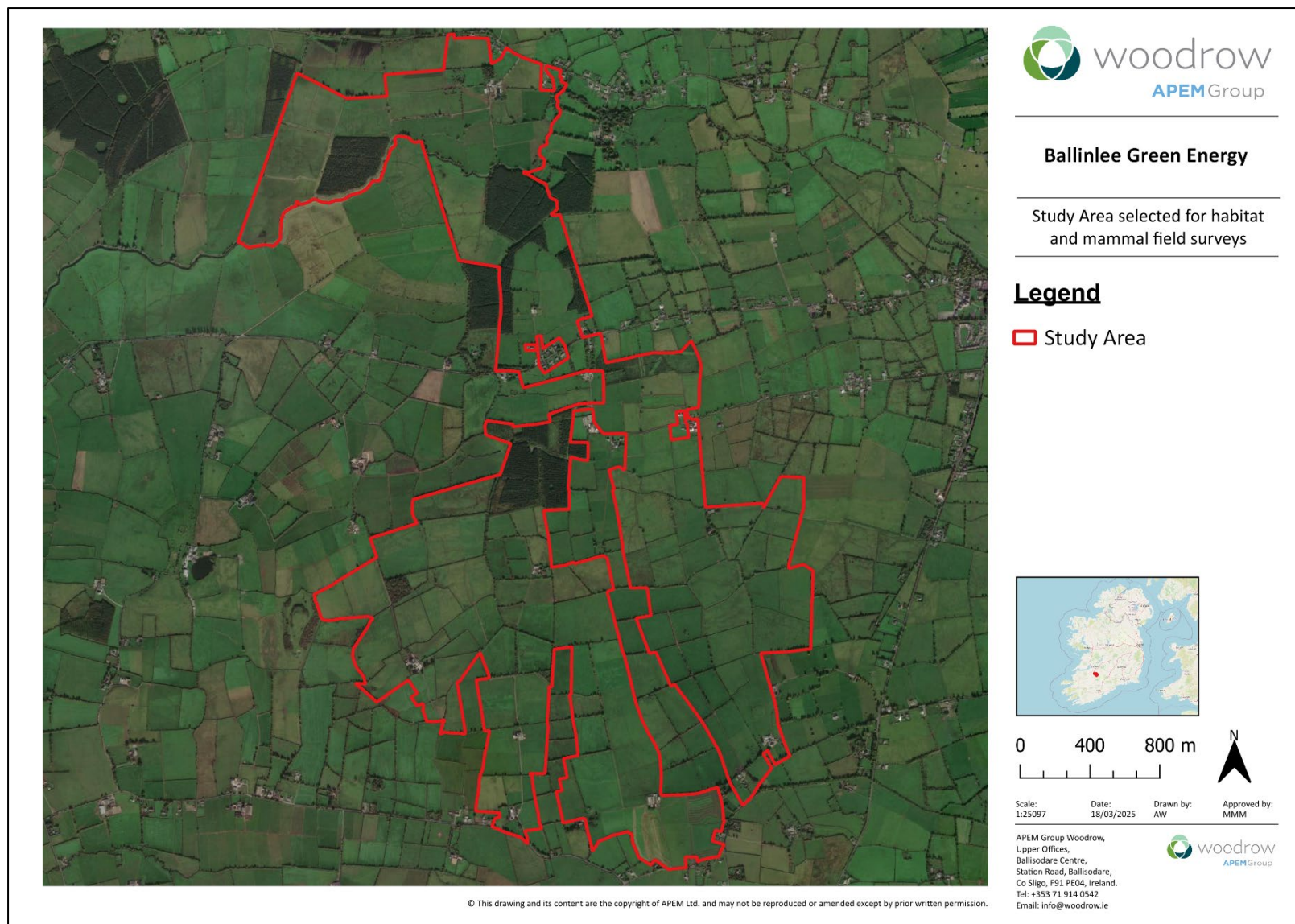
This document provides details on the methodology used to undertake the habitat and mammal surveys, results of surveys detailing habitats and mammals present within the proposed Wind Farm site and a discussion on the key findings.

### **1.2. Site description**

The proposed main Wind Farm site (known as “the Study Area” hereafter) is located on predominantly agricultural lands within the townlands of Ballincurra, Ballinlee South, Ballingayrou, Ballinrea, Knockuregare, Ballinlee North, Carrigeen and Camas South, c. 18 km south of Limerick City and c. 3 km southwest of Bruff, Co. Limerick. The site itself is intersected by the L1414 minor road (Convent Road), with sections of the Study Area extending both north and south of this (Figure 1).

The Study Area covers an area of approximately 595.3 ha which includes part of the Fourth Order Morningstar River. Stream order, a measure of stream size, follows the hierarchical classification system established by Strahler (1957), where first-order streams are the smallest. A Fourth Order watercourse comprises a small river or a medium sized stream.

The Study Area is rural in nature, with a land cover comprising mainly agricultural lands and one-off residential dwellings, with some small areas of forestry. Lands are managed for agriculture under varying level of farming practice intensity, predominantly as grasslands for livestock grazing, with hedgerows and drainage ditches dispersed throughout. Lands surrounding the Study Area are predominantly in agricultural use, interspersed with small conifer plantations and single residential dwellings.



**Figure 1: Overview of the Study Area**

### **1.3. Development description**

The current proposal includes a 17-turbine wind farm site, with associated access tracks (c. 10.8 km), cabling (c. 15.3 km) and other infrastructure including an on-site electrical substation. Access tracks will involve watercourse crossings, including one major watercourse crossing over the Morningstar River and 23 minor watercourse crossings, six of which cross over EPA-mapped watercourses, with the remainder crossing over artificial drainage ditches.

A TDR and a GCR are included in the proposal. The proposed TDR leaves the port at Foynes County Limerick and from the town of Croom follows the R516 road for approximately 15 km until it terminates at the northern boundary of the Study Area. The route is predominantly rural and almost exclusively agricultural landscape, comprising mainly pastureland. The GCR is approximately 27.6 km in length from the existing Killonan 220 / 110 kV Substation and follows a southern direction along the existing road network to culminate at the proposed Wind Farm substation.

Figure 2 provides an overview of the Development including the proposed Wind Farm site, TDR and GCR.

### **1.4. Purpose of this report**

The purpose of this baseline report is to describe the methods and results of habitat and mammal surveys conducted within the Study Area, and along the proposed TDR and GCR. The data gathered will inform the ecological impact assessment which is contained within the Environmental Impact Assessment Report (EIAR) Biodiversity chapter.



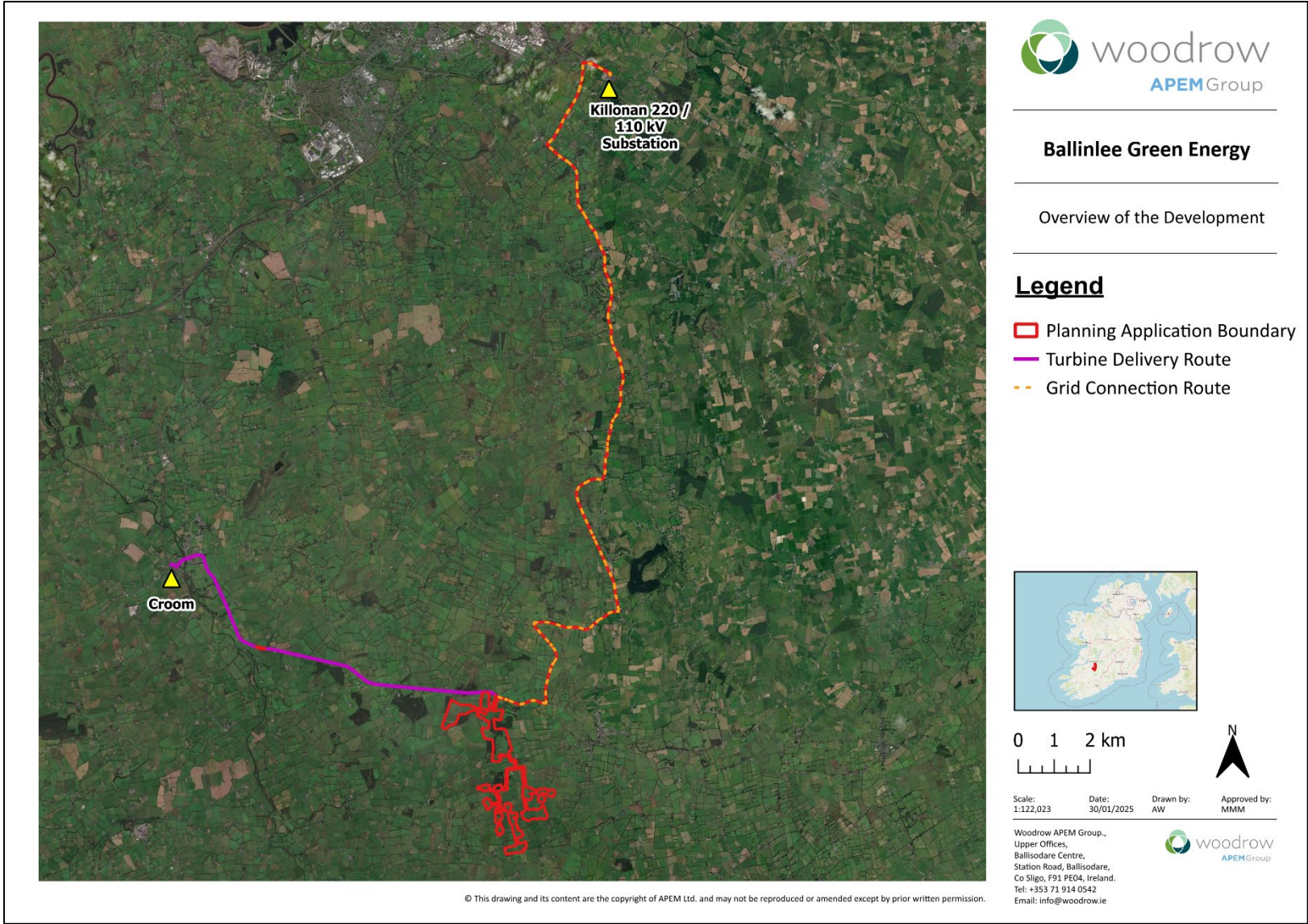


Figure 2: Development Overview

## 2. METHODOLOGY

### 2.1. Desk study

#### 2.1.1. Data sources

A desktop survey was undertaken to gather information on the likely occurrence of species in the general area prior to the survey visits so that a targeted approach to surveying could be undertaken. Information was gathered online from a variety of sources including the National Biodiversity Data Centre (NBDC) and National Parks and Wildlife Service (NPWS) online database. The following databases and websites were used:

- NBDC online map viewer and datasets<sup>1</sup>
- EPA online map viewer and datasets<sup>2</sup>
- NPWS Map Viewer<sup>3</sup>
- NPWS site synopses<sup>4</sup>
- Bat Conservation Ireland (BCI)<sup>5</sup>
- Invasive Species Ireland<sup>6</sup>
- Geological Survey of Ireland (GSI) online mapping<sup>7</sup>
- Mague Rivers Trust<sup>8</sup>

Records for important and protected species within proximity of the Study Area were obtained from the NBDC online database. This incorporates a number of databases for Ireland, including the mammal database, as well as atlas information for a variety of other taxa, including amphibians, invertebrates and Botanical Society of Britain & Ireland (BSBI) data. The NPWS Article 17 datasets for Annex I habitats were downloaded from the NPWS website and reviewed. These datasets document Annex I habitats within the Study Area, should they occur.

The Study Area falls within two 10 km Irish national grid squares (R53 and R63) and six 2 km Irish national grid squares (R53Y, R63D, R53X, R63C, R53W and R63B). Grid squares are projected using Irish Transverse Mercator.

The scope of habitats and terrestrial mammal surveys were informed by the results of previous surveys carried out at the Study Area in 2022 (Malachy Walsh & Partners, 2022). Where sensitive ecological receptors were recorded during these previous surveys, particular attention was paid to these features to assess any change in status over the period of time between when the 2022 surveys were carried out and the surveys carried out during this current assessment.

#### 2.1.2. Designated sites

Internationally designated sites include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). SACs are designated under the EU Habitats Directive and are intended to give protection to a suite of habitats and species listed on Annex I and Annex II of the Directive. SPAs are designated

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<sup>1</sup> <https://maps.biodiversityireland.ie/>

<sup>2</sup> <https://gis.epa.ie/EPAMaps/>

<sup>3</sup> <https://experience.arcgis.com/experience/edf34d92e28040fd87d3d14f55d8d95f>

<sup>4</sup> <https://www.npws.ie/protected-sites>

<sup>5</sup> <http://www.batconservationireland.org>

<sup>6</sup> <http://www.invasivespeciesireland.com/>

<sup>7</sup> <https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228>

<sup>8</sup> <https://maigueriverstrust.ie/biodiversity/scientific-reports-and-studies-on-the-river-maigue/>

under the EU Birds Directive and provide protection to birds listed on Annex I of the Birds Directive, as well as populations of migratory species regularly occurring at a site.

Nationally designated sites include National Heritage Areas (NHAs) which are designated under the Wildlife Act 1976 (as amended) (the Wildlife Act) as areas considered important for the habitats present or areas which support plants and animals whose habitat needs protection. Proposed National Heritage Areas (pNHAs) are recognised on a non-statutory basis but have not been statutorily proposed or designated. They are of ecological value for their habitats or species.

Shapefiles of designated sites, including SPAs, SACs, NHAs and pNHAs were downloaded from the NPWS website and imported onto QGIS.

## **2.2. Field surveys**

Field surveys were conducted within the lands of the Study Area (Figure 1) in addition to surveys along the proposed TDR and GCR (Figure 2) as detailed in the following sections. Table 1 provides a summary of the surveys undertaken.



**Table 1: Habitat and mammal surveys conducted at the Study Area**

| Survey type                     | Survey date                                                     | Surveyors                    |
|---------------------------------|-----------------------------------------------------------------|------------------------------|
| Habitat surveys                 | 14-17 August 2023<br>11-12 September 2023                       | C. Barry, R. Irwin, A. Walsh |
| Mammal surveys (excluding bats) | 14-17 August 2023<br>11-12 September 2023<br>28-29 July 2025    | C. Barry, R. Irwin, A. Walsh |
| Otter surveys                   | 12-15 February 2024<br>11-13 March 2024                         | A. Walsh, K. O'Reilly        |
| TDR and GCR surveys             | 12-13 March 2024                                                | A. Walsh, K. O'Reilly        |
| Badger trail camera surveys     | 12 Sep – 11 Oct 2023<br>11 Mar – 16 Apr 2024<br>18-28 June 2024 | A. Walsh                     |

### 2.2.1. Habitat surveys

Habitat surveys were undertaken during the optimal survey season between August and September 2024, as per the dates set out in Table 1. The scope of the habitat surveys was informed by a desk-based study employing satellite imagery to ascertain habitat types in addition to habitat survey results from previous surveys carried out at the Study Area (Malachy Walsh & Partners, 2022). ArcGIS Pro and QGIS were used to access satellite imagery for the maps produced in this document.

QGIS was used to draw polygons that delineate the habitats identified in the satellite imagery. These habitats were provisionally classified into recognised level three communities outlined by Fossitt (2000). The pre-existing knowledge of the Study Area and its associated habitats allowed some general assumptions to be made concerning the likelihood of specific habitat classifications aligning with those represented in satellite imagery. These delineations were confirmed or updated during the habitat survey by Adrian Walsh, an experienced ecologist with Woodrow.

The Study Area and perimeter were walked, ecological features of interest were noted, and habitats were confirmed or updated from the initial desktop study delineation. The location of each habitat type was noted and mapped and detailed notes on vegetation assemblages and species lists were made in areas of greater species diversity. Habitat types recorded were then further cross-referenced with EU Habitats Directive Annex I habitats to see if there is any affiliation with Annex I habitats.

A hedgerow assessment was undertaken in the field, based on the criteria set out in the Hedgerow Appraisal System (HAS) (Foulkes, *et al.* 2013). Each hedgerow was assigned a significance value, ranking hedges on a scale of 0-4 in five categories: historical significance (i.e. period of establishment), species diversity significance (i.e. species type, count, etc.), structure, construction and associated features (i.e. presence of a wall, bank, ditch, etc.), habitat connectivity significance (i.e. connectivity to other habitat features) and landscape significance (i.e. wind shaped, mature hedgerow trees, landscape designation). A condition assessment was also assigned based on hedgerows ranked from

0-3 (0- unfavourable to 3- highly favourable) in the categories representing the structural variables (e.g. height, width), continuity (e.g. gaps in the hedgerow) and other negative indicators (e.g. unfavourable species).

A drainage ditch assessment was undertaken in the field, based on the criteria used by Natural England for Statutory biodiversity metric: Condition assessment sheets (Natural England, 2025). Each drainage ditch was assigned a condition, based on answering yes to the following criteria:

- The ditch is of good water quality with clear water (low turbidity) indicating no obvious signs of pollution.
- A range of emergent, submerged and floating leaved plants are present. As a guide >10m cover of filamentous algae, and/or duckweed (these are signs of eutrophication).
- There is less than 10% cover of filamentous algae and/or duckweed (these are signs of eutrophication).
- A fringe of marginal vegetation is present along more than 75% of the ditch.
- Physical damage evident along less than 5% of the ditch, such as excessive poaching, damage from machinery use or storage, or any other damaging management activities.
- Sufficient water levels are maintained. As a guide a minimum summer depth of c. 50cm in minor ditches and 1m in main drains.
- There is an absence of non-native plant and animal species.

Three categories were then assigned based on the number of passes or number of yes answers to the above statements; a Pass was passes on  $\leq 5/8$  criteria, Moderate was passes on  $\geq 6/8$  criteria, and Good was passes on  $8/8$  criteria.

Habitat surveys of the proposed TDR and GCR are fully described in Section 2.3.

During the habitat surveys, consideration was given to identifying important or protected habitats and habitats that could be used by protected species.

### **2.2.2. Protected Flora**

In conjunction with habitat surveys, attention was also paid to searching suitable habitats for rare or protected flora species to determine whether they were present within, or close to, the Study Area. These include plant species listed under the Flora (Protection) Order (FPO) (2022) plant species listed in the Irish Red Data Book (Wyse Jackson et al., 2016). Those species listed on the FPO are afforded legal protection under the Wildlife Act 1976, as amended. The FPO online map viewer<sup>9</sup> was consulted prior to surveys to potentially identify the records of FPO species.

### **2.2.3. Invasive alien plant species**

The presence of any Invasive Alien Species (IAS) was recorded during all habitat surveys conducted at the Study Area and along the proposed TDR and GCR options, with particular attention paid to species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations

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<sup>9</sup> <https://heritagedata.maps.arcgis.com/apps/webappviewer/index.html?id=a41ef4e10227499d8de17a8abe42bd1e>

2011 (SI 477 of 2011, as amended). Surveys were based on the best practice guidance methodology (National Roads Authority, 2010)<sup>10</sup>.

#### **2.2.4. Mammal surveys (excluding bats)**

Surveys targeted species protected under the Wildlife Act, species listed in Annex II, Annex IV and Annex V of the Habitats Directive, Irish Red-listed species (Marnell *et al.* 2019), and species identified as Non-native/Invasive. Particular focus was given to protected species such as badger (*Meles meles*) and their resting places/setts (Smal, 1995), and otter (*Lutra lutra*) and their resting places such as couches, layups or holts (Reid *et al.* 2013). Based on the types of habitats identified during field surveys and species recorded by the NBDC for the 2 km grid squares encompassing the Study Area, surveyors looked for evidence for other mammals which are likely to occur, including pine marten (*Martes martes*), red squirrel (*Sciurus vulgaris*), hedgehog (*Erinaceus europaeus*), pygmy shrew (*Sorex minutus*), Irish stoat (*Mustela erminea hibernica*), and Irish hare (*Lepus timidus hibernicus*).

Trail cameras were deployed at mammal features of interest such as burrow entrances and commuting routes. Surveys and trail camera deployments were undertaken by licenced surveyors under a licence obtained from NPWS.

##### **2.2.4.1. Badger (*Meles meles*)**

An initial thorough mammal survey was conducted by experienced surveyors in August and September 2023, with update surveys in July 2025 (See Table 1). The primary focus of these surveys was to identify the presence of badger including latrines, snuffle holes, prints and/or their resting places/setts (Smal, 1995). Table 2 details the different types of badger setts that can be encountered and criteria on how to define these in the field. Following the initial survey, deployment of wildlife cameras occurred in September and October 2023, March, April and June 2024 to confirm status of identified setts.

The survey approach entailed a systematic walkover of the Study Area and adjacent habitats. This included the identification of suitable habitat, detection of field signs such as tracks, markings, feeding signs, droppings and scent points (e.g., fox *Vulpes vulpes*), as well as direct observation. All mammal target notes were accompanied by a photo and six figure grid reference.

The surveys were undertaken in line with Chartered Institute of Ecology and Environmental Management (CIEEM) (2013) *Competencies for Species Survey: Badger* and in line with Irish survey guidelines including *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes* (National Roads Authority (NRA), now Transport Infrastructure Ireland (TII), 2005). Every effort was made, through repeat visits, if possible, to assign the level of use and the status of a sett. Where this was not possible, the precautionary principle has been taken within reason and where it was not discernible, potential setts have been considered active. This has been highlighted where relevant within this report.

The surveys also included recording any incidental observations or detected evidence for other mammals of conservation concern which might be using the Study Area (e.g., Irish hare, pine marten, Irish stoat, hedgehog and pygmy shrew).

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<sup>10</sup> Guidelines for the Management of Noxious Weeds and Non native Invasive Plant Species on National Roads  
<https://www.tii.ie/media/rmi2ebi/management-of-noxious-weeds-and-non-native-invasive-plant-species-on-national-road-schemes.pdf>

Wildlife trail cameras (Spypoint Force-DARK) were deployed overlooking 10 burrow entrances that were identified as potentially active and/or inactive badger setts. This camera model utilises a passive infrared (PIR) 5-zone motion sensor with a detection range of up to 34 m. Footage, including images and videos, were analysed by a suitably experienced data analyst.

One trail camera was additionally deployed within areas of recent badger activity. Details of the burrows identified, and the cameras deployed at each are provided in Table 3.

**Table 2: Types of badger setts<sup>11</sup>**

| Sett type  | Definition                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Main       | <ul style="list-style-type: none"> <li>• Larger well-established sett with several entrances (1 to 38, average 6 to 7)</li> <li>• Large spoil heaps and obvious paths from or between sett entrances</li> <li>• Typically, in continuous use and where cubs are raised</li> </ul>                                                                                                                            |
| Annex      | <ul style="list-style-type: none"> <li>• Secondary large sett, generally smaller than the main sett</li> <li>• Close to main sett (within 150 m), with several entrances (1 to 14, average 3 to 4)</li> <li>• Often linked to main sett by well-worn paths</li> <li>• May not be in use all the time, but can be very active particularly during the spring when it may also be used for breeding</li> </ul> |
| Subsidiary | <ul style="list-style-type: none"> <li>• Usually &gt;50 m from main sett with 5 or less entrances (1 to 8, average 2 to 3)</li> <li>• No obvious paths to other setts</li> <li>• May only be used intermittently, possibly on a seasonal basis</li> </ul>                                                                                                                                                    |
| Outlier    | <ul style="list-style-type: none"> <li>• Often only a single entrance (1 to 5, average 1 to 2)</li> <li>• May be located some distance from the main sett</li> <li>• Little spoil visible, no obvious paths</li> <li>• May only be used sporadically</li> <li>• May also be used by foxes and rabbits</li> </ul>                                                                                             |

**Table 3: Trail camera deployments targeting badger features of interest**

| Coordinates (lat, long) | Deployment date | Retrieval date | Description of area                                                    | Image                                                                                |
|-------------------------|-----------------|----------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 52.448038, -8.571702    | 12.09.2023      | 11.10.2023     | Deployed in front of inactive sett entrance on raised bank in hedgerow |  |

<sup>11</sup> Natural England, 2007 Badgers and Development: A guide to best practise and licensing (interim guidance document, version 09/07). Natural England Wildlife Licensing Unit, Bristol, England.

| Coordinates (lat, long) | Deployment date | Retrieval date | Description of area                                                                          | Image                                                                                |
|-------------------------|-----------------|----------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 52.453945, -8.57352     | 12.09.2023      | 11.10.2023     | Deployed facing active burrow entrance within mature hedgerow bordered by improved grassland |    |
| 52.481197, -8.587128    | 12.09.2023      | 11.10.2023     | Deployed facing active sett entrance within treeline bordering improved grassland            |   |
| 52.481167, -8.586515    | 12.09.2023      | 11.10.2023     | Deployed facing inactive burrow entrance within treeline bordered by improved grassland      |  |
| 52.480972, -8.585081    | 12.09.2023      | 11.10.2023     | Deployed facing active sett entrance within treeline bordered by improved grassland          |  |



| Coordinates (lat, long) | Deployment date | Retrieval date | Description of area                                                  | Image                                                                                |
|-------------------------|-----------------|----------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 52.479328, -8.592445    | 11.03.2024      | 16.04.2024     | Facing drainage pipe with recent bedding deposited outside           |    |
| 52.47925, -8.592048     | 18.06.2024      | 28.06.2024     | Facing forest side of drainage pipe                                  |    |
| 52.479268, -8.592154    | 18.06.2024      | 28.06.2024     | Facing 1 <sup>st</sup> excavation made into drainage pipe from above |   |
| 52.479312, -8.592243    | 18.06.2024      | 28.06.2024     | Facing 2 <sup>nd</sup> excavation made into drainage pipe from above |  |
| 52.479127, -8.592165    | 18.06.2024      | 28.06.2024     | Facing active burrow entrance                                        |  |



| Coordinates (lat, long) | Deployment date | Retrieval date | Description of area                                                      | Image                                                                              |
|-------------------------|-----------------|----------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 52.479273, -8.591975    | 18.06.2024      | 28.06.2024     | Facing area of drainage pipe to assess level of activity in general area |  |

#### 2.2.4.2. Otter (*Lutra lutra*)

Otter surveys took place in February and March 2024 by suitably experienced surveyors (see Table 1). Surveys were completed as per NRA (2008) guidelines for the *Treatment of Otters prior to the Construction of National Road Schemes*. This involved surveying along surface water features and watercourses within the Study Area as well as a linear survey area extending 150 m upstream and downstream of any proposed watercourse crossing (Table 4 and Figure 3). The length of the Morningstar River in the Study Area was surveyed in detail as this was identified as having the greatest potential to support otters during the desk study.

To account for the presence of otter holts (i.e. otter dens), especially natal holts, riparian habitats were also surveyed up to 50 m from the watercourse edge where appropriate and where access allowed. The survey method involved the following:

- Walking the survey area systematically and checking all suitable areas (e.g. watercourses including suitable drainage ditches, riparian areas, areas under bridges) for otter activity, and identifying potential holt locations.
- Recording any otter signs, including spraints, anal jelly, couches, slides (i.e. access points to watercourses) and footprints.
- Recording trails and determining whether they may lead to holt locations.

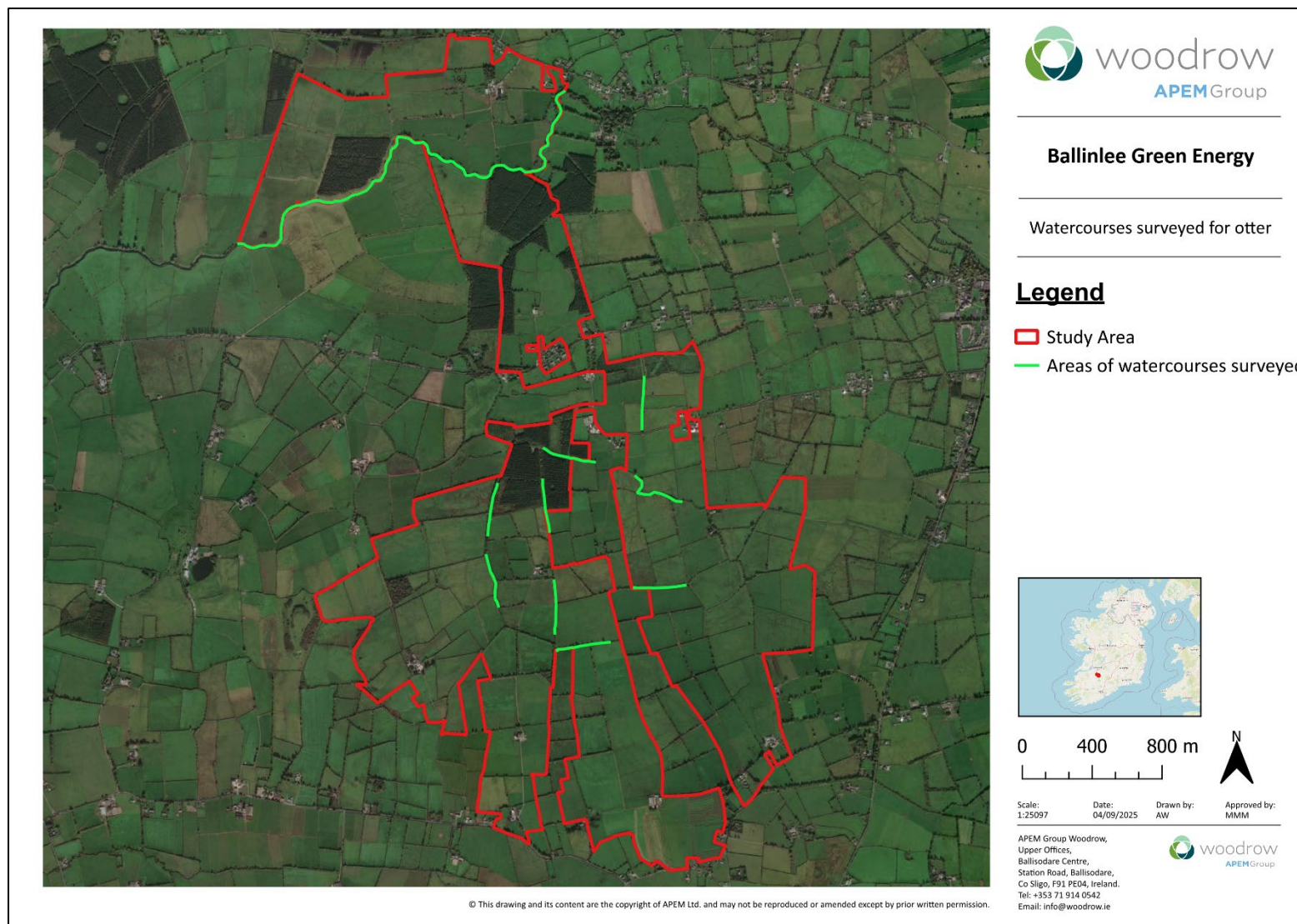
Survey timings were selected to avoid periods of high flow rates that follow heavy rain, which can wash away otter prints and spraints (droppings), and thus making it more difficult to survey for this species and collect evidence of otter.

Along each of the watercourses, particularly within the vicinity of proposed watercourse crossings, the survey area was covered by two surveyors, each of whom covered a separate stream or riverbank. In certain instances, and where accessibility permitted, sections of the watercourses were waded, whereby one ecologist entered the water while the other covered the adjacent banks. In compliance with health and safety, each surveyor was equipped with life jackets and throw ropes, and all surveying was undertaken with both surveyors in close proximity to each other.

Wildlife trail cameras (Spypoint Force-DARK) were deployed overlooking three features of interest in relation to otters. One trail camera was deployed facing a suspected otter holt along the Morningstar River and two were deployed overlooking potential otter resting places along the northern bank of the river. Details of trail camera deployments are provided in Table 5.

**Table 4: Watercourses surveyed for otter**

| Watercourse surveyed | Status       | Chainage/km's covered                                   |
|----------------------|--------------|---------------------------------------------------------|
| Morningstar River    | Main channel | Length of river occurring within Survey Area, c. 3.3 km |
| North Ballinlee      | Tributary    | 150 m upstream and downstream of crossing point         |
| Rathcannon           | Tributary    | 150 m upstream and downstream of crossing point         |
| Ballinlee South      | Tributary    | 150 m upstream and downstream of crossing point         |
| Ballygayrour         | Tributary    | 150 m upstream and downstream of crossing point         |
| Ballinrea            | Tributary    | 150 m upstream and downstream of crossing point         |



**Figure 3: Watercourses within the Study Area surveyed for otter**

**Table 5: Trail camera deployment targeting potential otter holt**

| Coordinates (lat, long) | Deployment date | Retrieval date | Description of area                                                            | Image                                                                                |
|-------------------------|-----------------|----------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 52.479097, -8.60186     | 13.03.2024      | 16.04.2024     | Facing potential otter holt on opposite side of riverbank                      |    |
| 52.478843, -8.602502    | 16.08.2024      | 02.09.2024     | Facing potential otter resting place on north riverbank                        |    |
| 52.479714, -8.601531    | 16.08.2024      | 02.09.2024     | Facing area of flattened vegetation on north riverbank – suspected otter layup |  |

#### **2.2.4.3. Pine marten (*Martes martes*)**

Pine marten surveys were carried out in conjunction with overall terrestrial mammal surveys in August-September 2023 and February-March 2024. Particular attention was paid to the outskirts of conifer plantations present within the Study Area. Any evidence of pine marten activity, including prints, scat and direct sightings, was recorded.

A trail camera (Spypoint Force-DARK) was deployed facing a suspected pine marten den site within a large tree hollow. Details of the burrow identified, and the camera deployed at the feature of interest are provided in Table 6.



**Table 6: Trail camera deployment targeting potential pine marten den**

| Coordinates (lat, long) | Deployment date | Retrieval date | Description of area                                                                         | Image                                                                              |
|-------------------------|-----------------|----------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 52.475088, -8.587647    | 11.03.2024      | 16.04.2024     | Facing tree with large hollow, signs of recent activity (loose wood chippings, scratchings) |  |

## 2.3. Turbine Delivery Route (TDR) and Grid Connection Route (GCR) options

### 2.3.1. Habitats

Locations along the proposed TDR and GCR (Figure 4 and Figure 5) were assessed for the habitats they supported in March 2024. This involved driving along the entirety of these proposed routes and employing a look-see methodology to assess the habitats present and areas where habitats may be affected particularly along the TDR where pinch points may result in habitat/vegetation clearance to facilitate access. During the habitat surveys, consideration was given to identifying important or protected habitats and habitats that could be used by protected species in addition to the presence of any invasive alien species that may occur along these routes. In particular, as the proposed temporary access track in the townland of Tullovin requires modification to habitat structure, this area was surveyed in detail for the habitats it supports.

### 2.3.2. Mammals (excluding bats)

Mammal surveys were also incorporated into the surveys of the proposed TDR and GCR. Particular focus was given to protected species such as badger, otters and pine marten and their resting and breeding places. Mammal trails that crossed roads were investigated further within 25 m from the route options to determine if resting and breeding places were potentially close to the proposed routes. Where the proposed routes crossed over bridges, the watercourses were investigated for evidence of otter activity or presence of holts.



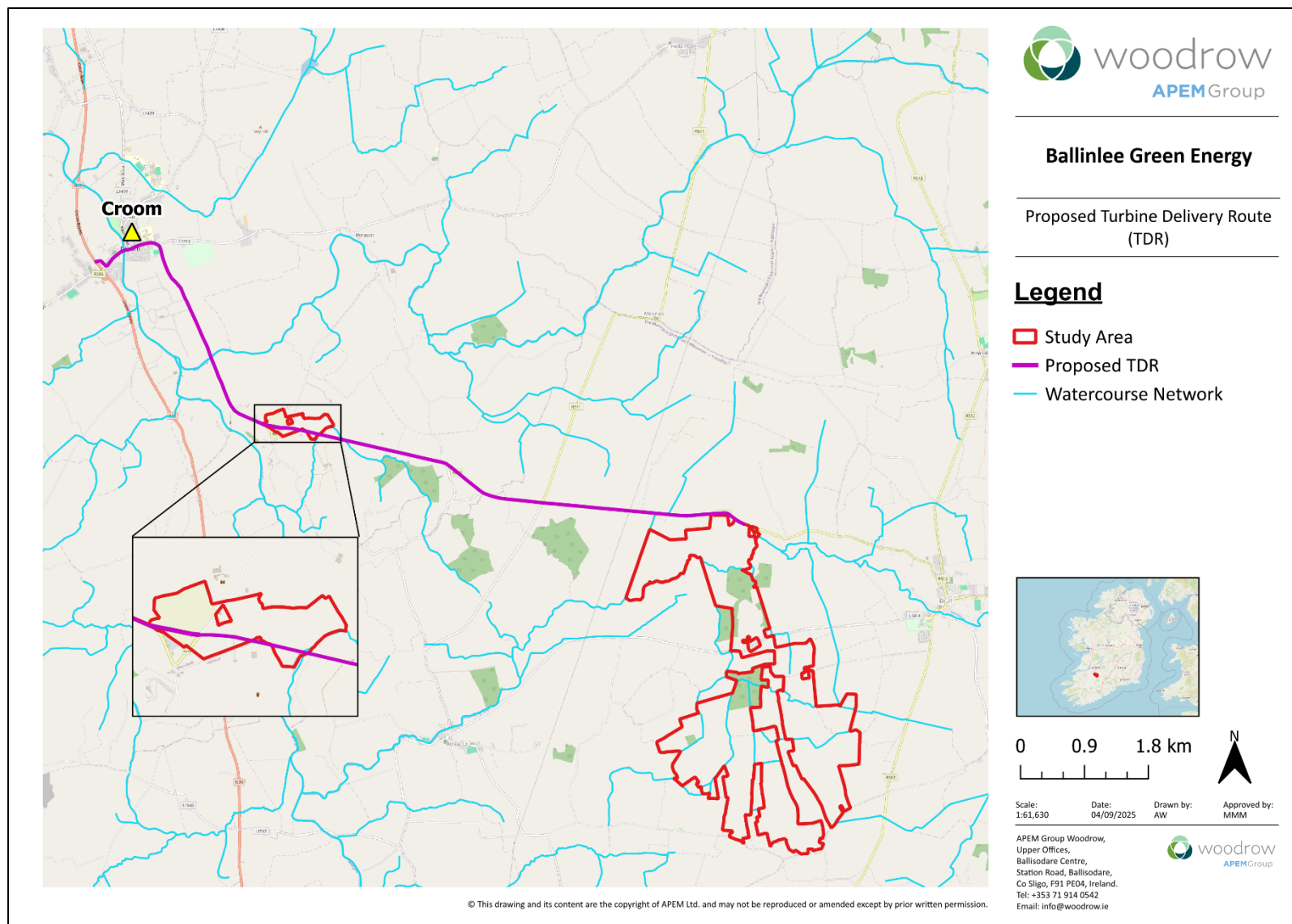


Figure 4: Location of the Study Area and Turbine Delivery Route (TDR) (from Croom). Inset map is route crossing through Tullovin.

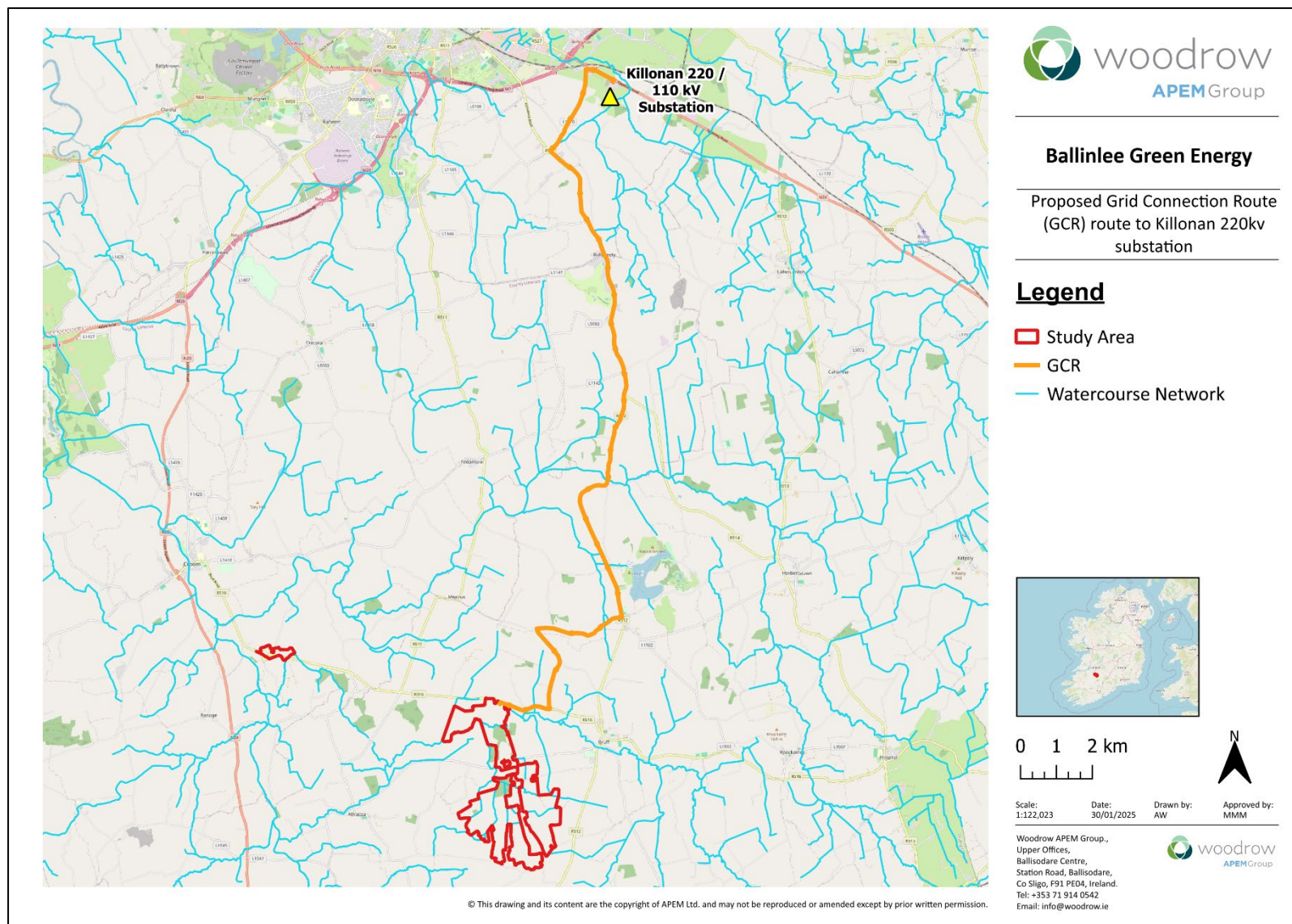


Figure 5: Location of the Study Area and Grid Connection Route (GCR)

## 2.4. Limitations

Survey timing was largely within the optimal survey period for flora identification (see Table 1); however, habitat surveys were undertaken outside the flowering period for earlier flowering plants, i.e. those flowering between April and June, meaning such plants were identified using a vegetative key. As such, the timing of flora and habitat surveys did not impact the classification of habitat types.

The initial badger survey was undertaken during the optimal survey period. As per NRA (2009) guidelines badger surveys can be undertaken at any time of the year, however the optimal survey period is November to April. Monitoring at some setts was conducted within the breeding badger season (December to June), however at other setts it occurred outside the badger breeding season. As such, a precautionary approach was taken and active setts were assessed as potential breeding setts in the absence of evidential confirmation.

The overall landscape of the Study Area was primarily comprised of agricultural fields intended for grazing livestock. The presence of livestock for the most part did not present an obstacle to conducting ecological surveys; however, in some instances there were access restrictions due to health and safety concerns. In these instances, repeat survey visits were undertaken to ensure all areas were visited and adequately surveyed.

The presence of dense conifer plantations within the Study Area presented a minor logistical challenge, as some sections were impenetrable due to thick vegetation. This made it impossible to survey the deepest interiors of these specific forestry blocks for mammal activity. However, this limitation did not compromise the overall robustness of the data collected. To ensure a comprehensive assessment, the survey focused on and thoroughly investigated the accessible perimeters of these dense areas, including fire breaks and forestry clearings. Critically, no evidence of mammal trails or activity was observed leading into the inaccessible sections, strongly suggesting that these dense areas were not primary thoroughfares or habitats for the mammals being studied. Therefore, the inaccessibility of these small, isolated patches of dense vegetation had no significant bearing on the survey's findings or the integrity of the overall dataset.

## 2.5. Evaluating Ecological Features

Ecological features identified within the Study Area, such as habitats and species, are evaluated in terms of geographic hierarchy of importance. The criteria to evaluate ecological features in this way is set out in the *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal, and Marine* published by the CIEEM (CIEEM, 2018). The categories used for this ecological evaluation have been adapted from CIEEM guidance (CIEEM, 2018) and are listed in Table 7.

**Table 7: Frame of reference used to determine value of ecological features**

| Importance               | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| International Importance | <ul style="list-style-type: none"> <li>• 'European Sites' including Special Areas of Conservation (SACs), Site of Community Importance (SCIs), or Special Protection Area (SPAs).</li> <li>• Proposed Special Area of Conservation (pSAC) or proposed Special Protection Area (pSPA).</li> <li>• Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).</li> <li>• Features essential to maintaining the coherence of the Natura 2000 Network.</li> <li>• Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.</li> <li>• Resident or regularly occurring populations (assessed to be important at the national level) of the following: <ul style="list-style-type: none"> <li>○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or</li> <li>○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.</li> </ul> </li> <li>• Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).</li> <li>• World Heritage Site (Convention for the Protection of World Cultural &amp; Natural Heritage, 1972).</li> <li>• Biosphere Reserve (UNESCO Man &amp; The Biosphere Programme).</li> <li>• Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).</li> <li>• Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).</li> <li>• Biogenetic Reserve under the Council of Europe.</li> <li>• European Diploma Site under the Council of Europe.</li> <li>• Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).</li> </ul> |
| National Importance      | <ul style="list-style-type: none"> <li>• Sites, habitats and species populations of importance in a national context.</li> <li>• Site designated or proposed as a Natural Heritage Area (NHA) in Ireland.</li> <li>• Site designated as an Area of Special Scientific Interest (ASSI) in Northern Ireland.</li> <li>• National or statutory Nature Reserve.</li> <li>• Undesignated site fulfilling the criteria for designation as an Area of Special Scientific Interest (ASSI) or National Nature Reserve.</li> <li>• Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve.</li> <li>• Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.</li> <li>• Site containing 'viable areas'<sup>12</sup> of habitat types listed in Annex I of the Habitats Directive.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

<sup>2</sup> A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).



|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | <ul style="list-style-type: none"> <li>• Resident or regularly occurring populations (assessed to be important at the national level in Ireland) of the following: <ul style="list-style-type: none"> <li>○ Species protected under the Wildlife Acts; and/or</li> <li>○ Species listed on the relevant Red Data list.</li> </ul> </li> <li>• Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.</li> <li>• Resident or regularly occurring populations (assessed to be important at the national level in Northern Ireland) of the following: <ul style="list-style-type: none"> <li>○ Species protected under the Wildlife (Northern Ireland) Order 1985; and/or</li> <li>○ Species listed on the relevant Red Data list.</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| County /<br>Regional<br>Importance    | <ul style="list-style-type: none"> <li>• Area of Special Amenity.</li> <li>• Area subject to a Tree Preservation Order.</li> <li>• Area of High Amenity, or equivalent, designated under the County Development Plan.</li> <li>• Resident or regularly occurring populations (assessed to be important at the County level) of the following: <ul style="list-style-type: none"> <li>○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;</li> <li>○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;</li> <li>○ Species protected under the Wildlife Acts Ireland); and/or</li> <li>○ Species protected under the Wildlife (Northern Ireland) Order 1985; and/or</li> <li>○ Species listed on the relevant Red Data list.</li> </ul> </li> <li>• County important populations of species; or viable areas of semi-natural habitats; or natural heritage features identified in the National or Local BAP; if this has been prepared.</li> <li>• Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.</li> <li>• Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.</li> <li>• Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.</li> <li>• SLNCIs supporting county important populations of species, or viable areas of semi-natural habitats identified as Northern Ireland Priority Habitats.</li> </ul> |
| Local<br>Importance<br>(Higher Value) | <ul style="list-style-type: none"> <li>• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared.</li> <li>• Resident or regularly occurring populations (assessed to be important at the Local level) of the following: <ul style="list-style-type: none"> <li>○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;</li> <li>○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;</li> <li>○ Species protected under the Wildlife Acts; and/or</li> <li>○ Species listed on the relevant Red Data list.</li> </ul> </li> <li>• Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality.</li> <li>• Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.</li> <li>• SLNCIs supporting locally important habitat assemblages and /or locally important populations of Northern Ireland Priority Species Sites, habitats and species populations of importance in a parish and district context, including Locally important populations of Northern Ireland Priority Species or Habitats.</li> </ul>                                                                                                                                                                                                                                                                      |
| Local<br>Importance<br>(Lower Value)  | <ul style="list-style-type: none"> <li>• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife.</li> <li>• Sites or features containing non-native species that are of some importance in maintaining habitat links.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



The status of a species requiring protection at an international level does not necessarily impose an 'International' conservation value on any single example of that species found at a site. Approaches to attributing nature conservation value to species have been previously developed for groups such as birds and bats.

### 3. BASELINE ECOLOGICAL CONDITIONS

The following section describes the existing ecological baseline, i.e. the survey results, within the Study Area, and in particular areas along the proposed TDR and GCR options, following the desk study, habitat and mammal surveys undertaken according to the methodology outlined in the previous section.

#### 3.1. Existing Ecological Records

Records of protected species and species of notable conservation concern, as well as any Invasive Alien Species (IAS), within 2 km of the Study Area are provided in Table 8.

**Table 8: Species of conservation interest recorded within 2 km of the Study Area (Source: NBDC)**

| Species <sup>13</sup>         | Scientific Name                                 | Habitats Directive Annex II / IV <sup>14</sup> | Wildlife Act <sup>15</sup> | Red List Status <sup>16</sup> | Most recent record |
|-------------------------------|-------------------------------------------------|------------------------------------------------|----------------------------|-------------------------------|--------------------|
| <b>Mammals</b>                |                                                 |                                                |                            |                               |                    |
| Eurasian badger               | <i>Meles meles</i>                              | Y                                              | Y                          | LC                            | 2008               |
| European hedgehog             | <i>Erinaceus europaeus</i>                      | Y                                              | Y                          | LC                            | 2017               |
| European otter                | <i>Lutra lutra</i>                              | Y                                              | Y                          | LC                            | 2022               |
| Pine marten                   | <i>Martes martes</i>                            | Y                                              | Y                          | LC                            | 2011               |
| <b>Amphibians</b>             |                                                 |                                                |                            |                               |                    |
| Common Frog                   | <i>Rana temporaria</i>                          | N                                              | Y                          | LC                            | 2002               |
| <b>Invasive Alien Species</b> |                                                 |                                                |                            |                               |                    |
| Indian Balsam                 | <i>Impatiens glandulifera</i>                   | -                                              | -                          | -                             | 2013               |
| Fallow deer                   | <i>Dama dama</i> [High impact invasive species] | N                                              | Y                          | LC                            | 2022               |
| European rabbit               | <i>Oryctolagus cuniculus</i> [Medium impact]    | N                                              | Y                          | LC                            | 2023               |

<sup>13</sup> Key to Red List Status: CR = Critically Endangered; NT = Near Threatened; VU = Vulnerable; LC = Least Concern; DD = Data Deficient

<sup>14</sup> [https://environment.ec.europa.eu/topics/nature-and-biodiversity/natura-2000/managing-and-protecting-natura-2000-sites\\_en](https://environment.ec.europa.eu/topics/nature-and-biodiversity/natura-2000/managing-and-protecting-natura-2000-sites_en)

<sup>15</sup> <https://www.irishstatutebook.ie/eli/1976/act/39/enacted/en/html#zza39y1976>

<sup>16</sup> <https://www.npws.ie/publications/red-lists>

## 3.2. Designated Sites

### 3.2.1. Internationally designated sites

There are five internationally designated sites that are within the vicinity of the Study Area. These are provided in Table 9.

**Table 9: SACs and SPAs within the zone of influence of the Study Area**

| European site [site code]                    | Qualifying Interests (* denotes priority habitat)/Special Conservation Interests                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Distance to the Proposed Development |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| <b>Special Area of Conservation (SAC)</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                      |
| Glen Bog SAC (Site Code: 001430)             | Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91E0]                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | c. 5 km northeast                    |
| Tory Hill SAC (Site Code: 000439)            | Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]<br><br>Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae [7210]<br><br>Alkaline fens [7230]                                                                                                                                                                                                                                                                                                                                       | c. 7.6 km northwest                  |
| Ballyhoura Mountains SAC (Site Code: 002036) | Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]<br><br>European dry heaths [4030]<br><br>Blanket bogs (* if active bog) [7130]                                                                                                                                                                                                                                                                                                                                                                                                                                                         | c. 13.7 km south                     |
| Lower River Shannon SAC (Site Code: 002165)  | Sandbanks which are slightly covered by sea water all the time [1110]<br><br>Estuaries [1130]<br><br>Mudflats and sandflats not covered by seawater at low tide [1140]<br><br>Coastal lagoons [1150]<br><br>Large shallow inlets and bays [1160]<br><br>Reefs [1170]<br><br>Perennial vegetation of stony banks [1220]<br><br>Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]<br><br>Salicornia and other annuals colonising mud and sand [1310]<br><br>Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]<br><br>Mediterranean salt meadows (Juncetalia maritimi) [1410] | c. 15 km northwest                   |

| European site [site code]                                        | Qualifying Interests (* denotes priority habitat)/Special Conservation Interests                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Distance to the Proposed Development |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
|                                                                  | <p>Water courses of plain to montane levels with the <i>Ranunculus fluitans</i> and <i>Callitriche-Batrachion</i> vegetation [3260]</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caerulea</i>) [6410]</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnus incana</i>, <i>Salix alba</i>) [91E0]</p> <p><i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029]</p> <p><i>Petromyzon marinus</i> (Sea Lamprey) [1095]</p> <p><i>Lampetra planeri</i> (Brook Lamprey) [1096]</p> <p><i>Lampetra fluviatilis</i> (River Lamprey) [1099]</p> <p><i>Salmo salar</i> (Salmon) [1106]</p> <p><i>Tursiops truncatus</i> (Common Bottlenose Dolphin) [1349]</p> <p><i>Lutra lutra</i> (Otter) [1355]</p>                                                                                                                                 |                                      |
| <b>Special Protection Area (SPA)</b>                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                      |
| River Shannon and River Fergus Estuaries SPA (Site Code: 004077) | <p>Cormorant (<i>Phalacrocorax carbo</i>) [A017]</p> <p>Whooper Swan (<i>Cygnus cygnus</i>) [A038]</p> <p>Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046]</p> <p>Shelduck (<i>Tadorna tadorna</i>) [A048]</p> <p>Wigeon (<i>Anas penelope</i>) [A050]</p> <p>Teal (<i>Anas crecca</i>) [A052]</p> <p>Pintail (<i>Anas acuta</i>) [A054]</p> <p>Shoveler (<i>Anas clypeata</i>) [A056]</p> <p>Scaup (<i>Aythya marila</i>) [A062]</p> <p>Ringed Plover (<i>Charadrius hiaticula</i>) [A137]</p> <p>Golden Plover (<i>Pluvialis apricaria</i>) [A140]</p> <p>Grey Plover (<i>Pluvialis squatarola</i>) [A141]</p> <p>Lapwing (<i>Vanellus vanellus</i>) [A142]</p> <p>Knot (<i>Calidris canutus</i>) [A143]</p> <p>Dunlin (<i>Calidris alpina</i>) [A149]</p> <p>Black-tailed Godwit (<i>Limosa limosa</i>) [A156]</p> <p>Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]</p> <p>Curlew (<i>Numenius arquata</i>) [A160]</p> | c. 18.2 km northwest                 |

| European site [site code] | Qualifying Interests (* denotes priority habitat)/Special Conservation Interests                                                                                                              | Distance to the Proposed Development |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
|                           | Redshank ( <i>Tringa totanus</i> ) [A162]<br>Greenshank ( <i>Tringa nebularia</i> ) [A164]<br>Black-headed Gull ( <i>Chroicocephalus ridibundus</i> ) [A179]<br>Wetland and Waterbirds [A999] |                                      |

### 3.2.2. Nationally designated sites

There are ten nationally designated sites that are within the vicinity of the Study Area. These are provided in Table 10.

**Table 10: pNHAs located within the zone of influence of the Study Area**

| European site [site code]                     | Qualifying Interests (* denotes priority habitat)/Special Conservation Interests                                                                                                                                                                                                                              | Distance to the Proposed Development |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| <b>Proposed Natural Heritage Areas (pNHA)</b> |                                                                                                                                                                                                                                                                                                               |                                      |
| Glen Bog pNHA (Site code: 001430)             | Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91E0]                                                                                                                                                                               | 5 km northeast                       |
| Lough Gur pNHA (Site code: 000437)            | Supports nationally important numbers of Shoveler, Tufted Duck and Coot, in addition to other species including Cormorant, Mute Swan, Whooper Swan, Teal, Gadwall, Mallard, Pochard, Lapwing and Curlew. Some of the habitats found at the Lough were recorded supporting the rare plant species Golden Dock. | 4.6 km northeast                     |
| Herbertstown Fen pNHA (Site code: 000436)     | This site is of ecological importance as it represents one of the few remaining undisturbed wildlife habitats in the local area and is important for many bird species, in particular providing foraging opportunities for waders.                                                                            | 8.3 km northeast                     |
| Skoolhill pNHA (Site code: 001996)            | Ecological significance stems from the presence of Various-leaved Fescue ( <i>Festuca heterophylla</i> ), a plant species that is not known to grow anywhere else in Ireland.                                                                                                                                 | 7.5 km north                         |
| Tory Hill pNHA (Site code: 000439)            | There is no information provided by NPWS for this pNHA, however this area is an SAC and thus the conservation objectives are the same.                                                                                                                                                                        | 7.4 km northwest                     |
| Adare Woodlands pNHA (Site code: 000429)      | Significant conservation value for the stand of broad-leaved woodland and associated flora and fauna that it supports. These are believed to be some of the oldest broad-leaved woodlands in the country.                                                                                                     | 12.2 km northwest                    |

| European site [site code]                            | Qualifying Interests (* denotes priority habitat)/Special Conservation Interests                                                            | Distance to the Proposed Development |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Ballyroe Hill & Mortlestown pNHA (Site code: 002089) | Conservation value due to the presence of largely undisturbed upland habitats including scrub and heath/blanket bog.                        | 12.3 km southeast                    |
| Mountrussel Wood pNHA (Site code: 002088)            | Consists of habitats of wet meadows leading to deciduous woodland with willow, alder and ash making up some of the tree species found here. | 12.5 km south                        |
| Castleoliver Woods pNHA (Site code: 002090)          | Consists of a series of long woodland strips surrounding a centre which for the most part is intensively farmed grassland.                  | 13.6 km south                        |
| Ballyhoura Mountains pNHA (Site code: 002036)        | There is no information provided by NPWS for this pNHA, however this area is an SAC and thus the conservation objectives are the same.      | 14.2 km south                        |

### 3.3. Habitats

The review of NPWS Article 17 datasets showed that no Annex I habitats or links to Annex I habitats were present within the Study Area, confirmed during field surveys.

The habitats recorded and the total area of each habitat type is shown in Table 11. A description of each habitat is provided in the following sections. The distribution of habitats is shown in Figure 6. See Appendix II for images corresponding to each habitat type recorded.

**Table 11: Habitats within the Study Area. Habitat classification is in accordance with Fossitt (2000)**

| Habitat Code | Habitat Classification             | EU Habitats Directive Annex I Habitat | Area [ha] or Length [m/km] within the survey area |
|--------------|------------------------------------|---------------------------------------|---------------------------------------------------|
| BL2          | Earth banks                        | None                                  | c. 0.25 km                                        |
| BL3          | Buildings and artificial surfaces  | None                                  | c. 5.2 ha                                         |
| GA1          | Improved agricultural grassland    | None                                  | c. 502.9 ha                                       |
| GS4          | Wet grassland                      | None                                  | c. 12.3 ha                                        |
| FW2          | Depositing/lowland river           | None                                  | c. 2.9 km                                         |
| FW4          | Drainage ditches                   | None                                  | c. 45 km                                          |
| WD2          | Mixed broadleaved/conifer woodland | None                                  | c. 6.9 ha                                         |
| WD4          | Conifer plantation                 | None                                  | c. 49.8 ha                                        |
| WL2          | Treeline                           | None                                  | c. 12.8 km                                        |
| WL1          | Hedgerows                          | None                                  | c. 35.4 km                                        |



| Habitat Code | Habitat Classification       | EU Habitats Directive Annex I Habitat | Area [ha] or Length [m/km] within the survey area |
|--------------|------------------------------|---------------------------------------|---------------------------------------------------|
| WS1          | Scrub                        | None                                  | c. 2.7 ha                                         |
| WS2          | Immature woodland            | None                                  | 5 c..9 ha                                         |
| WS3          | Ornamental/non-native shrubs | None                                  | c. 47.5 m                                         |

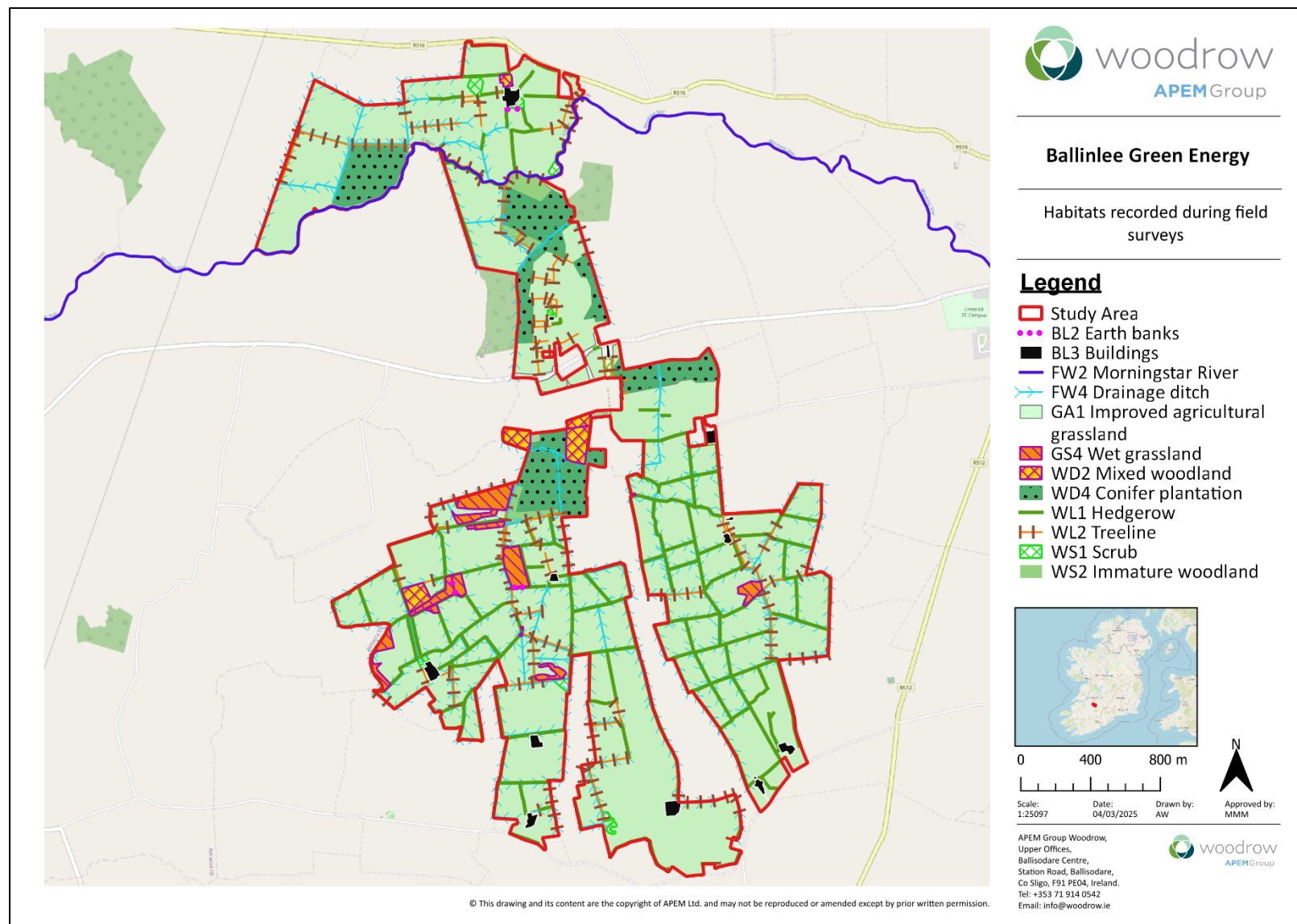


Figure 6: Overview of habitats recorded at the Study Area

### 3.3.1. WL1 Hedgerows, WL2 treelines and BL2 earth banks

Many of the field boundaries consist of species-rich and well-established hedgerows (Fossitt category WL1) and treelines (Fossitt category WL2). Hedgerows are typically 3-5 m tall and approximately 2 m in width.

The total length of hedgerows growing within the Study Area was recorded as c. 35.4 km. Hedgerow species are dominated by bramble *Rubus fruticosus* agg, hawthorn *Crataegus monogyna* and blackthorn *Prunus spinosa*. Other hedgerow species recorded include willow *Salix spp.*, elder *Sambucus nigra*, crab apple *Malus sylvestris*, guelder rose *Viburnum opulus*, gorse *Ulex spp.*, rosebay willowherb *Chamaenerion angustifolium*, ivy *Hedera helix*, buckler fern *Dryopteris dilatata*, cow parsley *Anthriscus sylvestris*, honeysuckle *Lonicera periclymenum*, alder *Alnus glutinosa*, ash *Fraxinus excelsior*, poplar *Populus spp.*, sycamore *Acer pseudoplatanus* and hazel *Corylus avellana*. Ash was present sporadically within c.20 % of hedgerows present; of these, ash within two hedgerows showed signs of ash-dieback.

Understorey species recorded include herb Robert *Geranium robertianum*, angelica *Angelica sylvestris*, common knapweed *Centaurea nigra*, and bush vetch *Vicia sepium*.

In total there were 34 hedgerows recorded within the Study Area which have been assessed in line with the Hedgerow Appraisal System (HAS). Of these, two scored as high significant hedgerows, as per methodology set out in Section 2.2.1, six rated as moderate, 21 as slight and five as low. The two that rate high were due to one hedgerow (no. 6) being along a stream/river, and the second (no. 33) forms a townland Parish boundary. Reference should be made to Table 12 for the full list of hedgerows and their significance rating as per HAS, and Figure 7 and Figure 8 for their locations within the Study Area.

**Table 12: Hedgerow Appraisal System (HAS) results within the Study Area**

| Hedgerow ID | Historical Significance <sup>17</sup> | Species Diversity <sup>18</sup> | Ground Flora <sup>19</sup> | Structure, Construction & Associated Features <sup>20</sup> | Habitat Connectivity Significance <sup>21</sup> | Landscape Significance <sup>22</sup> | Overall Hedgerow Significance |
|-------------|---------------------------------------|---------------------------------|----------------------------|-------------------------------------------------------------|-------------------------------------------------|--------------------------------------|-------------------------------|
| 1           | Low                                   | Low                             | Low                        | Moderate                                                    | Slight                                          | Low                                  | Low                           |

<sup>17</sup> Low - Recently established (0-25 years); Slight - Internal field boundary; Moderate - Roadside/Rail/Canal Boundary, Farm Boundary, March ditch, Mearing; Significant - Boundary appears on 1st Edition O.S; Highly significant - Townland Parish / County Boundary: Area shown as, or connected to, woodland on 1st Edition O.S. map: Connects to feature recorded on Sites and Monuments Record

<sup>18</sup> Low - 1-3 listed species/30m strip; Slight - 4/5 species / 30m strip; Moderate - 6/7 species / 30m strip; Significant - 8/9 species / 30m strip; Highly significant - 10+ species / 30m strip

<sup>19</sup> Low - <2 listed sp./30m and dominated by ruderal species nettle/dock/thistle/cleavers; Slight - 2-3 species / 30m strip; Moderate - 4-5 species / 30m strip; Significant - 6-7 species / 30m strip including 3-5 species; Highly significant - >7 species / 30m strip and >5 species

<sup>20</sup> Low - No associated features; Slight - Wall/Bank <0.5m height/dept; Moderate - Wall/Bank 0.5-1m, Dry ditch, Badger Sett, Green Lane; Significant - wall/bank >1m, wet ditch/drain; Highly significant - Double ditch, Stream/River

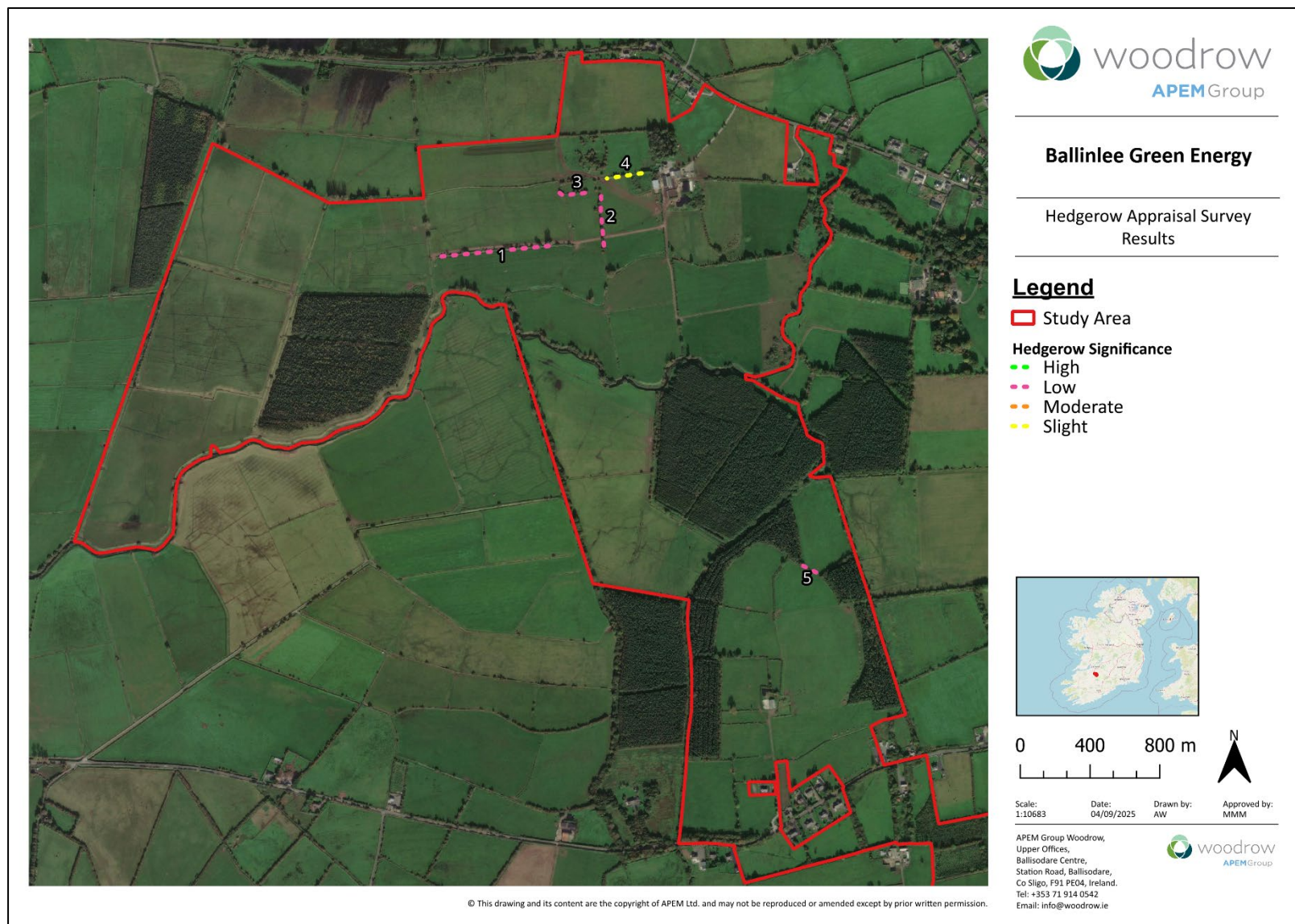
<sup>21</sup> Low - No connection with other semi-natural habitat; Slight - Single link with semi-natural habitat including hedgerow; Moderate - Multiple links with semi-natural habitats, including hedgerows; Significant - Link with woodland/forest habitat; Highly significant (score 4) - Link with designated area, particularly woodland

<sup>22</sup> Low; Slight - Wind shaped; Moderate - Mature Hedgerow Trees, including hedgerows; Significant; Highly significant - Area covered by Landscape designation (Landscape Conservation Order, Tree Protection Order, Amenity Area Order)

| Hedgerow ID | Historical Significance <sup>17</sup> | Species Diversity <sup>18</sup> | Ground Flora <sup>19</sup> | Structure, Construction & Associated Features <sup>20</sup> | Habitat Connectivity Significance <sup>21</sup> | Landscape Significance <sup>22</sup> | Overall Hedgerow Significance |
|-------------|---------------------------------------|---------------------------------|----------------------------|-------------------------------------------------------------|-------------------------------------------------|--------------------------------------|-------------------------------|
| 2           | Slight                                | Low                             | Low                        | Slight                                                      | Moderate                                        | Low                                  | Low                           |
| 3           | Slight                                | Low                             | Low                        | Slight                                                      | Moderate                                        | Low                                  | Low                           |
| 4           | Slight                                | Slight                          | Low                        | Low                                                         | Slight                                          | Low                                  | Slight                        |
| 5           | Slight                                | Low                             | Low                        | Low                                                         | Moderate                                        | Low                                  | Low                           |
| 6           | Moderate                              | Low                             | Low                        | Highly significant                                          | Significant                                     | Moderate                             | High                          |
| 7           | Slight                                | Low                             | Low                        | Low                                                         | Significant                                     | Moderate                             | Slight                        |
| 8           | Moderate                              | Slight                          | Low                        | Low                                                         | Significant                                     | Moderate                             | Moderate                      |
| 9           | Slight                                | Low                             | Slight                     | Slight                                                      | Significant                                     | Slight                               | Slight                        |
| 10          | Slight                                | Low                             | Low                        | Moderate                                                    | Moderate                                        | Moderate                             | Moderate                      |
| 11          | Slight                                | Low                             | Low                        | Moderate                                                    | Moderate                                        | Slight                               | Slight                        |
| 12          | Slight                                | Slight                          | Low                        | Moderate                                                    | Moderate                                        | Slight                               | Slight                        |
| 13          | Slight                                | Slight                          | Low                        | Moderate                                                    | Moderate                                        | Slight                               | Moderate                      |
| 14          | Slight                                | Low                             | Low                        | Slight                                                      | Low                                             | Low                                  | Slight                        |
| 15          | Slight                                | Low                             | Low                        | Moderate                                                    | Moderate                                        | Low                                  | Slight                        |
| 16          | Slight                                | Slight                          | Low                        | Moderate                                                    | Moderate                                        | Moderate                             | Moderate                      |
| 17          | Slight                                | Moderate                        | Slight                     | Slight                                                      | Moderate                                        | Moderate                             | Moderate                      |
| 18          | Slight                                | Low                             | Low                        | Moderate                                                    | Moderate                                        | Low                                  | Slight                        |
| 19          | Slight                                | Slight                          | Low                        | Significant                                                 | Moderate                                        | Moderate                             | Moderate                      |
| 20          | Slight                                | Low                             | Low                        | Slight                                                      | Moderate                                        | Slight                               | Slight                        |
| 21          | Slight                                | Low                             | Low                        | Slight                                                      | Moderate                                        | Slight                               | Slight                        |
| 22          | Slight                                | Low                             | Low                        | Slight                                                      | Slight                                          | Low                                  | Slight                        |
| 23          | Slight                                | Slight                          | Slight                     | Slight                                                      | Slight                                          | Moderate                             | Slight                        |
| 24          | Slight                                | Low                             | Low                        | Low                                                         | Slight                                          | Slight                               | Slight                        |
| 25          | Low                                   | Low                             | Low                        | Slight                                                      | Moderate                                        | Low                                  | Slight                        |

| Hedgerow ID | Historical Significance <sup>17</sup> | Species Diversity <sup>18</sup> | Ground Flora <sup>19</sup> | Structure, Construction & Associated Features <sup>20</sup> | Habitat Connectivity Significance <sup>21</sup> | Landscape Significance <sup>22</sup> | Overall Hedgerow Significance |
|-------------|---------------------------------------|---------------------------------|----------------------------|-------------------------------------------------------------|-------------------------------------------------|--------------------------------------|-------------------------------|
| 26          | Slight                                | Low                             | Slight                     | Low                                                         | Low                                             | Low                                  | Slight                        |
| 27          | Slight                                | Low                             | Low                        | Moderate                                                    | Moderate                                        | Low                                  | Slight                        |
| 28          | Slight                                | Low                             | Low                        | Moderate                                                    | Moderate                                        | Low                                  | Slight                        |
| 29          | Slight                                | Slight                          | Slight                     | Slight                                                      | Moderate                                        | Moderate                             | Slight                        |
| 30          | Slight                                | Slight                          | Slight                     | Moderate                                                    | Moderate                                        | Low                                  | Slight                        |
| 31          | Low                                   | Low                             | Low                        | Low                                                         | Slight                                          | Low                                  | Slight                        |
| 32          | Low                                   | Low                             | Low                        | Low                                                         | Moderate                                        | Low                                  | Low                           |
| 33          | Highly Significant                    | Moderate                        | Moderate                   | Moderate                                                    | Moderate                                        | Low                                  | High                          |
| 34          | Slight                                | Low                             | Moderate                   | Moderate                                                    | Moderate                                        | Low                                  | Slight                        |





**Figure 7: Hedgerow Appraisal System (HAS) results within the northern section of the Development**

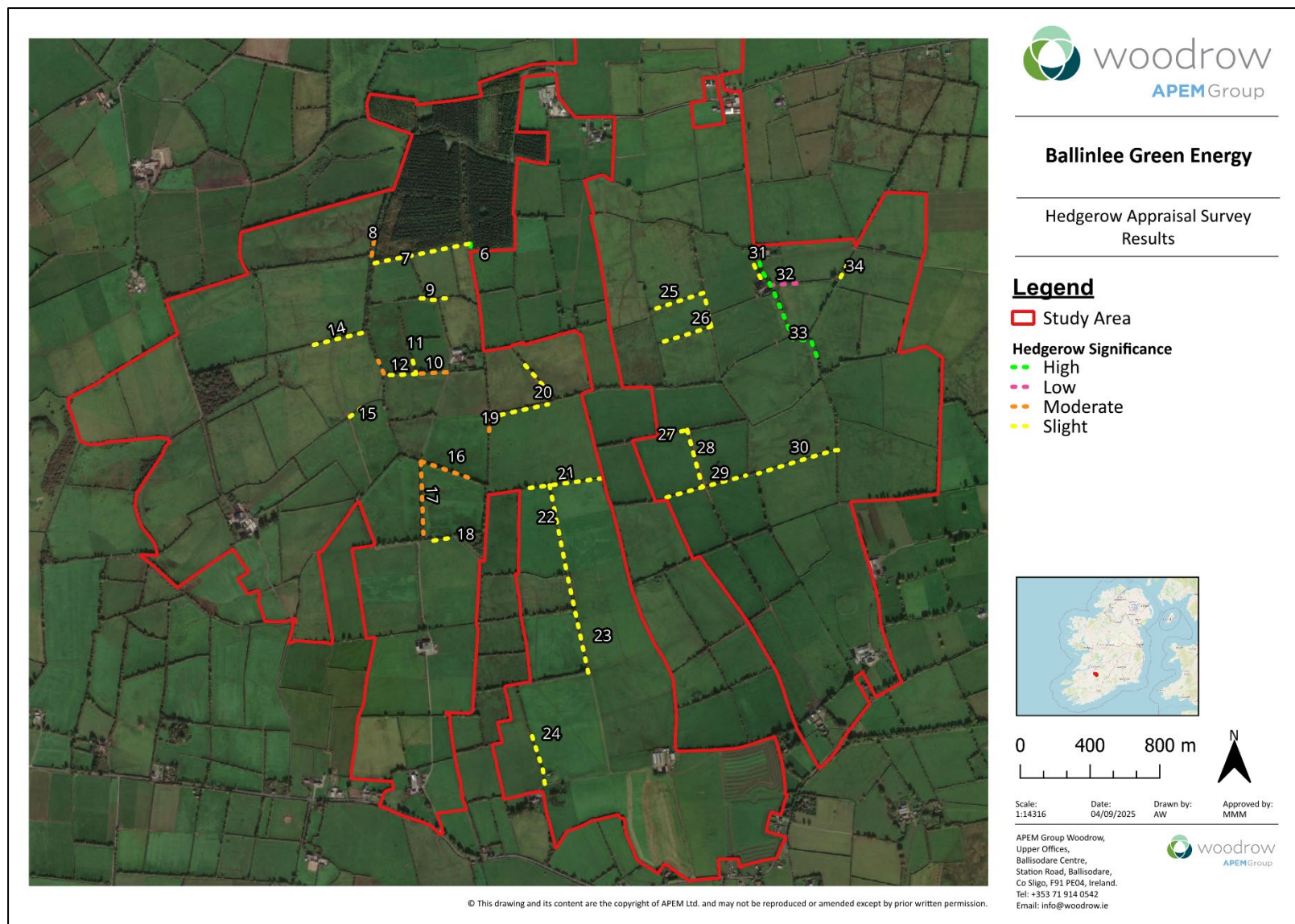


Figure 8: Hedgerow Appraisal System (HAS) results within southern section



Approximately 12.8 km of treeline habitat was recorded during field surveys. Treelines occurred in a sporadic distribution across the Study Area, with dominant woody species comprising of ash (*Fraxinus excelsior*), horse chestnut (*Aesculus hippocastanum*), sycamore (*Acer pseudoplatanus*), elder (*Sambucus nigra*), birch (*Betula pendula*), alder (*Alnus glutinosa*), hazel (*Corylus avellana*) and sessile oak (*Quercus petraea*). Willow (*Salix spp.*), hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), crab apple, bramble and ivy (*Hedera helix*) are also frequent. Where ash was present within treelines, ash dieback was noted in less than 50% of treelines.

The earth banks present in the Study Area support hedgerows and treelines with species present indicative of these habitat types including ash, blackthorn and bramble.

The network of field boundaries within the Study Area, most notably where this is composed of hedgerows and treelines, support biodiversity that would otherwise be limited given the agricultural nature of the surrounding area. Such boundary features are not necessarily species-rich in their own right but provide food and shelter for a range of birds, small mammals and invertebrates, and also provide foraging habitat for bats which feed on the flying insects associated with such features. These linear habitats form a continuum of habitat along which wildlife can safely move to other areas of feeding or sheltering habitat.

Overall, the network of vegetated boundary features represents a feature of Local (Higher) ecological importance.

### **3.3.2. BL3 Buildings and artificial surfaces**

Several buildings, primarily farm sheds and associated yards, derelict buildings, milking parlours are found within the Study Area. This habitat consists of more permanent buildings and tracks, which are unlikely to be demolished as a component of the proposed windfarm development.

This habitat is considered to be a feature of Local (lower) ecological importance and therefore it is not considered to be an important ecological feature and will not be brought forward for impact assessment.

### **3.3.3. GA1 Improved agricultural grassland**

Improved agricultural grassland totalling c. 502.9 ha was recorded across the majority of the Study Area. Much of these areas have been reseeded with perennial ryegrass (*Lolium perenne*) and are used for livestock grazing and silage production. Fertiliser is applied regularly, and reseeded areas appear to take place every few years. As a result, species diversity is low and ecological value of such areas is very limited.

Species recorded within this habitat type include red clover *Trifolium pratense*, white clover *Trifolium repens*, silverweed *Potentilla anserina*, creeping buttercup *Ranunculus repens*, hawkweed *Hieracium spp.*, soft rush *Juncus effusus*, meadowsweet *Filipendula ulmaria*, marsh horsetail *Equisetum palustre*, sharp-flowered rush *Juncus acutiflorus*, selfheal *Prunella vulgaris*, smooth hawksbeard *Crepis capillaris*, common ragwort *Jacobaea vulgaris*, meadow buttercup *Ranunculus acris*, Yorkshire fog *Holcus lanatus*, field thistle *Cirsium discolor*, dandelion *Taraxacum vulgaria*, dock *Rumex spp.*, perennial ryegrass *Lolium perenne* and Italian ryegrass *Lolium multiflorum*.

Some additional plant species that were recorded in the northern section of the Study Area that were not recorded in the southern section include chickweed *Stellaria media*, creeping bent *Agrostis stolonifera*, and cocks-foot *Dactylis glomerata*.

There are some areas within improved agricultural fields that are fenced off from rest of the field, potentially set aside for nature to reach farm percentage – with dock, thistle and rosebay willowherb prevalent along with previous grassland species. However, these areas did not occupy significant areas within the overall improved agricultural grassland habitat and were not mapped specifically.

This habitat is considered to be a feature of Local (lower) ecological importance and therefore it is not considered to be an important ecological feature and will not be brought forward for impact assessment.

#### **3.3.4. GS4 Wet grassland**

Wet grassland (GS4) is widespread in Ireland and encompasses a variety of vegetation communities, its exact species composition being influenced by a range of factors such as geology, soil type, hydrology, pH and altitude. It is characterised by having at least 50% cover of grass species, with rushes, sedges and herbs together totalling less than 50%. Wet grassland (GS4) occurs in areas of poorly-drained farmland that have not recently been improved, seasonally-flooded alluvial grasslands and turlough basins.

Approximately 12.3 ha of this habitat was recorded within the southern section of the Study Area and typically occurs in a mosaic along with improved agricultural grassland.

The wet grassland in the Study Area is dominated by a dense sward of soft rush *Juncus effusus* and hard rush *Juncus inflexus*. Other species commonly recorded within this habitat include yellow iris *Iris pseudacorus*, Yorkshire fog *Holcus lanatus*, crested dog's tail *Cynosurus cristatus*, tufted hair grass *Deschampsia cespitosa*, creeping thistle *Cirsium arvense*, meadowsweet *Filipendula ulmaria*, kidney vetch *Anthyllis vulneraria*, water mint *Mentha aquatica* and ragged robin *Silene flos-cuculi*. Willow *Salix spp.* saplings were also observed growing in areas of wet grassland.

As this is a species-poor example of wet grassland that is dominated by grasses and rushes, it is considered that this habitat represents an ecological feature of Local (Lower) value and will therefore not be brought forward to the impact assessment stage.

#### **3.3.5. FW2 Depositing lowland river**

The fourth order Morningstar River [EPA Code: 24M02] flows in a westerly direction through the northern section of the Study Area and is fed by several smaller streams ranging from first order to third order. The river itself feeds into the River Maigue [EPA Code: 24M01] which then flows into the Lower River Shannon SAC (Site Code: 002165) c. 24.2 rkm downstream of the Study Area, River Shannon and River Fergus Estuaries SPA (Site Code: 004077) c. 36.9 rkm downstream of the Study Area and Inner Shannon Estuary pNHA (Site Code: 000435) c. 39.6 rkm downstream of the Study Area.

Bank and in-stream vegetation of the Morningstar River consists of bulrush *Typha latifolia*, common club-rush *Schoenoplectus lacustris*, pondweeds *Potamogeton spp.*, yellow iris *Iris pseudacorus* and willow *Salix spp.*

This river has been dredged between 1973-86 as part of the arterial drainage scheme of the Maigue subcatchment, under the Arterial Drainage Act, 1945<sup>23</sup>. Livestock are currently allowed to access the river in some parts, which are contributing to the degradation of this habitat arising from riverbed disturbance, defecation and poaching.

Eleven tributaries of the Morningstar River, comprising 1<sup>st</sup> and 2<sup>nd</sup> order watercourses (as mapped by the EPA<sup>24</sup>) drain the Study Area, and are presented in Table 13 and Figure 9. Stream order is described using the classification system given in Strahler (1957) which defines stream size based on a hierarchy of tributaries (with 1<sup>st</sup> order streams being the smallest). These tributaries have been channelised and form field boundaries in many locations.

The Morningstar River is considered to be a feature of County ecological value.

**Table 13: List of main drainage ditches (corresponding to those mapped by the EPA/OSI) within the Study Area**

| River Waterbody Code | EPA Name        | EPA Code | Order | Location within the Study Area | Drains to         |
|----------------------|-----------------|----------|-------|--------------------------------|-------------------|
| IE_SH_24MO20800      | South Ballinlee | 24S24    | 1     | Most western river             | Rathcannon        |
| IE_SH_24MO20800      | Raymondstown    | 24R14    | 1     | Southwest                      | Rathcannon        |
| IE_SH_24MO20800      | Rathcannon      | 24R12    | 2     | West and north                 | Morningstar River |
| IE_SH_24MO20800      | Ballinlee South | 24B94    | 2     | Centre                         | North Ballinlee   |
| IE_SH_24MO20800      | Ballingayrou    | 24B95    | 1     | Centre                         | Ballinlee South   |
| IE_SH_24MO20800      | Ballinrea       | 24B91    | 1     | North                          | Ballinlee South   |
| IE_SH_24MO20800      | North Ballinlee | 24N05    | 1     | Northmost river                | Rathcannon        |
| IE_SH_24MO20800      | Camas_South     | 24C43    | 1     | Eastmost stream                | Morningstar River |
| IE_SH_24NO20800      | Parkroe 24      | 24P03    | 1     | Northern section               | Morningstar River |
| IE_SH_24M020800      | Killorath       | 24K37    | 2     | Northwest section              | Morningstar River |
| IE_SH_24M020800      | Carrigeen 24    | 24C54    | 1     | Northwest section              | Morningstar River |

<sup>23</sup> <https://www.gov.ie/en/publication/c646ec-arterial-drainage-schemes/>

<sup>24</sup> <https://gis.epa.ie/EPAMaps/>



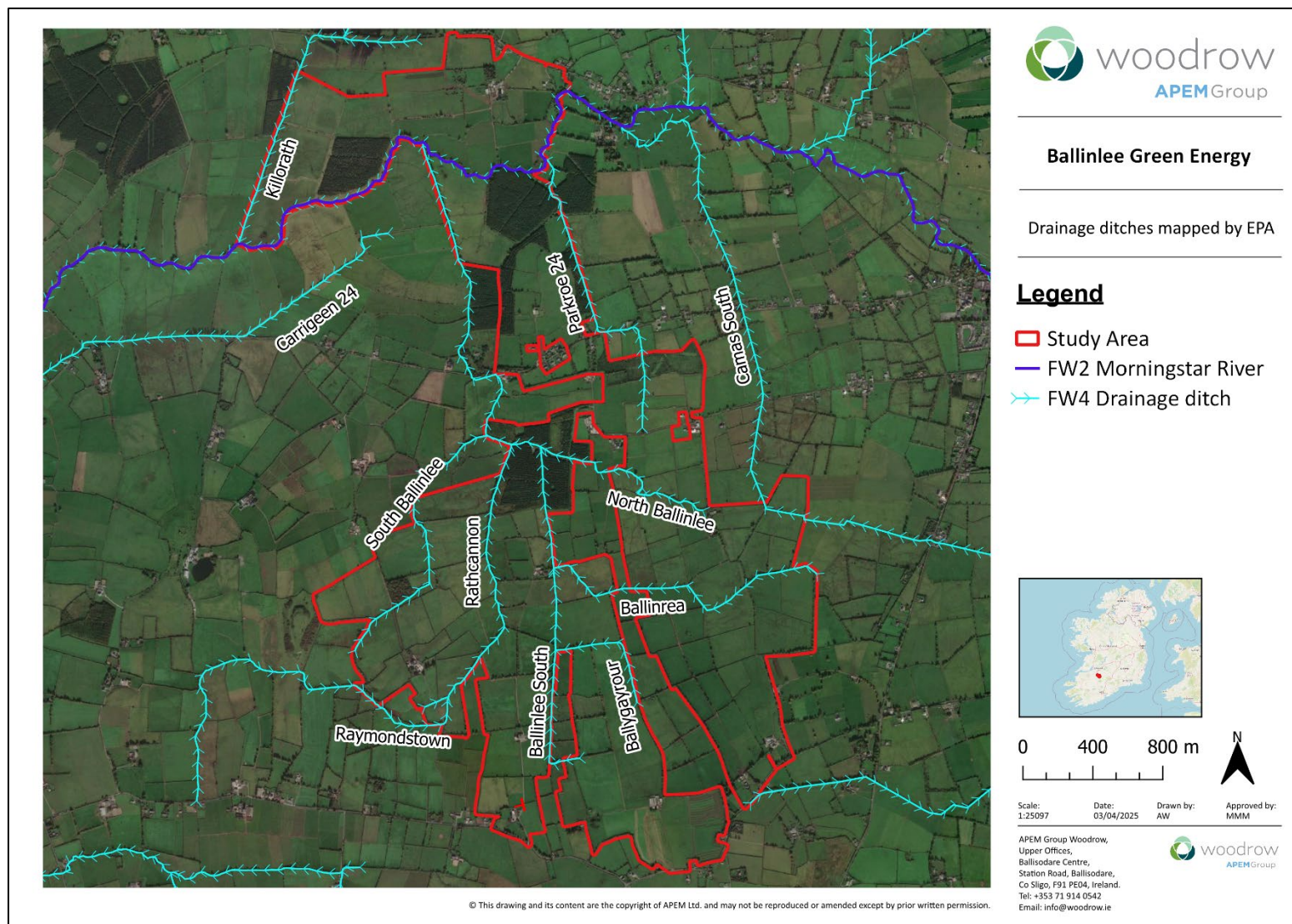


Figure 9: FW2 Depositing/lowland rivers within the Study Area (as mapped by the EPA)

### 3.3.6. FW4 Drainage ditches

Drainage ditches are prevalent across the Study Area and border almost every field of improved grassland. This habitat commonly occurs alongside hedgerow and treeline features across the Study Area, and this is reflected in the species that were recorded alongside drainage ditch habitats.

This network of drainage ditches culminate in drainage to the Morningstar River. This river joins the main channel of the River Maigue approximately 2 km southwest of the Study Area. The River Maigue discharges into the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA.

Species recorded within this habitat include yellow iris *Iris pseudacorus*, Yorkshire fog *Holcus lanatus*, creeping thistle *Cirsium arvense*, meadowsweet *Filipendula ulmaria*, kidney vetch *Anthyllis vulneraria*, water mint *Mentha aquatica*, ragged robin *Silene flos-cuculi* and rosebay willowherb *Chamaenerion angustifolium*.

In total there were 25 drainage ditches recorded within the Planning Application Boundary which have each been assessed for their condition. Of these, two scored Good condition having good water quality, emergent/submerged/floating leaved vegetation, no signs of eutrophication, marginal vegetation, no physical damage, sufficient water levels and absence of non-native invasive species. A further 12 scored Moderate condition answering yes to  $\geq 6/8$  of the criteria and 11 scored as passes answering yes to  $\geq 5/8$ . Reference should be made to Table 14 for the full list of drainage ditches assessed and their condition assessment score within the Study Area.

Drainage ditches are considered to be features of Local (Higher) ecological value.

**Table 14: Drainage ditch condition assessment within the Study Area**

| Drainage ditch ID | Good water quality? <sup>25</sup> | Emergent/submerged/floating leaved plants? <sup>26</sup> | <10% cover filamentous algae/duckweed? <sup>27</sup> | Marginal vegetation >75%? <sup>28</sup> | Physical damage <5%? <sup>29</sup> | Sufficient water levels? <sup>30</sup> | <10% is heavily shaded? | Absence of non-native species? <sup>31</sup> | Condition Assessment Result <sup>32</sup> |
|-------------------|-----------------------------------|----------------------------------------------------------|------------------------------------------------------|-----------------------------------------|------------------------------------|----------------------------------------|-------------------------|----------------------------------------------|-------------------------------------------|
| 1                 | Yes                               | No                                                       | Yes                                                  | Yes                                     | Yes                                | Yes                                    | Yes                     | Yes                                          | Moderate                                  |
| 2                 | Yes                               | No                                                       | Yes                                                  | Yes                                     | Yes                                | No                                     | Yes                     | No                                           | Passes                                    |
| 3                 | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | Yes                                    | Yes                     | Yes                                          | Good                                      |
| 4                 | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | Yes                                    | Yes                     | No                                           | Moderate                                  |
| 5                 | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | No                                 | No                                     | Yes                     | Yes                                          | Moderate                                  |
| 6                 | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | Yes                                    | No                      | Yes                                          | Moderate                                  |
| 7                 | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | Yes                                    | Yes                     | Yes                                          | Good                                      |
| 8                 | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | Yes                                    | No                      | Yes                                          | Moderate                                  |
| 9                 | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | No                                     | No                      | Yes                                          | Moderate                                  |
| 10                | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | No                                     | No                      | Yes                                          | Moderate                                  |
| 11                | No                                | No                                                       | Yes                                                  | Yes                                     | Yes                                | No                                     | Yes                     | Yes                                          | Moderate                                  |
| 12                | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | Yes                                    | No                      | No                                           | Moderate                                  |
| 13                | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | No                                     | Yes                     | Yes                                          | Moderate                                  |
| 14                | No                                | No                                                       | Yes                                                  | Yes                                     | Yes                                | No                                     | No                      | Yes                                          | Passes                                    |
| 15                | No                                | No                                                       | Yes                                                  | Yes                                     | Yes                                | No                                     | No                      | No                                           | Passes                                    |
| 16                | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | No                                     | No                      | Yes                                          | Moderate                                  |
| 17                | Yes                               | No                                                       | Yes                                                  | Yes                                     | Yes                                | No                                     | No                      | Yes                                          | Moderate                                  |
| 18                | No                                | No                                                       | Yes                                                  | Yes                                     | Yes                                | No                                     | Yes                     | Yes                                          | Passes                                    |
| 19                | No                                | No                                                       | No                                                   | Yes                                     | No                                 | No                                     | No                      | Yes                                          | Passes                                    |
| 20                | No                                | No                                                       | Yes                                                  | Yes                                     | No                                 | No                                     | No                      | Yes                                          | Passes                                    |
| 21                | No                                | No                                                       | Yes                                                  | Yes                                     | Yes                                | No                                     | Yes                     | No                                           | Passes                                    |

<sup>25</sup> The ditch is of good water quality with clear water (low turbidity) indicating no obvious signs of pollution

<sup>26</sup> A range of emergent, submerged and floating leaved plants are present. As a guide >10m cover of filamentous algae, and/or duckweed (these are signs of eutrophication)

<sup>27</sup> There is less than 10% cover of filamentous algae and/or duckweed (these are signs of eutrophication)

<sup>28</sup> A fringe of marginal vegetation is present along more than 75% of the ditch

<sup>29</sup> Physical damage evident along less than 5% of the ditch, such as excessive poaching, damage from machinery use or storage, or any other damaging management activities.

<sup>30</sup> Sufficient water levels are maintained. As a guide a minimum summer depth of c. 50cm in minor ditches and 1m in main drains.

<sup>31</sup> There is an absence of non-native plant and animal species.

<sup>32</sup> Passes - Passes ≤5/8 criteria by answering yes to the previous questions; Moderate - Passes ≥6/8 criteria; Good - Passes 8/8 criteria

| Drainage ditch ID | Good water quality? <sup>25</sup> | Emergent/submerged/floating leaved plants? <sup>26</sup> | <10% cover filamentous algae/duckweed? <sup>27</sup> | Marginal vegetation >75%? <sup>28</sup> | Physical damage <5%? <sup>29</sup> | Sufficient water levels? <sup>30</sup> | <10% is heavily shaded? | Absence of non-native species? <sup>31</sup> | Condition Assessment Result <sup>32</sup> |
|-------------------|-----------------------------------|----------------------------------------------------------|------------------------------------------------------|-----------------------------------------|------------------------------------|----------------------------------------|-------------------------|----------------------------------------------|-------------------------------------------|
| 22                | No                                | No                                                       | Yes                                                  | Yes                                     | Yes                                | No                                     | Yes                     | Yes                                          | Passes                                    |
| 23                | No                                | No                                                       | Yes                                                  | No                                      | Yes                                | No                                     | Yes                     | Yes                                          | Passes                                    |
| 24                | No                                | No                                                       | Yes                                                  | No                                      | No                                 | No                                     | Yes                     | No                                           | Passes                                    |
| 25                | Yes                               | Yes                                                      | Yes                                                  | Yes                                     | Yes                                | No                                     | Yes                     | Yes                                          | Passes                                    |

### 3.3.7. WD2 Mixed broadleaved/conifer woodland

Approximately 6.9 ha of this woodland habitat is present within the Study Area as shown in Figure 6.

Beech *Fagus spp.*, sycamore *Acer pseudoplatanus*, hawthorn *Crataegus monogyna* and mature Sitka spruce *Picea sitchensis* comprise this woodland habitat within northern section, whilst ash *Fraxinus excelsior*, hawthorn and Sitka spruce makes up the woodland species found in this habitat type in the southern section. There were noticeable signs of ash dieback across much of this section of immature woodland.

In the context of the surrounding land, which is mainly agricultural in character, it is considered that this habitat represents a habitat resource that is relatively limited in the wider area and is therefore a feature of Local (Higher) importance.

### 3.3.8. WD4 Conifer plantation

Conifer plantations account for c. 42 ha within the Study Area. These plantations were assessed as species poor monoculture habitats, mainly comprised of evenly aged stands of sitka spruce *Picea sitchensis* in addition to one small Scots pine *Pinus sylvestris* plantation located in the northern section. Conifer plantations recorded were bordered by narrow linear strips of broadleaved trees including sycamore *Acer pseudoplatanus*, ash *Fraxinus excelsior*, alder *Alnus glutinosa* and sessile oak *Quercus petraea*. However, as these broad-leaved components did not exceed more than 25% of the overall plantation area, these areas could not be classified as mixed broadleaved/conifer woodland as above.

This habitat type is considered to be a feature of Local (Lower) ecological importance and therefore it is not considered to be an important ecological feature for the purposes of this impact assessment.

### 3.3.9. WS2 Immature woodland

This habitat is limited within the Study Area, with an area of approximately 3.8 ha found in the northern section, comprising sessile oak *Quercus petraea*. An area of immature woodland in the southern section of the Study Area, where conifer plantation had been previously felled, was largely comprised of ash *Fraxinus excelsior* and sycamore *Acer pseudoplatanus*. Ash dieback disease was evident on the majority (>70%) of ash trees in this area. During the update survey in July 2025, an area of 0.4 ha had been felled at this location and is now occupied by sycamore and ash saplings. The age range of trees in immature woodland within the Study Area is from saplings and up to 15-20 years old.

These woodlands have a poached ground layer due to grazing by deer. Species within the understorey include ivy, bramble, and nettle.

In the context of the surrounding land, which is mainly agricultural in character, it is considered that this habitat represents a habitat resource that is relatively limited in the wider area and is therefore a feature of Local (Higher) importance.

### **3.3.10. WS1 Scrub**

Scrub habitat across the Study Area was relatively sparse, accounting for approximately 2.7 ha. Scrub habitat consists primarily of a mosaic of bramble *Rubus fruticosus*, hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa* and gorse *Ulex spp.*, providing cover habitat for mammals and birds. Other species comprising scrub habitats include elder *Sambucus nigra*, ivy *Hedera helix*, rosebay willowherb *Chamaenerion angustifolium*, field thistle *Cirsium discolor*, and curly dock *Rumex crispus*.

Where this habitat occurs, it is typically bordered by improved agricultural grassland and hedgerows.

In the context of the surrounding land, which is mainly agricultural in character, it is considered that scrub habitat, although quite limited within the Study Area represents a habitat resource that is also relatively limited in the wider area and is therefore a feature of Local (Higher) importance.

### **3.3.11. WS3 Ornamental/ non-native shrubs**

Ornamental shrubs, including laurel and cypress hedges, are planted within the immediate vicinity of some of the private dwellings at the limits of the southern boundary of the Study Area.

This habitat type is considered to be a feature of Local (lower) ecological importance and therefore it is not considered to be an important ecological feature for the purposes of this impact assessment.

### **3.3.12. Protected Flora**

There were no records of Flora Protection Order (FPO) plants within the Study Area. Field surveys conducted focused on identifying suitable habitats for rare and protected flora species within the Study Area. These surveys were timed to coincide with the optimal growth period for these species. No flora species protected under the FPO were observed during surveys within the Study Area.

### **3.3.13. Invasive alien plant species**

Giant rhubarb *Gunnera manicata* and Japanese knotweed *Reynoutria japonica*, both listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015), were recorded during ecological surveys within the Study Area.

Four stands of giant rhubarb were recorded in the northern section of the Study Area, all occurring along the banks of the Morningstar River.

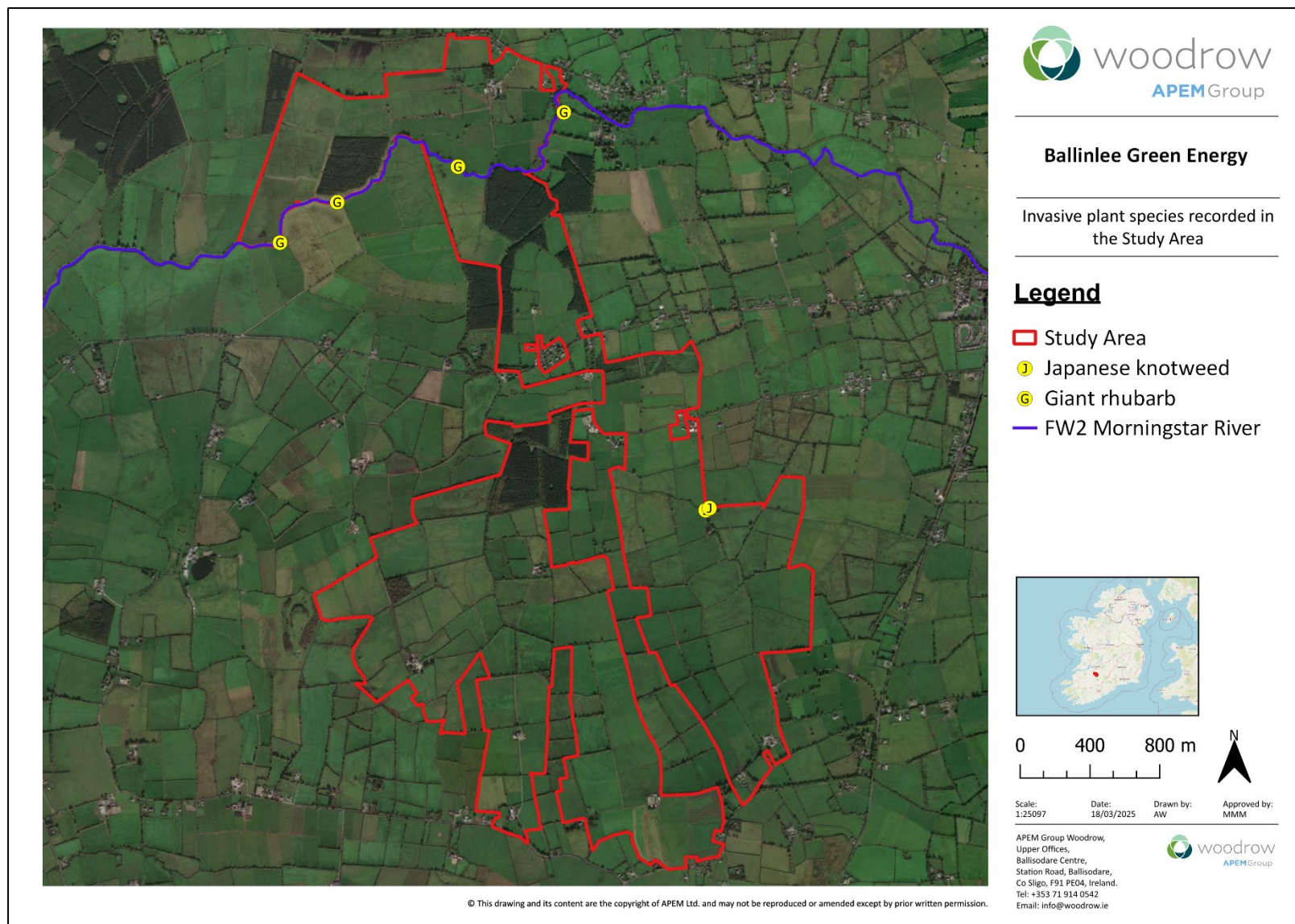
Japanese knotweed was recorded within the southern section, where two large mature stands were found to be growing next to livestock sheds approximately 50 m from a proposed access track. These stands were cut between when they were first recorded, in August 2023, and when field surveyors were present again in December 2023. During the update survey in July 2025, new growth had been detected within the existing farm access track adjacent to the stand of Japanese knotweed.



A list of all invasive alien plant species recorded, and their locations is provided in Table 15 and Figure 10.

**Table 15: Invasive species identified within the Study Area**

| Species           | Scientific Name            | Location (lat, long) | Notes                                                             | Status                         |
|-------------------|----------------------------|----------------------|-------------------------------------------------------------------|--------------------------------|
| Japanese Knotweed | <i>Reynoutria japonica</i> | 52.461869, -8.574126 | c. 5x10 m stand adjacent to cattle sheds                          | High impact invasive species   |
|                   |                            | 52.461655, -8.57395  | New growth of two plants in the existing farm access track        | Third Schedule listed species  |
| Giant rhubarb     | <i>Gunnera manicata</i>    | 52.475476, -8.610188 | 5x5 m stand                                                       | Medium impact invasive species |
|                   |                            | 52.482384, -8.586413 | 3x8 m stand in field corner                                       | Third Schedule listed species  |
|                   |                            | 52.477534, -8.605623 | 5x30 m stand along edge of Morningstar River                      |                                |
|                   |                            | 52.479538, -8.595351 | Southern bank of Morningstar River west to edge of field boundary |                                |



**Figure 10: Invasive alien plant species recorded during surveys**

### 3.4. Mammals (excluding bats)

The Study Area was investigated for tracks and signs of mammal activity, with particular attention given to and within the vicinity of watercourses and field boundaries where heightened mammal activity typically takes place. The northern section is prone to flooding, particularly during the winter months. Similarly, much of the southern section becomes wet and prone to flooding during the winter months and following periods of heavy rain. Despite this mammal activity was high throughout with numerous trails and signs recorded throughout.

See **Appendix IV** for images of mammal presence and activity within the Study Area.

#### 3.4.1. Badger

Details on badger setts and sett entrances identified within the Study Area including their locations are provided in **Appendix III: Badger Setts**.

Badger activity was recorded throughout the Study Area with latrines, prints, scat, trails and feeding signs frequently recorded during surveys. This level of activity was considered to be representative of suitable habitat within the Study Area i.e. agricultural land with areas of forestry and an established network of hedgerows. Eight setts were identified, comprising three active setts and five inactive setts.

Sett 1, the largest sett consisting of five entrances, was identified within a treeline comprised mainly of ash, willow, oak and ivy. Examinations of the entrances showed them to be very well used, with much bare ground in the surrounding area and very little accumulated litter (for example, leaves and sticks) in the entrances. Fresh bedding was observed in burrow entrances on each survey visit. There was some mounding of earth showing previous excavation and some fresh scratch marks were observed in the vicinity. Other signs of badger activity, such as badger hairs, trails and snuffle holes were observed in the general vicinity of this sett. Judging from the size of this sett which has at least five entrances (four active and one inactive entrance), as well as the frequency and nature of the activity recorded at this location during the trail camera deployment, it is considered that this is a subsidiary sett in accordance with the characteristics summarised in Table 2.

Sett 2, an outlier sett consisting of six entrances (two active and four inactive), was identified directly south of the Morningstar River at the perimeter of immature woodland. Trail cameras were deployed at this feature to determine the status of this potential sett/resting place, including the level of use. Badger were confirmed emerging from the sett, as such, it can be concluded that badger are using this feature as a resting place/sett. Monitoring of this sett in March-April 2024 did not record evidence of breeding, i.e. no presence of juvenile badgers. Based on the activity recorded, and distance to the next nearest sett, c. 359.9 m to the northeast, it was concluded that this sett is an outlier.

Sett 3, consisting of three inactive entrances, was identified within a treeline in the southern section of the Study Area. This sett showed no signs of activity during surveys and for this reason is classified as an inactive outlier sett.

Sett 4, 5, 6, 7 and 8 were classified as outlier setts due to their isolation and the presence of only one entrance at each sett.

A large fresh spoil heap was identified outside the entrance of sett 4 and was therefore classified as an active sett. Sett 5 showed no signs of activity on survey days while sett 6 was classified as active during surveys. Trail cameras deployed to monitor setts 7 and 8 recorded badgers passing within the vicinity, but no badgers were recorded entering or exiting the setts, therefore these were classified as inactive setts.

See **Appendix III** for characteristics of each sett, trail camera footage and photographic evidence of each sett identified during surveys and described in this section.

The Study Area and surrounding area provides suitable habitat for foraging and breeding badger, and usage corresponds with that which would be expected for this type of area. Given that badger is a protected species under the Wildlife Act (1976) as amended (2000), the badger population within the Study Area is considered to be a feature of Local (Higher) importance.

### 3.4.2. Otter

The NBDC database for the six 2 km grid squares in which the Study Area is located revealed previous records of otter from grid square, R53X, with the most recent record from 2022. The nearest Maigne Rivers Trust record of otter is c. 6.3 km downstream of the Study Area (Sweeney, 2018).

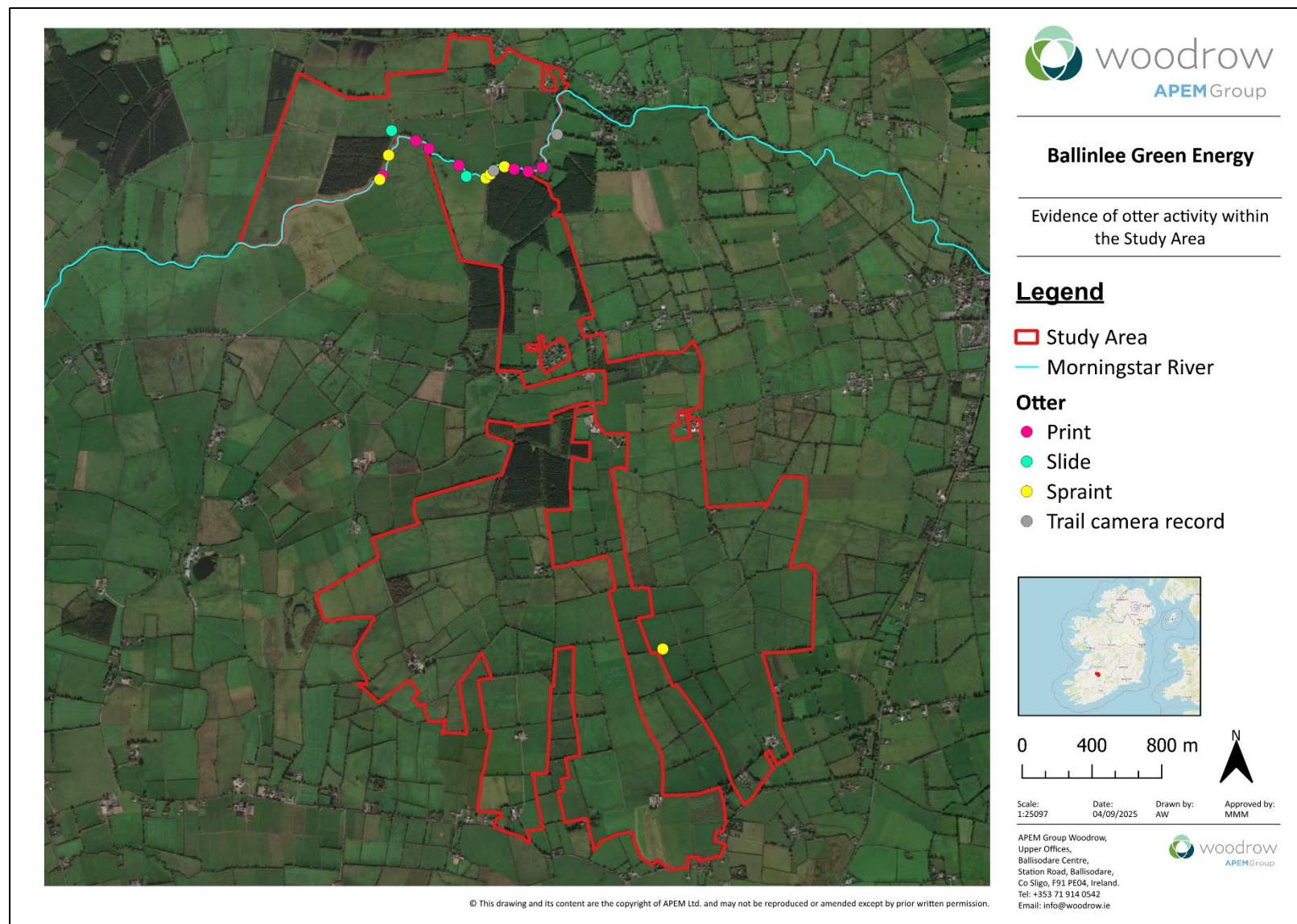
Otter activity was concentrated along the section of the Morningstar River as it flows through the Study Area with numerous fresh prints, spraint and slides recorded, demonstrating that this species is actively present and utilising the river. Additionally, trail camera monitoring provided evidence of otter commuting along the banks of the river (See **Appendix IV**). One potential otter holt in dense vegetation was monitored for usage but through monitoring and further investigation there was no feature resembling a holt present. No other signs of otter were recorded across the Study Area.

Figure 11 illustrates otter activity and field signs recorded.

No evidence of breeding otter was found during field surveys, with no holts, active or inactive, identified. Otters are therefore primarily utilising the Study Area, in particular the Morningstar River and the areas immediately adjacent to the river, for hunting and commuting purposes.

For this reason, otter has been valued as Local (Higher) importance and will be brought forward to the impact assessment stage.





**Figure 11: Otter signs recorded at the Study Area**

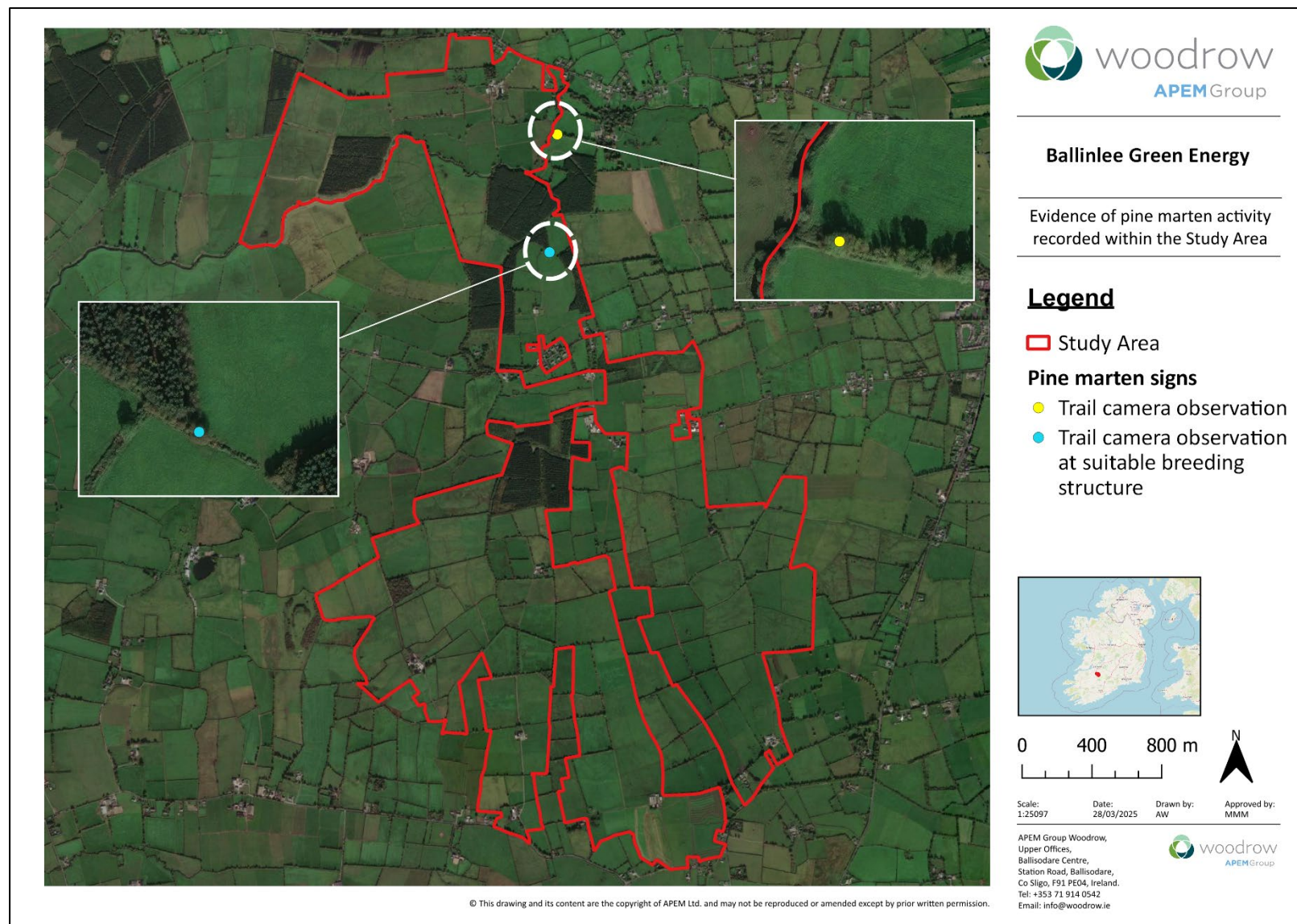


### 3.4.3. Pine marten

The NBDC database for the six 2 km Irish national grid squares in which the Study Area is located did not reveal any previous records of pine marten.

Pine marten were recorded at two locations via trail camera monitoring (Figure 12). With the exception of these two records, there were no direct sightings of pine marten or observations of any pine marten field signs, including prints and droppings, recorded during field surveys. One observation was along a treeline, marginally east of the Study Area, and the second observation was at a tree hollow. The tree hollow is situated along the periphery of coniferous plantation in the northern section of the Study Area and was identified as a potential pine marten den site due to the recent excavations made in the hollow. A trail camera was deployed to validate the status of this feature for pine marten. The trail camera recorded pine marten (Plate 27) moving up and down the tree on two occasions (23 and 25 March 2024). A pair of blue tits were regularly recorded entering and exiting the tree hollow, indicating that pine marten were recorded hunting rather than using this feature as a den site. Notwithstanding this, a precautionary approach has been taken and the tree hollow, whilst not in use by breeding pine marten at the time of field surveys, cannot be ruled out as a potential den site in the future. Elevated arboreal cavities are preferred structures in which to construct their dens, as they offer pine martens effective insulation and protection from predators such as foxes (Birks *et al.* 2005). While there is ample woodland habitat within the Study Area, most of this is comprised of immature woodland and conifer plantations which typically do not possess many tree cavities/hollows etc. that are preferable for pine marten dens.

Given that pine marten were recorded, the presence of suitable woodland habitat, and its Annex IV protected status, it is considered likely that the Study Area and surrounding area supports a population of pine marten that is of Local (Higher) importance. As such pine marten is a key ecological feature and will be brought forward into the impact assessment stage.



**Figure 12: Pine marten signs recorded at the Study Area**

#### **3.4.4. Other mammals**

Figure 13 provides locations where evidence of other mammal activity was recorded at the Study Area.

##### **3.4.4.1. Irish Hare (*Lepus timidus hibernicus*)**

The NBDC database for the six 2 km Irish national grid squares in which the Study Area is located did not reveal any previous records of Irish hare.

There were no sightings of Irish hare during field surveys in 2023 and 2024 nor were any field signs recorded. However, the Study Area is considered as having suitable resting and breeding habitat for this species.

##### **3.4.4.2. Irish stoat (*Mustela erminea Hibernica*)**

The NBDC database for the six 2 km Irish national grid squares in which the Study Area is located did not reveal any previous records of Irish stoat.

A trail camera deployed at an active badger sett entrance recorded footage of one stoat moving in front of the sett entrance.

##### **3.4.4.3. Hedgehog (*Erinaceus europaeus*)**

The NBDC database for the six 2 km Irish national grid squares in which the Study Area is located revealed previous records of hedgehog from grid square, R53Y, with the most recent record from 2017.

There were no sightings of hedgehog during field surveys in 2023 and 2024 nor were any field signs recorded. However, the Study Area is considered as having suitable resting and breeding habitat for this species.

##### **3.4.4.4. Pygmy shrew (*Sorex minutus*)**

The NBDC database for the six 2 km Irish national grid squares in which the Study Area is located did not reveal any previous records of pygmy shrew.

There were no sightings of pygmy shrew during field surveys in 2023 and 2024 nor were any field signs recorded. However, the Study Area is considered as having suitable resting and breeding habitat for this species.

##### **3.4.4.5. Red squirrel (*Sciurus vulgaris*)**

The NBDC database for the six 2 km Irish national grid squares in which the Study Area is located did not reveal any previous records of red squirrel.

There were no sightings of red squirrel during field surveys in 2023 and 2024 nor were any field signs recorded. The Study Area was considered to have limited suitable habitat for this species which requires areas of extensive, connected woodland.

##### **3.4.4.6. Fox (*Vulpes vulpes*)**

Signs of fox primarily in the form of scat and numerous mammal trails were recorded across the Study Area during mammal surveys in August and September 2023 as well as during targeted otter surveys in 2024, with one individual seen during the former.

### **3.4.4.7. Invasive mammal species**

#### **3.4.4.7.1. American mink (*Neogale vison*)**

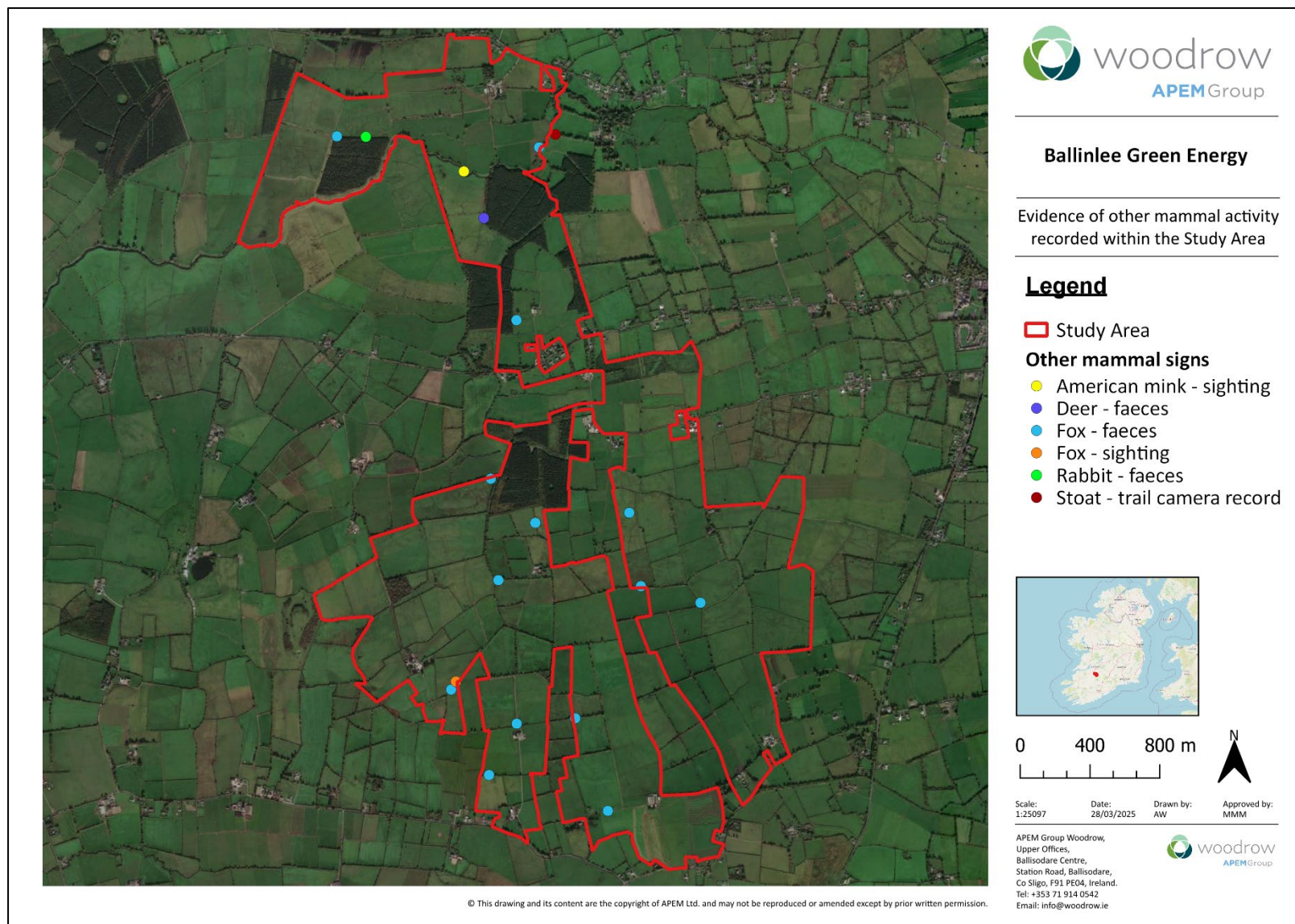
During otter surveys along the Morningstar River on 11 March 2024, an American mink was sighted resting along the bank of the river before being flushed from the area where it moved downstream to the west. This species is classified as a High Impact Invasive Species<sup>33</sup>.

No other invasive fauna species were recorded during surveys, including those returned during the desk study, as listed in Table 8, which are grey squirrel (*Sciurus carolinensis*), rabbit (*Oryctolagus cuniculus*) and, fallow deer (*Dama dama*).

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<sup>33</sup> <https://invasives.ie/about/irelands-invasive-species/>





**Figure 13: Other mammals recorded at the Study Area**



### **3.5. Turbine Delivery Route (TDR) and Grid Connection Route (GCR) options**

#### **3.5.1. Habitats**

The proposed Turbine Delivery Route (TDR) comprises an existing road network and adjacent associated habitats. The areas potentially affected by works along the proposed TDR to facilitate turbine access, in terms of temporary verge strengthening and creation of turning area, comprise a mosaic of BL1 Stone walls and other stonework, GS2 Dry Meadows and Grassy Verges, GA1 Improved Agricultural Grassland. Some minor works, such as tree trimming are likely to be required in habitats comprising WL1 Hedgerows and WL2 Treelines.

To facilitate the turbine delivery there will be one section of new temporary access track constructed. This is proposed to cross lands within the townland of Tullovin approximately 3.3 km southeast of Croom, Co. Limerick. Habitats in this area consist of hedgerows and improved agricultural grassland, see Figure 14. A section of stone wall (c. 20 m long) will be temporarily removed at this location and will be reinstated upon completion of turbine component transport. This stone wall is concreted, and vegetation (primarily ivy) covers the entire surface of the wall.

The proposed GCR from the existing 220/110 kV Killonan Substation follows the N24 in a westerly direction and then proceeds along the L1171 for a short distance to the intersection with the L1170 (Ballysimon Commons Road) going south until it intersects with the R512. It then follows south along the R512 through Ballyneety to Hollycross, then west onto the L1412 road, then south along the L8011 road to the R516 where it turns west towards the proposed site entrance. Terrestrial habitats primarily consist of GA1 improved agricultural grassland, BL3 buildings and artificial surfaces, WL1 hedgerows and WL2 treelines along the route. A total of 19 watercourses, primarily in the form of drainage ditches, will be crossed on this route, with one of these corresponding to FW2 depositing lowland rivers (Sixmile Bridge).

#### **3.5.2. Invasive alien plant species**

Several invasive species were identified along the length of the GCR, including several stands of winter heliotrope *Petasites pyrenaicus* and Japanese knotweed. The locations of these are provided in Figure 14.

#### **3.5.3. Mammals**

Mammal activity was noted in some areas along the TDR and GCR, mainly in the form of trails that were present on either side of the road, showing that mammals cross over the routes. However, no evidence of badger setts or other mammal burrows were found along the TDR and GCR.

Mammal trails and paths were recorded along the TDR from Croom to the proposed site entrance, however no mammal resting places/burrows were recorded during surveys. The TDR from Croom includes four watercourse crossings. Three of these were considered suitable for otter or able to sustain an otter population, namely the watercourse crossings over the Camoge River, the Killorath stream and the Glenbevan stream. Surveys yielded evidence of otter within the vicinity of the Killorath stream in the form of a slide leading from the nearby road into the stream.

The proposed GCR includes seven major watercourse crossings. However, only one of these was considered suitable for otter or able to sustain an otter population, namely the Sixmile Bridge crossing over the Camoge River. This area, where accessible, was assessed for the presence of otter evidence and holts within the vicinity. Apart from a number of indistinguishable trails and potential otter slides (i.e. otter access point to a river or stream), there were no other signs indicative of otter activity recorded. No obvious holts were recorded. Despite this, habitat at watercourse crossings along the GCR were considered suitable for otter and as such presence of otter is assumed.

A walker observed an otter within one of the watercourses along the GCR (Pers. Comm, Local Resident, 2024). No other mammal signs were recorded during mammal surveys along the GCR.

Figure 14 provide the results of the TDR and GCR surveys.

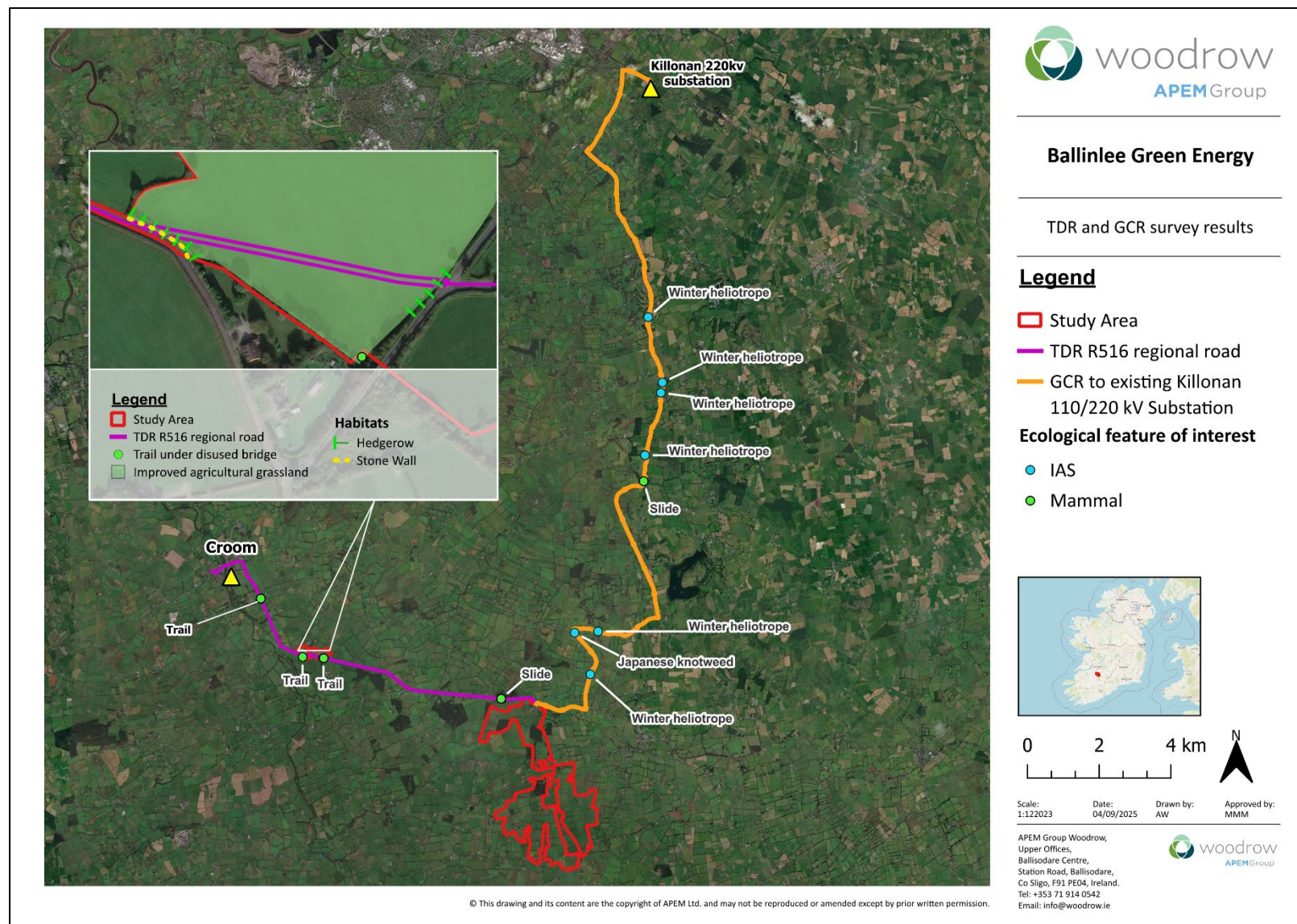


Figure 14: Results of TDR and GCR surveys

## 4. SUMMARY

### 4.1. Habitats

The majority of habitats recorded within the Study Area are comprised of GA1 Improved Agricultural Grassland, WL1 Hedgerows and FW4 Drainage ditches. No Annex I habitats were recorded. A summary of habitats recorded, and their ecological evaluation are shown in Table 16.

**Table 16: Ecological evaluation of habitats occurring at the Study Area**

| Habitat Code | Habitat classification (Fossitt, 2000) | Basis of Evaluation                                                                                                               | Highest Evaluation/Importance | IEF brought forward into impact assessment stage? Yes/No |
|--------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------|
| BL2          | Earth banks                            | Raised earthen banks in association with hedgerow and treeline features.                                                          | Local (Higher)                | Yes                                                      |
| BL3          | Buildings and artificial surfaces      | Various agricultural buildings and abandoned structures<br>Note: buildings were assessed separately for suitability as bat roosts | Local (Lower)                 | No                                                       |
| GA1          | Improved agricultural grassland        | Improved and grazed agricultural grassland sward. Low diversity.                                                                  | Local (Lower)                 | No                                                       |
| GS4          | Wet grassland                          | Species-poor example of this semi natural sward dominated by grasses and rushes.                                                  | Local (Lower)                 | No                                                       |
| FW2          | Depositing/lowland river               | Fourth Order Morningstar River with connectivity to Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA      | County                        | Yes                                                      |
| FW4          | Drainage ditches                       | Network of drainage ditches that connect with Morningstar River.                                                                  | Local (Higher)                | Yes                                                      |
| WD2          | Mixed broadleaved/conifer woodland     | Small areas of disconnected woodland providing important refuge for fauna.                                                        | Local (Higher)                | Yes                                                      |

| Habitat Code | Habitat classification (Fossitt, 2000) | Basis of Evaluation                                                                                                               | Highest Evaluation/Importance | IEF brought forward into impact assessment stage? Yes/No |
|--------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------|
| WD4          | Conifer plantation                     | Mature commercial coniferous forestry. Low diversity.                                                                             | Local (Lower)                 | No                                                       |
| WL1          | Hedgerows                              | Network of mature species rich hedgerows. This habitat is likely to support breeding birds, mammals, foraging and commuting bats. | Local (Higher)                | Yes                                                      |
| WL2          | Treeline                               | Mature species rich treelines. This habitat is likely to support breeding birds, mammals, foraging and commuting bats.            | Local (Higher)                | Yes                                                      |
| WS1          | Scrub                                  | Small areas of scattered scrub.<br>The habitat is likely to support breeding birds, mammals, foraging and commuting bats.         | Local (Higher)                | Yes                                                      |
| WS2          | Immature woodland                      | Areas of planted sessile oak and planted ash trees. Ash dieback ongoing in these areas.                                           | Local (Higher)                | Yes                                                      |
| WS3          | Ornamental/non-native shrubs           | In close association with private dwellings.                                                                                      | Local (Lower)                 | No                                                       |

## 4.2. Mammals

Mammal activity was recorded frequently throughout the Study Area during surveys. A summary of mammals recorded, and their ecological evaluation are shown in Table 17.

**Table 17: Ecological evaluation of mammals occurring at the Study Area**

| Important Ecological Features (IEF's) identified | Basis of Evaluation                       | Highest Evaluation/Importance | IEF brought forward into impact assessment stage? Y/N |
|--------------------------------------------------|-------------------------------------------|-------------------------------|-------------------------------------------------------|
| Badger                                           | Active and inactive badger setts recorded | Local (Higher)                | Yes                                                   |



|              |                                                                                                                                                                                                                                                |                |     |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----|
| Otter        | <p>Otter commuting and foraging along the Morningstar River.</p> <p>On basis of habitat suitability and trail camera footage, the Study Area is considered to contribute to the local otter population.</p>                                    | Local (Higher) | Yes |
| Pine marten  | <p>Pine marten foraging within the Study Area.</p> <p>On basis of habitat suitability and trail camera footage, the Study Area is considered to contribute to the local pine marten population.</p>                                            | Local (Higher) | Yes |
| Irish hare   | <p>No evidence of Irish hare recorded during field surveys.</p> <p>On basis of habitat suitability, the Study Area is considered to contribute to the local Irish hare population.</p>                                                         | Local (Higher) | Yes |
| Irish stoat  | <p>On basis of habitat suitability and trail camera footage, the Study Area is considered to contribute to the local Irish stoat population.</p>                                                                                               | Local (Higher) | Yes |
| Hedgehog     | <p>No evidence of hedgehog recorded during field surveys.</p> <p>On basis of habitat suitability and desk study records of species occurring within the area, the Study Area is considered to contribute to the local hedgehog population.</p> | Local (Higher) | Yes |
| Pygmy shrew  | <p>No evidence of pygmy shrew recorded during field surveys.</p> <p>On basis of habitat suitability, the Study Area is considered to contribute to the local pygmy shrew population.</p>                                                       | Local (Higher) | Yes |
| Red squirrel | <p>No evidence of red squirrel recorded during field surveys.</p> <p>On basis of limited habitat suitability, the Study Area is not considered to contribute to the local red squirrel population.</p>                                         | Local (Lower)  | No  |
| Fox          | <p>The wider area provides an abundance of suitable habitat for fox. Not specifically protected under wildlife legislation.</p>                                                                                                                | Local (Lower)  | No  |

## 5. DISCUSSION

Key ecological constraints that have been identified as a result of the habitat and mammal surveys, and that may be impacted on by the proposed wind farm development, are outlined below.

1. Habitat surveys across the Study Area did not yield any evidence of Annex I habitats. Several habitats have been identified as features of Local (Higher) ecological importance. The network of linear features (drainage ditches connecting to Morningstar River, species-rich hedgerows and treelines) that occur throughout the Study Area support a wide range of fauna in addition to providing commuting and foraging habitat for a number of species including bats, birds and larger terrestrial mammals. It will be important to maintain these linear features, where these linear features are fragmented a replanting schedule to maintain their connectivity across the Study Area is recommended.
2. Terrestrial mammal surveys confirmed the presence of active and inactive badger setts within the Study Area. Appropriate exclusion buffer zones of 50 m (150 m if blasting or pile driving are to be carried out) around confirmed badger setts will need to be implemented during construction to avoid disturbance to these species (NRA (Now TII), 2005b).
3. Pine marten and otter were confirmed to be utilising the Study Area for foraging and commuting purposes however, no confirmed breeding or resting sites were identified for either species, however a potentially suitable breeding site for pine marten was identified.
4. Apart from badger setts, several inactive mammal burrows were recorded across the Study Area; therefore it will be necessary to conduct pre-construction inspection surveys on these features to determine possible re-excavation and occupancy. If mammals, particularly badgers are found to be using these burrows prior to construction, a mitigation strategy will be employed involving the closure of these burrows in accordance with TII Guidelines.

## 6. REFERENCES

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## **APPENDIX I - Evidence for Technical Competence and Experience**

### **Maeve Maher McWilliams – Project manager**

Maeve Maher-McWilliams ACIEEM is an Associate Director with APEM Group Woodrow, an experienced ecologist who has worked for over twelve years on complex environmental impact assessments and mitigation design for development projects across Ireland, Northern Ireland and Scotland. Maeve has been involved in projects across several sectors such as renewable energy; linear infrastructure; flood relief schemes and port developments; tourism and recreation; residential, pharmaceutical and data centre development, providing advice and recommendations throughout the project lifetime, from inception and due diligence, right through the planning process and into post-planning compliance. As a project manager and field ecologist she carries out multidisciplinary surveys, habitat surveys, bat surveys, mammal surveys and specialises in ornithology surveys. She is also a skilled Ecological Clerk of Works.

#### Qualifications:

BSc (Hons) – Biological Sciences, Queen’s University Belfast, 2008

MSc – Evolutionary and Behavioural Ecology, University of Exeter, 2010

### **Adrian Walsh – Ecologist**

Adrian is an Ecologist with APEM Group Woodrow. He has completed an honours BSc with a focus on Zoology and an MSc in Wildlife Conservation and Management at University College Dublin. He is a Qualifying Member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Adrian had developed proficiencies in ornithological and terrestrial mammal surveying in addition to advanced habitat, bat and invertebrates monitoring. Adrian regularly contributes to Appropriate Assessment and Ecological Impact Assessment reports. He volunteers as a surveyor for Birdwatch Ireland for the Irish Wetland Bird Survey (I-WeBS) and the Countryside Bird Survey (CBS) and is a Qualifying Member of CIEEM.

#### Qualifications:

BSc (Hons) Zoology. University of Galway. 2018

MSc Wildlife Conservation and Management. University College Dublin. 2020

### **Kevin O’Reilly – Ecologist**

Kevin O’Reilly obtained a First Class Honours degree in Business and Law at University College Dublin before training and qualifying as a Solicitor with the Law Society of Ireland. He is currently completing a master’s research project in environmental management and GIS with Ulster University with a focus on bats and street lighting. Kevin has also undertaken several volunteer projects to gain valuable experience in habitat surveying techniques and knowledge of environmental management and the flora and fauna of protected species in Ireland and abroad. Since joining Woodrow, Kevin has undertaken bat surveys including static detector deployment and roost surveys and worked on a number of large-scale developments. Kevin is a qualifying member of CIEEM and holds a full bat derogation license issued by NPWS (DER/BAT 2023-100).

#### Qualifications:

BBL Bachelor of Business and Law. University College Dublin, 2016

Professional Practice Courses I & II. The Law Society of Ireland, 2019

PgDip Environmental Management with GIS. Ulster University, 2023

### **Conn Barry - Ecology Support and Data Officer**

Conn Barry is an Ecology Support and Data Officer with APEM Group - Woodrow, holding a Master's in Environmental Resource Management from University College Dublin (UCD). He has diverse experience in organising and conducting ecological surveys, including bat roost and Phase 1 surveys, and managing data for wind farms. Proficient in GIS, he creates site maps and bird flightline maps using QGIS and ArcGIS Pro. A Qualifying member of CIEEM, Conn is actively involved in health and safety procedures and has participated in various bird conservation programs.

#### Qualifications:

MSc Environmental Resource Management. University College Dublin (2021)

#### Former Woodrow Staff that worked on the Project:

### **Rachel Irwin – Senior Agri-Ecologist**

Rachel Irwin, BSc (Hons), QCIEEM. is an Agri-ecologist who has more than six years' professional experience working within the environmental sector in both Ireland and the UK. She holds a PhD awarded through the Teagasc Walsh Scholarship Programme with her research focusing on promoting agroforestry uptake on Irish dairy and drystock farms by engaging farmers and stakeholders and by fostering behavioural change. Rachel also has a proven track-record in communicating and negotiating with farmers on conservation matters including liaising with governments, groups and communities. As part of Woodrow, Rachel also undertook botanical surveying and monitoring in conjunction with protected species surveys such as bats, otter, badger, red squirrel and herptofauna. She has also presented the findings of her PhD research at various national and international conferences and is competent in report writing, having published various publications in peer-reviewed scientific journals.

#### Qualifications:

BSc (Hons) Zoology with Conservation. Bangor University. 2018

Level 6 Specific Purpose Certificate in Farming. Teagasc (Distance Ed.). 2022

PhD Walsh Scholar. University College Dublin. 2020-Present



## APPENDIX II – Habitats Recorded Within the Study Area



**Plate 1: Hedgerow with hawthorn and wild cherry**



**Plate 2: Hedgerow with hawthorn and apple spp.**





**Plate 3: Mature treeline bordering improved agricultural grassland**



**Plate 4: Mature treeline with drainage ditch on either side**





**Plate 5: Earth bank habitat**



**Plate 6: Improved agricultural grassland at the southern section of the Study Area**





**Plate 7: Improved agricultural grassland in the northern section of the Study Area**



**Plate 8: Wet grassland habitat**





**Plate 9: The Morningstar River is classified as a depositing/lowland river**



**Plate 10: Examples of drainage ditches found within the Study Area**



**Plate 11: Mixed broadleaved/conifer woodland**



**Plate 12: Conifer plantations found within the Study Area**





**Plate 13: Immature woodland**



**Plate 14: Scrub habitat**





**Plate 15: Ornamental/non-native shrubs**

## APPENDIX III – Badger Setts

**Table 18: Details of sett entrances, including location and description of sett entrances and trail camera deployments result.**

| Coordinates (lat, long) | Deployment period       | Description of area                                                                        | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded                         | Results of deployment                                                                                    | Photo evidence                                                                                                          |
|-------------------------|-------------------------|--------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 52.481197, -8.587128    | 12.09.2023 – 11.10.2023 | Sett 1, Entrance (i)<br>Active sett entrance – part of subsidiary sett complex in the NE.  | 32x22 cm                          |   | Badger, otter, pine marten, stoat, mouse | 49 badger observations, one confirmed sett entry. No exit recorded so likely left via separate entrance. | <br>13/09/2023 07:19 02°C (SPYPOINT) |
| 52.481167, -8.586515    | NA                      | Sett 1, Entrance (ii)<br>Active sett entrance – part of subsidiary sett complex in the NE. | 50x30 cm                          |  | N/A                                      | No deployment                                                                                            | None.                                                                                                                   |



| Coordinates (lat, long) | Deployment period       | Description of area                                                                                       | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded               | Results of deployment                                                                     | Photo evidence                                                                       |
|-------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 52.481167, -8.586515    | 12.09.2023 – 11.10.2023 | Sett 1, Entrance (iii)<br><br>Active sett entrance. – part of subsidiary sett complex in the NE.          | 50x30 cm                          |   | Badger, field mouse            | Three badger observations. Badger exiting sett recorded – confirmed active sett entrance. |   |
| 52.480972, -8.585081    | 12.09.2023 – 11.10.2023 | Sett 1, Entrance (iv)<br><br>Active sett entrance in treeline – part of subsidiary sett complex in the NE | 26x26 cm                          |  | Field mouse, brown rat, badger | Unknown animal knocks equipment over.                                                     |  |



| Coordinates (lat, long) | Deployment period       | Description of area                                                                                         | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded | Results of deployment                     | Photo evidence |
|-------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|------------------|-------------------------------------------|----------------|
| 52.480865, -8.584277    | NA                      | Sett 1, Entrance (v)<br>Inactive sett entrance – part of subsidiary sett complex within same treeline.      |                                   |   | N/A              | No deployment.                            | None.          |
| 52.479328, -8.592445    | 11.03.2024 – 16.04.2024 | Sett 2, Entrance (i)<br>Active sett entrance – Located between perimeter of woodland and Morningstar River. | 25x25 cm                          |  | Badger, otter    | Confirmed badger emergence from entrance. | N/A            |

| Coordinates (lat, long) | Deployment period     | Description of area                                                                       | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded | Results of deployment                                                 | Photo evidence                                                                      |
|-------------------------|-----------------------|-------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 52.47925, -8.592048     | 18.06.2024-28.06.2024 | Sett 2, Entrance (ii)<br><br>Deployed facing active burrow sett within immature woodland. | 25x25 cm                          |   | Badger           | 3 badger observations                                                 |  |
| 52.479268, -8.592154    | 18.06.2024-28.06.2024 | Sett 2, Entrance (iii)<br><br>Inactive sett entrance – at perimeter of immature woodland. | 26x28 cm                          |  | None             | No badger observations nor any other mammal entry/emergence observed. | N/A                                                                                 |

| Coordinates (lat, long) | Deployment period     | Description of area                                                                        | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded | Results of deployment                                                 | Photo evidence                                                                       |
|-------------------------|-----------------------|--------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 52.479312, -8.592243    | 18.06.2024-28.06.2024 | Sett 2, Entrance (iv)<br>Inactive sett entrance - at perimeter of woodland in grass patch. | 25x26 cm                          |   | None             | No badger observations nor any other mammal entry/emergence observed. | N/A                                                                                  |
| 52.479127, -8.592165    | 18.06.2024-28.06.2024 | Sett 2, Entrance (v)<br>Inactive sett entrance within immature woodland.                   | 30x20 cm                          |  | Badger           | One badger observation. Did not enter or emerge from sett.            |  |



| Coordinates (lat, long) | Deployment period | Description of area                                                                                        | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded | Results of deployment | Photo evidence |
|-------------------------|-------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|------------------|-----------------------|----------------|
| 52.47942, -8.591505     | NA                | Sett 2, Entrance (vi)<br><br>Inactive sett entrance – c. 41 m NW of active sett entrance.                  | 28x24 cm                          |   | NA               | No deployment         | N/A            |
| 52.461862, -8.589791    | NA                | Sett 3, Entrance (i)<br><br>Inactive sett entrance – located within treeline between woodland and farmland | 22x18 cm                          |  | NA               | No deployment         | N/A            |



| Coordinates (lat, long) | Deployment period | Description of area                                                                                           | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded | Results of deployment | Photo evidence |
|-------------------------|-------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|------------------|-----------------------|----------------|
| 52.461862, -8.589791    | NA                | Sett 3, Entrance (ii)<br>Inactive sett entrance – directly beside entrance (i)                                | 20x18 cm                          |   | NA               | No deployment         | N/A            |
| 52.462033, -8.588181    | NA                | Sett 3, Entrance (iii)<br>Inactive sett entrance – along same treeline as entrance (i) and (ii) c. 110 m east | 28x24 cm                          |  | NA               | No deployment         | N/A            |

| Coordinates (lat, long) | Deployment period | Description of area                                                   | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded | Results of deployment | Photo evidence |
|-------------------------|-------------------|-----------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|------------------|-----------------------|----------------|
| 52.45955, -8.5927       | NA                | Sett 4<br>Entrance (i)<br>Active sett entrance with fresh spoil heap. | 30x25 cm                          |   | NA               | No deployment         | N/A            |
| 52.450719, -8.585145    | NA                | Sett 5,<br>Entrance (i)<br>Inactive sett entrance                     | 30x26 cm                          |  | NA               | No deployment         | N/A            |

| Coordinates (lat, long) | Deployment period       | Description of area                                                                                            | Approximate size of sett entrance | Sett entrance reference                                                             | Species recorded | Results of deployment                                                 | Photo evidence |
|-------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------|----------------|
| 52.453282, -8.57536     | NA                      | Sett 6, Entrance (i)<br>Active outlier sett entrance                                                           | 28x24 cm                          |   | NA               | No deployment                                                         | N/A            |
| 52.453945, -8.57352     | 12.09.2023 – 11.10.2023 | Sett 7, Entrance (i)<br>Active outlier sett entrance within mature hedgerow bordered by agricultural grassland | 30x22 cm                          |  | None             | No badger observations nor any other mammal entry/emergence observed. | N/A            |

| Coordinates (lat, long) | Deployment period       | Description of area                                                           | Approximate size of sett entrance | Sett entrance reference                                                            | Species recorded                      | Results of deployment                                                 | Photo evidence                                                                      |
|-------------------------|-------------------------|-------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 52.448038, -8.571702    | 12.09.2023 – 11.10.2023 | Sett 8, Entrance (i)<br>Inactive sett entrance on raised bank within hedgerow | 30x23 cm                          |  | Badger, fox, field mouse, pygmy shrew | Three badger passes recorded – no sett entrance / emergence recorded. |  |



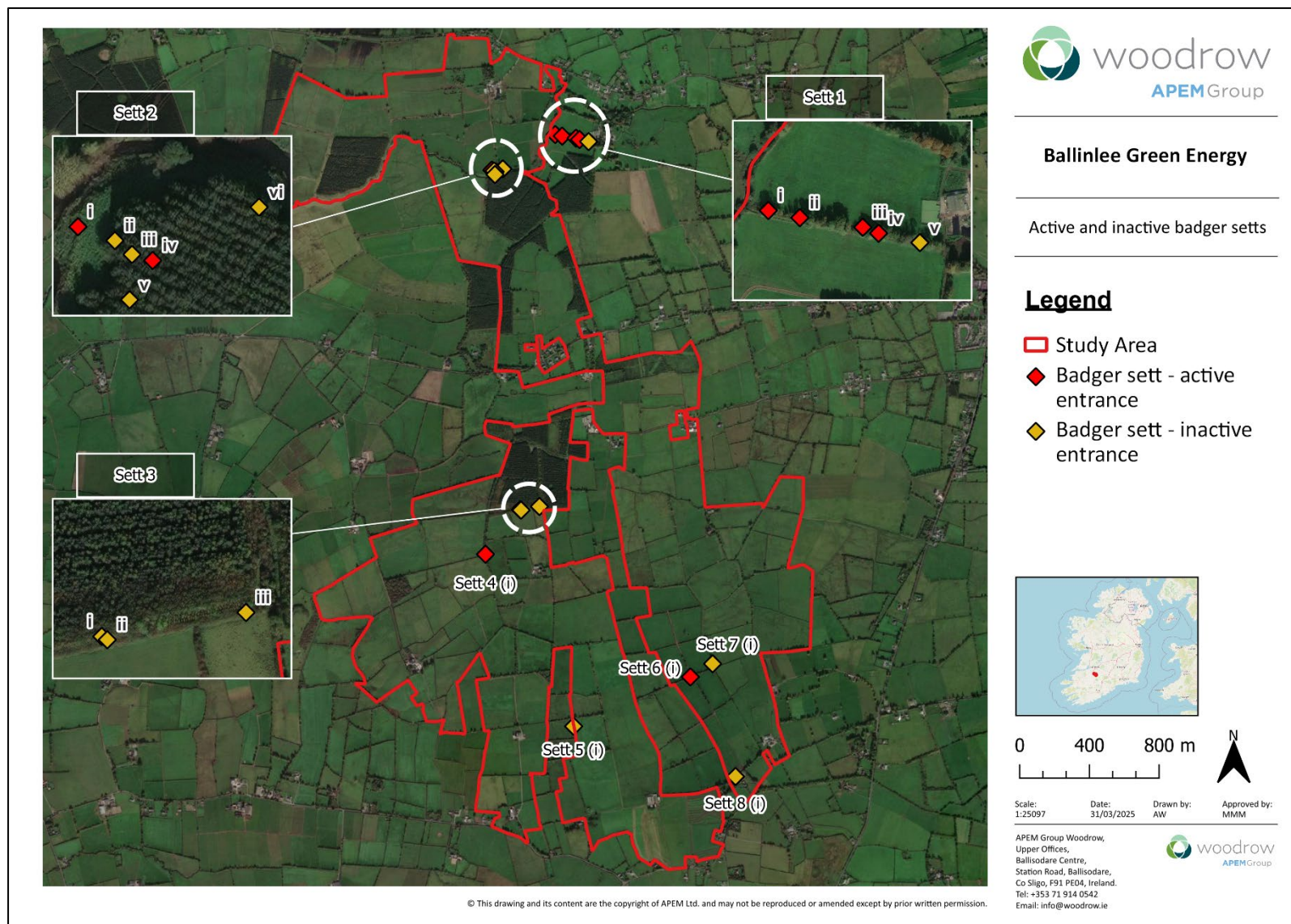


Figure 15: Badger setts recorded within the Study Area



## APPENDIX IV – Mammal Images



Plate 16: Badger in front of active sett



Plate 17: Badger present in front of active sett



Plate 18: Badger emerging from sett entrance



Plate 19: Badger present in sett entrance



Plate 20: Badger prints on mudbank  
(otter prints also present)



Plate 21: Badger latrine with fresh droppings



**Plate 22: Otter moving in front of active sett**



**Plate 23: Otter scent marking on riverbank**



**Plate 24: Otter spraint in vicinity of Morningstar river**



**Plate 25: Otter prints leading into river**



**Plate 26 (a) and (b): Pine marten investigating active badger sett entrance**





**Plate 27: Pine marten recorded beside tree with hollow**



**Plate 28: Stoat passing in front of active badger sett entrance**