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Natura Impact Statement

Ballynisky Wind Farm, County Limerick

Ballynisky Green Energy Limited

December 2025

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Appendices

Appendix 1 – Screening for Appropriate Assessment Report

Appendix 2 – Habitat Maps

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1. Summary of Findings

1.1 Natura Impact Statement

Project Title	Ballynisky Wind Farm
Project Proponent	Ballynisky Green Energy Limited
Project Location	The proposed development site is situated in the townlands of Ballynisky, Graigoor, Ballyegny More, Kilbradran, Ballysteen, Dunmoylan, Carrons and Lisbane to the west of Coolcappa in northwest County Limerick, approximately 6 kilometres northwest of Rathkeale and 9 kilometres north of Newcastle West.
Natura Impact Statement	In cases where an Appropriate Assessment is required, a Natura Impact Statement (NIS) is prepared and includes a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any adverse impacts a project may have, either individually or in combination with other plans or projects, on the integrity of a European site(s) in view of the conservation objectives of the site(s).
Conclusion	For the reasons set out in detail in this NIS, and based on best scientific knowledge, the proposed development will not, either alone or in combination with other plans and projects, adversely affect (directly or indirectly) the integrity of three identified European sites, namely the Lower River Shannon SAC, the River Shannon and River Fergus Estuaries SPA, and the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA considering the specific conservation objectives of each site. The NIS contains information which the competent authority may consider in making its own complete, precise and definitive findings and conclusions, and upon which the competent authority is capable of determining that all reasonable scientific doubt has been removed as to the effects of the project on the integrity of the relevant European sites. Provided that the mitigation measures are implemented in full, it is considered that the proposed development, either individually, or in combination with other plans/projects, will not affect the integrity of the following three European sites, or any other European site: ▪ Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161) ▪ Lower River Shannon SAC (0021650) ▪ River Shannon and River Fergus Estuaries SPA (004077)

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2. Introduction

2.1 Purpose of the Assessment and Legislative Context

Appropriate Assessment (AA) is the consideration of the impact of a project on the integrity of a European site[1], either alone or in combination with other plans or projects, with respect to the site's ecological structure and function, and in view of the site's conservation objectives. The conservation objectives of European sites are site specific and based on the ecological requirements of the species and habitats present. They define the desired conservation condition of certain species and habitat types for the site. Conservation objectives are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, structure and function. The conservation objectives may be either to maintain or restore the favourable conservation condition of a habitat/species.

Article 6(3) of Directive 92/43/EEC stipulates that certain projects and plans must be subjected to an "appropriate assessment" of their effects on the integrity of European site(s). Article 6(3) provides in full:

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

A screening for Appropriate Assessment report was completed for the proposed Ballynisky Wind Farm to establish whether the project is likely to have a significant effect on any European sites. The screening for Appropriate Assessment report determined that a full Appropriate Assessment of the proposed development is required, as it could not be excluded based on objective information that the proposed development, individually or in combination with other plans or projects, will not have a significant impact on any European sites, in view of the sites' conservation objectives.

It was concluded that the proposed wind energy development at Ballynisky is likely to have a significant effect, or the potential for significant effects cannot be ruled out (at the screening stage), in the absence of mitigation on the following three European sites:

- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161);
- Lower River Shannon SAC (002165);
- River Shannon and River Fergus Estuaries SPA (004077).

Refer to **Appendix 1** of this document for the Screening for Appropriate Assessment report.

An Appropriate Assessment of the project is required; hence, this Natura Impact Statement (NIS) has been prepared to

[1] 'European sites' are defined in Section 177R of Part XAB of the Planning and Development Act 2000 and include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) at all stages of designation.

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1. Determine which individual qualifying features have the potential to be adversely affected by the Proposed Development
2. Provide information with regard to the Conservation Objectives and site-specific pressures and threats for those qualifying features that have the potential to be adversely affected.

The aim of the assessment is to provide a sufficient level of information to the competent authority on which to base their appropriate assessment of the project. Additionally, mitigation measures to avoid or reduce adverse ecological effects were considered. The proposed development is fully described in **Section 5.3**, below, and includes details on all elements of the development, particularly in relation to the aspects that could interact with the surrounding environment.

This NIS identifies the aspects of the proposed development that will interact with the ecological requirements or sensitivities of the habitats and species listed in **Sections 8.1.2, 8.2.2** and **8.3.2**, below, and determines whether these will result in adverse effects on the SAC and its QIs and on the SPAs and their SCIs for which the European sites listed above are designated. Mitigation measures to avoid or reduce ecological effects are provided in **Section 9**, below.

2.2 Statement of Competency

This Natura Impact Statement has been prepared by Úna Williams (BSc. MSc.), Senior Ecologist and Environmental Scientist. Úna has worked with Malachy Walsh and Partners (MWP) Engineering and Environmental Consultants for over six years. She is an experienced field ecologist familiar with various ecological survey methodologies including habitat/survey mapping and zoological surveys and has worked on research teams both in Ireland and abroad. She has undertaken assessments for a wide variety of projects including for renewable energy developments, and infrastructural and coastal developments. Úna has designed and completed several Collision Risk Models for proposed wind farms and has authored many ecological and environmental reports including Screenings for Appropriate Assessment Reports (Stage 1), Natura Impact Statements (Stage 2), Ecological Impact Assessments (EcIA), and Environmental Impact Assessments (EIA).

This report was reviewed by Hazel Dalton (BSc., BBus.), Principal Ecologist at MWP, and Gerard Hayes (BSc.), Senior Ecologist, formerly of MWP.

Hazel has over ten years' experience working at MWP since graduating with a first-class Honours Degree in '*Wildlife Biology*' from Munster Technological University (MTU) in 2015. Hazel is experienced in ecological surveying and impact assessment for AA and Environmental Impact Assessment Reports (EIAR). She has authored and contributed to numerous Screenings for AA, NIS and Ecological Impact Assessment (EcIA) reports. Hazel is an experienced field ecologist with a diverse ecological survey profile including habitats and flora, mammals, bats, birds and terrestrial invertebrates. She has held/holds National Parks and Wildlife Service (NPWS) Licences for small mammal trapping, tape lure/endoscope bird surveys, Kerry slug (*Geomalacus maculosus*) surveys, disturbance of bat roosts, photographing wild animals (badger and otter) at their resting/breeding places and undertaking bat surveys.

Gerard is a Senior aquatic ecologist formerly of MWP with over fifteen years' experience in environmental consultancy. He is a member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and the Freshwater Biological Association (FBA). Gerard has a diverse ecological profile - Phase 1 habitat, mammal (including bats), bird, amphibian, macroinvertebrate, and tree survey experience. He has had numerous responsibilities including waste assimilation capacity assessment, report writing (EIS, EIA, EA, AA, NIS) and ecological monitoring. His project involvement has been primarily in the areas of wind energy development, wastewater treatment plants, roads/bridges, water supply, flood defence and hydro schemes. He has co-authored and/or carried out surveys for NPWS Irish Wildlife Manual No. 15, 24, 26, 37, 45.

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Details of the appropriately qualified, trained and competent professionals that carried out the relevant ecological surveys for the assessment within this Natura Impact Statement are included in **Chapter 06 Biodiversity** and **Chapter 07 Ornithology** in **Volume III** of the EIAR.

2.3 Project Overview

Ballynisky Green Energy Limited ('the Applicant') is submitting a planning application for developing and operating a commercially viable six-turbine wind farm development on privately-owned lands at Ballynisky in County Limerick. For the purposes of this assessment, the 'proposed development' refers to all elements of the proposed wind energy project including all wind farm infrastructure, new on-site 38kV electrical substation, and two grid connection options – see **Section 5**, below, for further details on the characteristics of each element of the proposed development.

It is envisaged that the proposed six-turbine development will have an output of approximately 27MW (megawatts). The Applicant is seeking a 10-year permission to construct the development which, once commissioned, will have an expected operational life of no less than 35 years from the date of commissioning.

MWP was commissioned by the Applicant to complete a Screening for Appropriate Assessment Report and, if necessary, a Natura Impact Statement (NIS). MWP have also prepared an Environmental Impact Assessment (EIA) and an Environmental Impact Assessment Report (EIAR) that are submitted as part of the planning application.

3. Methodology

3.1 Appropriate Assessment Guidance

This NIS has been prepared in accordance with following guidance documents:

- The European Commission (EC) guidelines '*Assessment of plans and projects in relation to Natura 2000 sites - Methodological Guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*' (EC, 2021);
- The EC Notice '*Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*' (EC, 2019);
- The National Parks and Wildlife Service (NPWS) guidelines '*Appropriate Assessment of Plans & Projects - Guidance for Planning Authorities'* (DEHLG, 2010); and,
- The Office of the Planning Regulator (OPR) Practice Note '*Appropriate Assessment Screening for Development Management*' (OPR, 2021).

3.2 Consultation

A pre-planning consultation with Limerick City and County Council (LCCC) occurred on 10th November 2022. During the meeting, the Applicant and MWP presented an overview of the proposed development to LCCC that included details of the development's location, layout, constraints, traffic and access, and progress to date. The grid connection options, the turbine delivery route from Foynes Port, any potential visual impacts, public consultation, the Natura Impact Statement (NIS) and the Environmental Impact Assessment Report (EIAR) were also all discussed during the meeting.

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A second meeting was held with LCCC on 17th July 2024 whereby the proposed underground grid connection options were further discussed. A third pre-planning meeting was held with LCCC on the 18th December 2025.

On the 19th/22nd August 2022, the following statutory and non-statutory bodies were consulted, amongst others, in relation to the proposed development:

- Department of Housing, Local Government and Heritage (DoHLGH);
- Department of Environment, Climate and Communications (DoECC);
- Department of Agriculture, Food and the Marine (DoAFM);
- National Parks and Wildlife Service (NPWS);
- Geological Survey Ireland;
- An Taisce - The National Trust for Ireland;
- Bat Conservation Ireland (BCI);
- Inland Fisheries Ireland (IFI);
- BirdWatch Ireland;
- Irish Wildlife Trust;
- Irish Aviation Authority (both the Headquarters and the Shannon Centre); and
- Transport Infrastructure Ireland (TII) (formerly called the National Roads Authority (NRA)).

A full list of the organisations/groups consulted, copies of the consultation documents and the responses received are provided in **Appendix 1B** in **Volume III** of the EIAR.

In October 2022, the Applicant commenced public consultation on the proposed wind energy development prior to hosting a public consultation event on 7th December 2022 at Coolcappa Community Hall. Community members were encouraged to attend and use the opportunity to engage with Ballynisky Green Energy Limited to acquire further information regarding the proposed development. Community consultation has been ongoing since then.

3.3 Data Requests and Database Searches

The proposed development site lies within the Ordnance Survey Ireland (OSI) National Grid hectad[2] R24 (western side of site) and hectad R34 (eastern side of site). Concise and site-specific information on species records available in this hectad was retrieved from the NBDC on-line database and reviewed.

On 11th February 2022, a request was made to NPWS for Sensitive Data Access and for records of rare or protected species within a 5-kilometre radius of the proposed development site encompassing hectads R24 and R34, as well as smaller northern sections of hectads R23 and R33. Information was provided by NPWS on 17th February 2022. On 28th November 2022, an additional request was made to NPWS for Sensitive Data Access for hectads R24 and R34, and the information was provided by NPWS on 30th November 2022.

A data request was also submitted to Bat Conservation Ireland (BCI) on 21st January 2023 for the provision of bat records within a 10-kilometre radius of the proposed development site. All available records were provided by BCI on 24th January 2023.

Information received via the NPWS, BCI and the NBDC was used to help inform the impact assessment in relation to the proposal.

[2] Hectad - unit of land area measuring 10 km x 10 km.

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3.4 Desktop Study

To complete the NIS, certain information on the existing environment is required. A desktop study was carried out to collate information available on the proposed development site's natural environment. This comprised a review of relevant publications, data and datasets from the following sources:

- Ordnance Survey Ireland (OSI) aerial photography, 1:50000 mapping, GeoHive and online satellite imagery sources;
- National Parks and Wildlife Service (NPWS);
- National Biodiversity Data Centre (NBDC) (online map-viewer);
- Central Statistics Office (CSO) – Census of Agriculture (online);
- BirdWatch Ireland;
- Bat Conservation Ireland (BCI);
- Geological Survey Ireland (GSI) area maps (including Teagasc soil area maps);
- Environmental Protection Agency (EPA) water quality data and maps;
- Shannon International River Basin District (ShIRBD) datasets (Water Framework Directive);
- Inland Fisheries Ireland (IFI) online fish sampling reports and fish data;
- Review of requested records from NPWS Rare and Protected Species database;
- Limerick Development Plan (2022 – 2028)[3]; and
- Other sources and research listed in **Section 13**, below, and as footnotes throughout the report.

3.5 Study Area and Zone of Influence (ZOI) of the Proposed Development

The zone of influence (ZOI) for the proposed development is the geographical area over which construction and/or operation and/or decommissioning of the proposed wind farm has the potential to affect the receiving environment in such a manner as to significantly affect the Qualifying interests (QI) of a European site. The area over which ecological features may be affected by biophysical changes because of the proposed project and associated activities is likely to extend beyond the project site where, for example, there are ecological or hydrological links beyond the site boundaries (CIEEM, 2018). Consequently, and to ensure completion of an integrated assessment, the study area for this project included the entire proposed development site, its adjacent habitats and the downstream watercourses ecologically connected to them (see **Figure 1**, below).

For details on the Zone of Influence (ZOI) of the proposed development and the use of the Source-Pathway-Receptor (SPR) model in determining which European sites are further assessed, refer to **Section 8**, below.

[3] Limerick Development Plan 2022-2028 | Limerick.ie Accessed: 6th June 2025

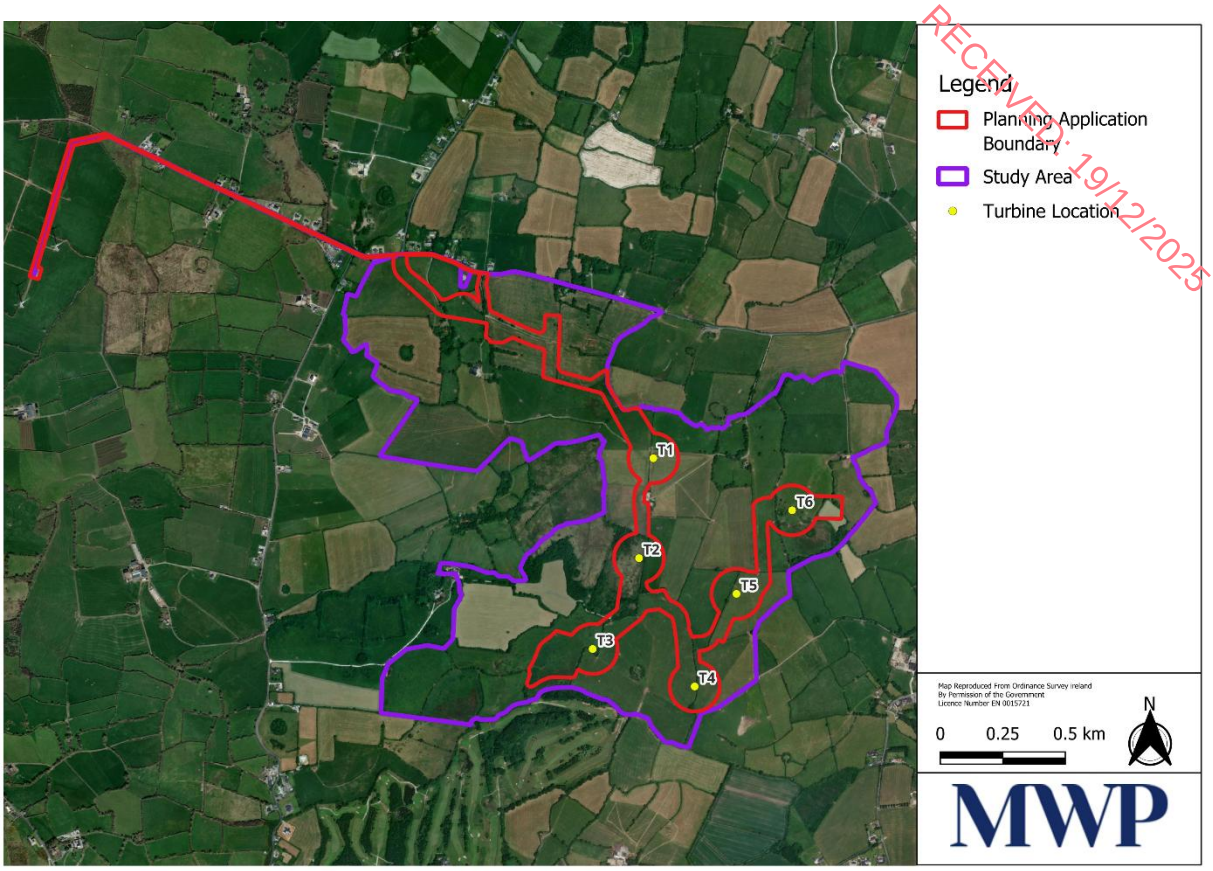

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Figure 1: Proposed development site boundary and study area of Ballynisky Wind Farm in County Limerick.

3.6 Field Surveys

Field surveys carried out on-site in support of this Natura Impact Statement include the following:

- Habitat surveys and mapping;
- Non-volant mammal[4] surveys;
- Invasive alien plant species (IAPS) surveys;
- Aquatic ecology surveys;
- Breeding bird surveys, including Vantage Point surveys; and
- Wintering bird surveys, including Vantage Point surveys.

Full details of all surveys and methodologies have been presented in **Chapter 06 Biodiversity** and **Chapter 07 Ornithology**, in Volume II of the EIAR. The results of the surveys listed above are summarised in **Section 4.2**, below.

Ecological field surveys and aquatic ecology surveys were undertaken at different locations within the proposed development site on multiple dates between 2020 and 2025 to establish the site's ecological features and resources and to identify any that may potentially be impacted by the proposed development, particularly any rare or protected species and habitats. Surveys were undertaken by MWP ecologists with the assistance of external consultants/field surveyors.

[4] Non-volant mammals are land-based mammals incapable of flight i.e. all land-based mammals excluding bats.

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Habitats recorded were classified according to Fossitt '*A Guide to Habitats in Ireland*' (2000). Non-volant mammals and/or evidence of their activity such as prints, faecal pellets/droppings, burrow-holes/dens and food caches, activity trails and disturbed vegetation were looked for during walkover surveys. In general, the Mammal Society publication '*How to Find and Identify Mammals'* by Muir *et al.* (2013) was followed. Evidence of otter was looked for at any watercourse/drain crossings encountered and '*Monitoring the Otter* Lutra lutra' (Chanin, 2003a) and '*Ecology of the European Otter*' by Chanin (2003b) were consulted for guidance on identification of otter signs including spraints, footprints, tracks, couches, and holts.

3.6.1 Aquatic Ecology Surveys

Aquatic ecology field surveys and water sampling were undertaken at fifteen representative sites on watercourses at locations detailed in **Figure 2** and **Table 1**, below, within and downstream of the proposed development site. For a description of the aquatic habitats of the watercourses within and around the proposed development site and the physical characteristics of the aquatic ecology survey sites, refer to **Section 4.2.7.1**, below.

The majority of the field work was carried out during the summer months of 2022 - from 14th to 21st June, and on 11th July and 15th August. Supplemental visual surveys were carried out on 23rd April 2024. Additional water samples were taken from survey sites on 16th/17th January 2025 and then sent to the laboratory at Southern Scientific Services at Farranfore in County Kerry for comprehensive ex-situ water quality analyses to assess key physico-chemical parameters.

For each of the fifteen survey sites some/all of the following surveys were completed, depending on the suitability/accessibility of the survey site and flow conditions (see **Table 1**, below, for details of which surveys were carried out at each survey site):

- Evaluation of aquatic habitats;
- Fish survey;
- Biotic assessment using aquatic macroinvertebrates;
- Water sampling for analysis of physico-chemical water quality parameters.

For site photographs of survey locations and further details on survey methodologies, refer to **Chapter 06 Biodiversity** of Volume II, and the Aquatic Ecology Survey Report in **Appendix 6C** of Volume III, of the EIAR.

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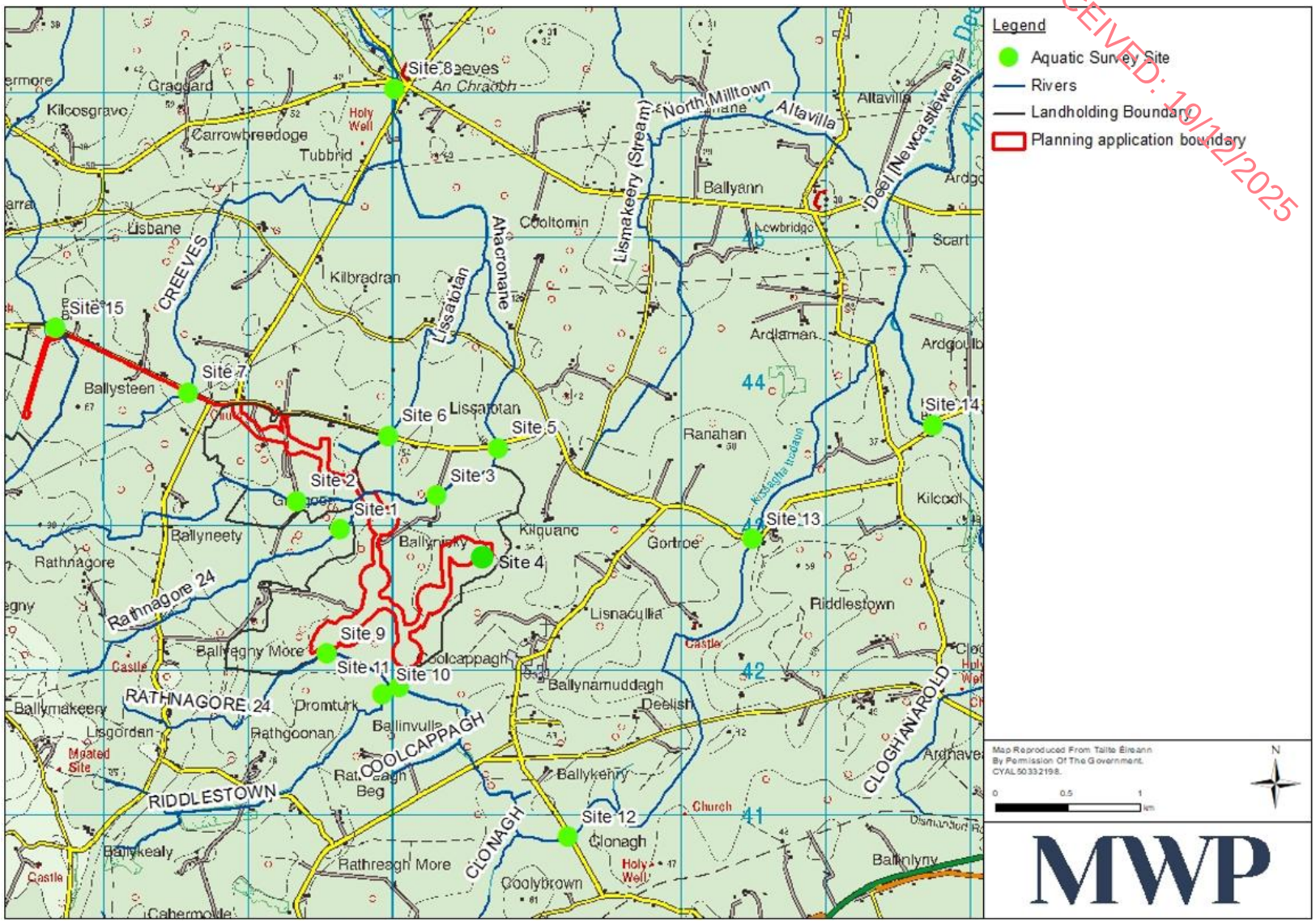

Figure 2: Watercourses and aquatic survey sites examined as part of the freshwater aquatic ecology studies for the proposed Ballynisky Wind Farm.

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Table 1. Summary details of aquatic ecology surveys of watercourses draining the proposed development site at Ballynisky in County Limerick.

Hydrometric Area	Sub-basin	Site No.	Watercourse	River Segment Code	Watercourse Order	Coordinates (ITM)		Surveys Undertaken			
						X	Y	Aquatic habitats assessment	Fish survey	Biological sampling	Physico-chemical sampling
24 – Shannon Estuary South	Ahacronane_010	1	Rathnagore_24 (24R40)	24_1465	1st	529610	643026	✓	✓	✓	✓
		2	Ahacronane River	24_1590	1st	529308	643228	✓	✓	✓	✓
		3	Ahacronane River	24_1521	2nd	530261	643257	✓	✓	✓	✓
		4	Ballynisky Pond	n/a*	-	530512	642787			✓	
		5	Ahacronane River	24_1521	2nd	530699	643607	✓	✓	✓	✓
	Ahacronane_020	6	Lissatotan	24_1520	1st	529934	643681	✓	✓	✓	✓
		7	Creeves	24_996	1st	528549	643979	✓			
		8	Ahacronane River	24_855	2nd	529990	646122	✓	✓	✓	✓
	Deel (Newcastlewest) _130	9	RATHNAGORE 24 (24R22)	24_1414	1st	529517	642166	✓	✓	✓	✓
		10	Riddlestown	24_1323	2nd	529907	641882	✓	✓	✓	✓
		11	Riddlestown	24_1320	2nd	529308	643228	✓	✓	✓	✓
		12	Riddlestown	24_1316	2nd	530010	641936	✓	✓	✓	✓
		13	Riddlestown	24_1070	2nd	532462	642957	✓			✓
		14	Deel (Newcastlewest)	24_1579	6th	533715	643719	✓			✓
	Dooncaha Stream_010	15	Knockardnacorlan	24_1097	2nd	527639	644419	✓			✓

* Waterbody not registered on EPA/OSI databases

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3.6.2 Ornithological Surveys

Ornithological field surveys were undertaken at the proposed development site from April 2020 to March 2025, inclusive (60 months in total), divided into the following ten survey periods comprising six months each:

- Breeding (summer) 2020 (April to September, inclusive);
- Winter 2020/21 (October to March, inclusive);
- Breeding (summer) 2021 (April to September, inclusive);
- Winter 2021/22 (October to March, inclusive);
- Breeding (summer) 2022 (April to September, inclusive);
- Winter 2022/23 (October to March, inclusive);
- Breeding (summer) 2023 (April to September, inclusive);
- Winter 2023/24 (October to March, inclusive);
- Breeding (summer) 2024 (April to September, inclusive); and,
- Winter 2024/25 (October to March, inclusive).

There were two main elements to the bird surveys –

1) Vantage point (VP) surveys, and

2) Targeted abundance and distribution surveys that included:

- Walkover transect surveys;
- Hen harrier (*Circus cyaneus*) roost surveys;
- Hinterland surveys;
- Breeding raptor surveys;
- Wintering waterfowl distribution surveys; and
- Breeding wader surveys.

Prior to the commencement of survey work, a list of target species was determined, and these became the focus of the surveys. Target species are typically those species that are afforded a higher level of legislative protection, or which are more sensitive to potential impacts from wind farm developments by virtue of their behaviour (SNH, 2017). The target species list was drawn from:

- Annex I of the Birds Directive (2009/147/EC)[5].
- Special Conservation Interest (SCI) species for which Special Protection Areas (SPA) within 15 kilometres of the proposed development site are designated;
- Fourth Schedule species protected under the Wildlife Acts 1976-2012 (as amended) (buzzards, eagles, falcons, harriers, hawks, kites, osprey, owls); and

[5] Annex I of the Birds Directive (2009/147/EC) lists 194 species and sub-species of birds that are particularly threatened. EU Member States must designate Special Protection Areas (SPAs) for them and all migratory bird species.

- Red-listed Birds of Conservation Concern (BoCCI) 2020-2026[6].

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Summary details of survey methodologies are outlined in the following sub-sections with results summarised in **Section 4.2.8**, below. Full details of survey methodologies and results are in **Chapter 07 Ornithology** of Volume II.

3.6.2.1 Vantage Point Surveys

Monthly vantage point (VP) surveys were carried out by suitably qualified personnel for all ten survey seasons from April 2020 to March 2025, inclusive, to record bird activity throughout the site, including flight activity by target species. Two VP locations were chosen to ensure maximum visibility of the airspace over the proposed development area as shown in **Figure 3**, below. Irish Transverse Mercator (ITM) grid co-ordinates for VP locations are listed in **Table 2**, below.

The VP survey design was based on the guidelines '*Recommended bird survey methods to inform impact assessment of onshore wind farms*' (SNH, 2017). Two VP survey watches, each lasting three hours, were carried out at each VP location every month resulting in a total vantage point survey effort of twelve hours per month.

Table 2. Irish Transverse Mercator (ITM) grid co-ordinates of vantage point (VP) survey locations at the proposed Ballynisky Wind Farm site.

Vantage Point	ITM Grid Co-ordinates (X, Y)
1	528736, 642245
2	530115, 643612

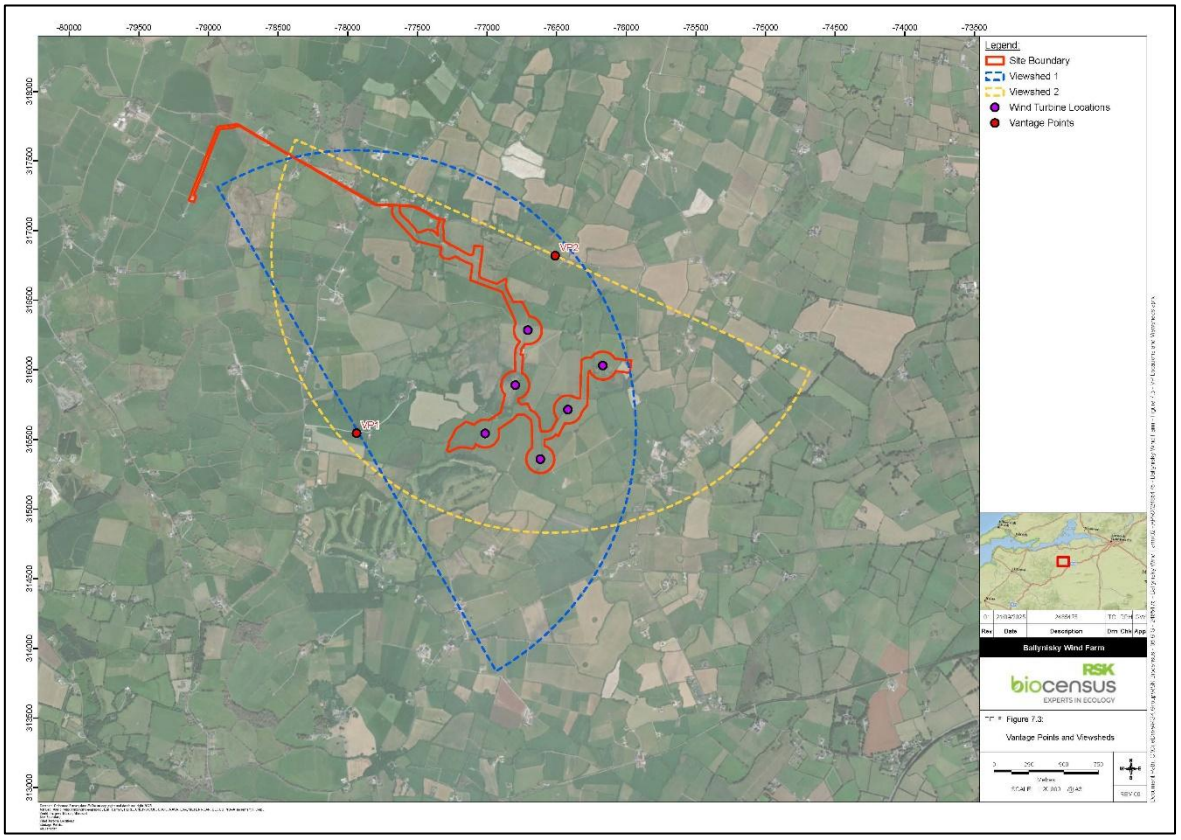

Figure 3: Vantage Point (VP) survey locations at Ballynisky and the viewshed arc of each.

[6] Factor determined by most recent listing of species on the BOCCI list (Gilbert *et al.*, 2021). All commonly occurring species are given a status of Red (high concern), Amber (medium concern) or Green (all other species), depending on a combination of threat categories.

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During VP surveys, the flight behaviour of target species was recorded. At the time of each individual observation the following information was recorded:

- The time at which the bird(s) was first detected;
- Duration (seconds) of flight spent within flight height categories/bands (0-20m, 20-50m, 50-100m, 100-180m and >180m) (if observed not flying e.g. perched, location and length of time visible was recorded);
- Estimation of actual flight height in metres;
- Sex and age of the bird(s) (adult/juvenile), where possible to determine;
- Species and number of individuals observed within the flight;
- Type of activity/behaviour exhibited by the bird(s) e.g. hunting, flying, displaying, perched, etc; and
- Habitat(s) in which the bird(s) was present.

Once an initial sighting was made, the individual(s) was observed until lost from view and the flight path recorded on enlarged Discovery series maps. All other non-target species were also recorded during VP surveys, where it did not infringe on recording of target species flight data.

3.6.2.2 Distribution and Abundance Surveys

3.6.2.2.1 *Transect Surveys*

A transect survey is a survey along a defined route within the study area. The overall aim of the transect surveys was to assess general bird distribution throughout the site and to record supplementary information on bird populations within 500 metres of the site. Initially, one transect route (Transect A) was selected to ensure representative coverage of all open and closed habitats occurring within the site boundary, and this route was surveyed between three and five times per season for the period April 2020 to August 2022, inclusive.

For the survey period October 2022 to March 2025, three extra transect survey routes - Transects B, C, and D - were added to ensure greater site coverage of habitats. All four transect routes were each then surveyed between three and six times per season for the final five survey seasons - refer to **Figure 4**, below, for survey routes.

During each transect survey, all bird species seen or heard, typically within 100 metres of the route, were recorded, although the topography of the landscape often allowed for the detection of birds at greater distances. Transect routes were interspersed with stops, during which the ornithologist scanned for birds using optical equipment. Transect surveys were undertaken at different times of day, ensuring different areas of the site were surveyed at a range of times and therefore aiding the recording of species that are active at varying times of day.

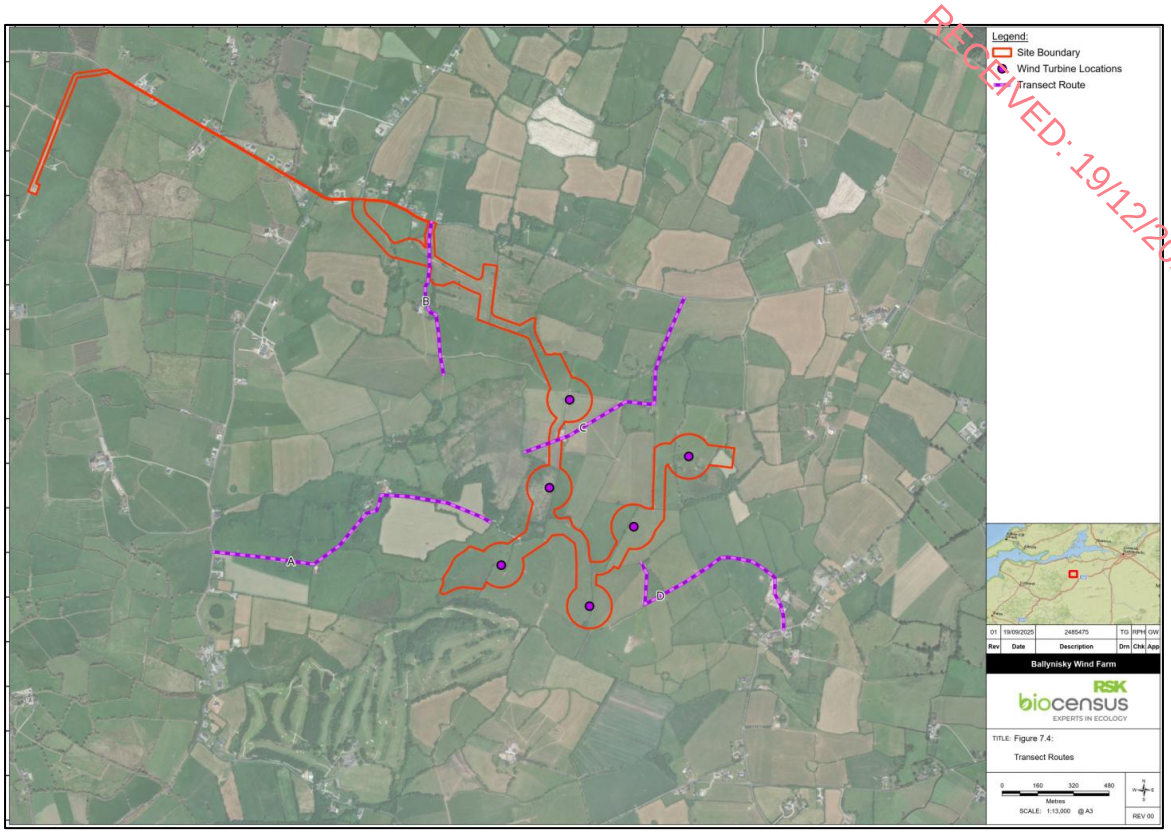

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Figure 4: Routes of Transects A, B, C, and D within the proposed Ballynisky Wind Farm site.

3.6.2.2.2 *Hen Harrier Roost Surveys*

Best practice guidance recommends that surveys be carried out for hen harrier roost sites located within two kilometres of wind farm sites (SNH, 2017). In addition, hen harriers have a maximum foraging range of ten kilometres but an optimal foraging range of five kilometres (SNH, 2016). Based on these distances and after a comprehensive analysis of potential roosting habitats within the hinterland, areas at Carrigkerry Bog (approximately six kilometres west of the proposed development site) were subject to specific surveys in reference to best practice hen harrier winter roost survey guidance (O'Donoghue, 2019). No additional areas requiring detailed hen harrier roost surveys were identified.

Twelve hen harrier roost surveys were carried out as detailed in **Table 3**, below. For each survey, a suitably experienced ornithologist scanned suitable habitat and potential roost sites from a suitable vantage point for at least two hours per survey. Any observations of hen harrier or other relevant target species were recorded and mapped.

Table 3. Summary details of hen harrier roost surveys completed at Carrigkerry Bog.

Survey Period	Number of Hen Harrier Surveys Completed
Winter 2022/23	3 (November, February, March)
Summer 2023	3 (April, May, June)
Winter 2023/24	5 (October, December, January, February, March)
Winter 2024/25	1 (November)

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3.6.2.2.3 *Breeding Raptor Surveys*

To provide supplementary information on breeding raptor activity within the landscape surrounding the proposed development site, breeding raptor surveys were carried out at suitable habitat situated within two kilometres and five kilometres of the proposed development site during the breeding seasons of 2023 and 2024, respectively. Surveys were carried out on 15th May, 16th June, and 17th July 2023, and 3rd May and 5th June 2024 during which any observations of raptors were recorded and mapped with emphasis on the recording of breeding evidence.

3.6.2.2.4 *Breeding Wader Surveys*

Four wading bird transect surveys were carried out during the 2023 breeding season to provide supplementary information on wader species within the wider area. One survey was carried out on each of the following dates: 10th and 22nd May, and 8th and 15th June 2023, within suitable wader breeding habitat to the west of the proposed development along the transect route illustrated in Figure 5, below.

During each survey, the surveyor walked a predetermined transect route recording waders and other target species observed within 100 metres of the route onto standardised maps using recommended British Trust for Ornithology (BTO) species codes and behaviour notation (Marchant, 1983). The transect was interspersed with stops during which the ornithologist scanned for waders using optical equipment. Wading bird surveys were undertaken at suitable times of day and in suitable weather conditions, avoiding extreme temperatures, heavy rain or fog.

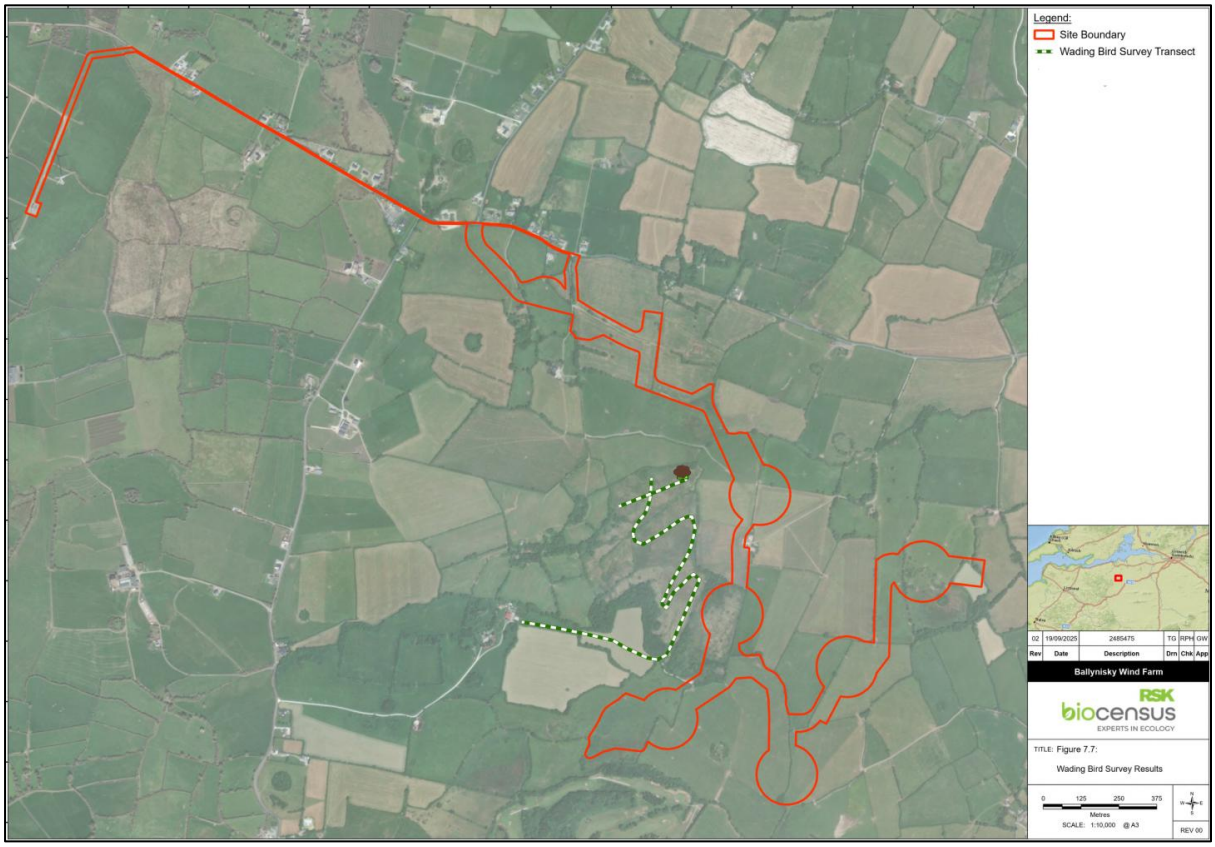

Figure 5: Transect route used during the breeding wader surveys carried out on four dates in summer 2023.

3.6.2.2.5 *Hinterland Surveys*

Driven surveys of the hinterland surrounding the proposed development site were completed on 1st December 2022, 9th February 2023, and 15th January 2024. Within a radius of approximately five kilometres of the proposed

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development site, surveyors travelled a consistent road-transect and regularly stopped at locations with optimal views over potentially suitable habitats for birds of conservation importance, particularly waterbird species and birds of prey. However, all bird species of interest encountered around the proposed development area were recorded during surveys. More details can be found in the Ornithology Baseline Report in **Appendix 7A** in Volume III of the EIAR.

The purpose of the hinterland counts was to establish a better understanding of which bird species utilise the surrounding habitats, and to determine whether those species traverse the proposed development site.

3.6.2.2.6 *Wintering Waterfowl Distribution Surveys*

To ascertain additional information on the distribution and abundance of wintering waterfowl species within the wider area, waterfowl counts were carried out at Lough Doohyle, located approximately 6.4 kilometres to the east of the proposed development site and known to be of importance to waterfowl aggregations.

Based on I-WeBS[7] survey methodology[8] and Bibby *et al* (2000), the surveys were carried out at Lough Doohyle on 1st December 2022 and 10th January 2023 (refer to **Figure 6**, below).

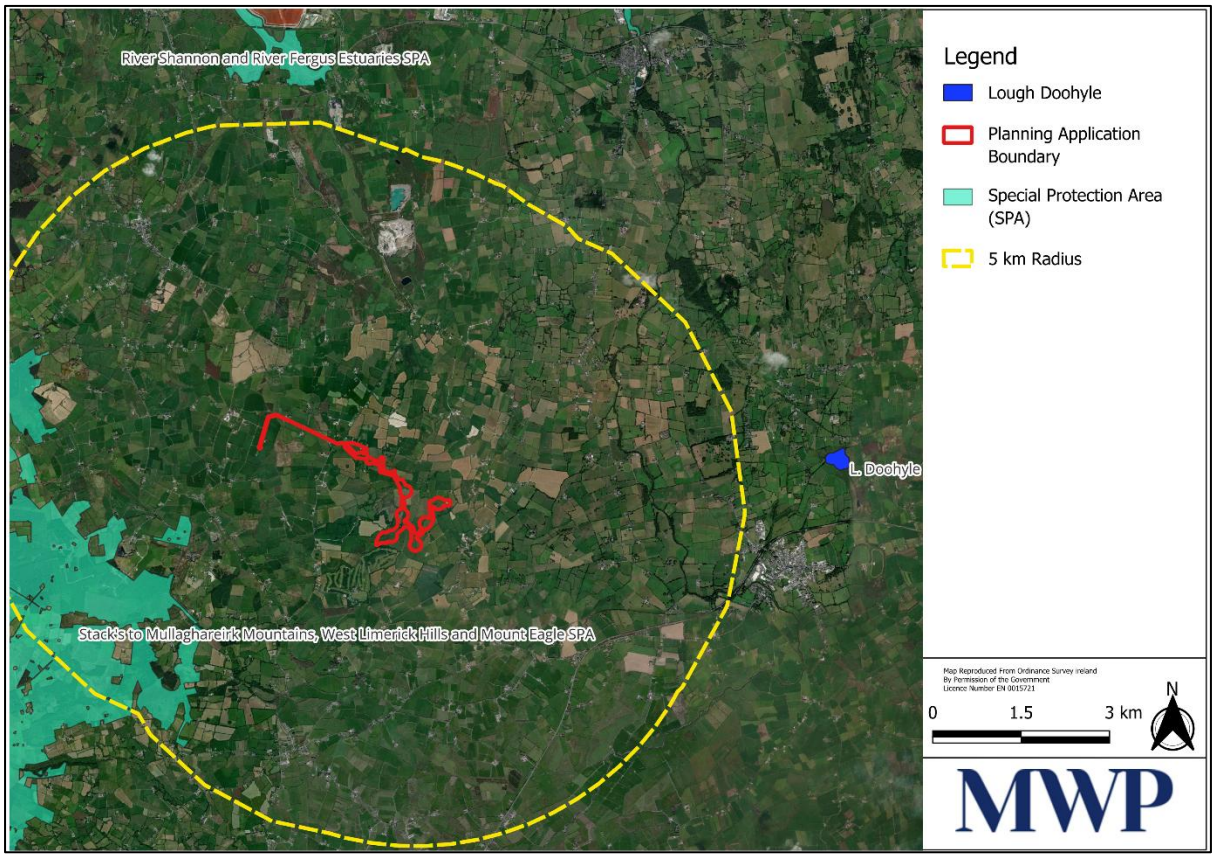

Figure 6: Location of the winter 2022/23 waterfowl counts at Lough Doohyle relative to the proposed development site and nearby Special Protection Areas (SPAs).

[7] I-WeBS - Irish Wetland Bird Survey
[8] I-WeBS Counter Manual - BirdWatch Ireland Accessed: 30th June 2025

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3.7 Assessment of Potentially Significant Effects

Upon completion of the Screening for Appropriate Assessment report (see **Appendix 1**), it was concluded that the project could have significant effects, or significant effects could not be ruled out, for the following three European sites:

- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161);
- Lower River Shannon SAC (002165); and
- River Shannon and River Fergus Estuaries SPA (004077).

On this basis, it was necessary to proceed to Appropriate Assessment, and an NIS was required for the proposed development.

An evaluation was undertaken to determine which of the Qualifying Interests (QI) of the SAC and the Special Conservation Interest (SCI) species of the SPAs potentially lie within the zone of influence of the proposed development and required further assessment in the NIS (see **Section 8**, below). This was done through a scientific examination of the ecological evidence and data from the resources listed above in **Section 3.4** or referenced within the text, together with the ecological field survey results (**Section 4.2**).

The conservation objectives of a European site are site-specific, are based on the ecological requirements of the species and habitats present and define the desired conservation condition of these species and habitat types for the site. For defining favourable status, conservation objectives are identified using attributes and targets that are based on parameters as set out in the Habitats Directive, namely area, range, structure and function. The conservation objectives may either be to maintain or to restore the favourable conservation condition of a habitat.

The effects of the proposed wind farm development on the QI of the SAC and the SCI species of the SPAs that are potentially within the zone of influence were assessed against the measures designed to achieve the conservation objectives. This was done by way of a focused and detailed examination, analysis, and evaluation of the implications of the proposed development, alone and in combination with other plans and projects, on the integrity of the relevant European sites in view of the sites' conservation objectives.

4. Description of the Existing Site

4.1 Site Location and Context

The proposed development site, including the grid connection route, encompasses an area of approximately 43.02 hectares and is situated within the townlands of Ballynisky, Graigoor, Ballyegny More, Kilbradran, Ballysteen, Dunmoylan, Lisbane, and Carrons in County Limerick, approximately 6 kilometres northwest of Rathkeale town and approximately 9 kilometres north of Newcastle West - refer to **Figure 7**, below. The lands that make up the site are rural in nature and privately-owned and are predominantly used for agricultural activities to varying degrees of farming practice intensity. The area surrounding the site is characterised by agricultural holdings and one-off residential dwellings and is located within a 'Preferred Area' for wind energy development as defined in the current Limerick Development Plan (2022 – 2028)[9].

The topography of the proposed development site is relatively flat ranging from 46 to 56 metres above ordnance datum (AOD) with a terrain that is dotted with small hills and depressions, and slopes gently upwards in a southwesterly direction. Maximum elevation within the study area is approximately 78 metres AOD.

[9] Limerick Development Plan 2022-2028 | Limerick.ie Accessed: 6th June 2025

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The proposed development site can be accessed via the local road network and various surrounding regional roads - the R521 (Shanagolden to Newcastle West) to the west; the R518 (Askeaton to Rathkeale) to the east; and the R523 (Ardagh to Rathkeale) to the south. The N69 (Limerick to Listowel) national primary road runs from east to west along the coast north of the proposed development site (see **Figure 7**, below).

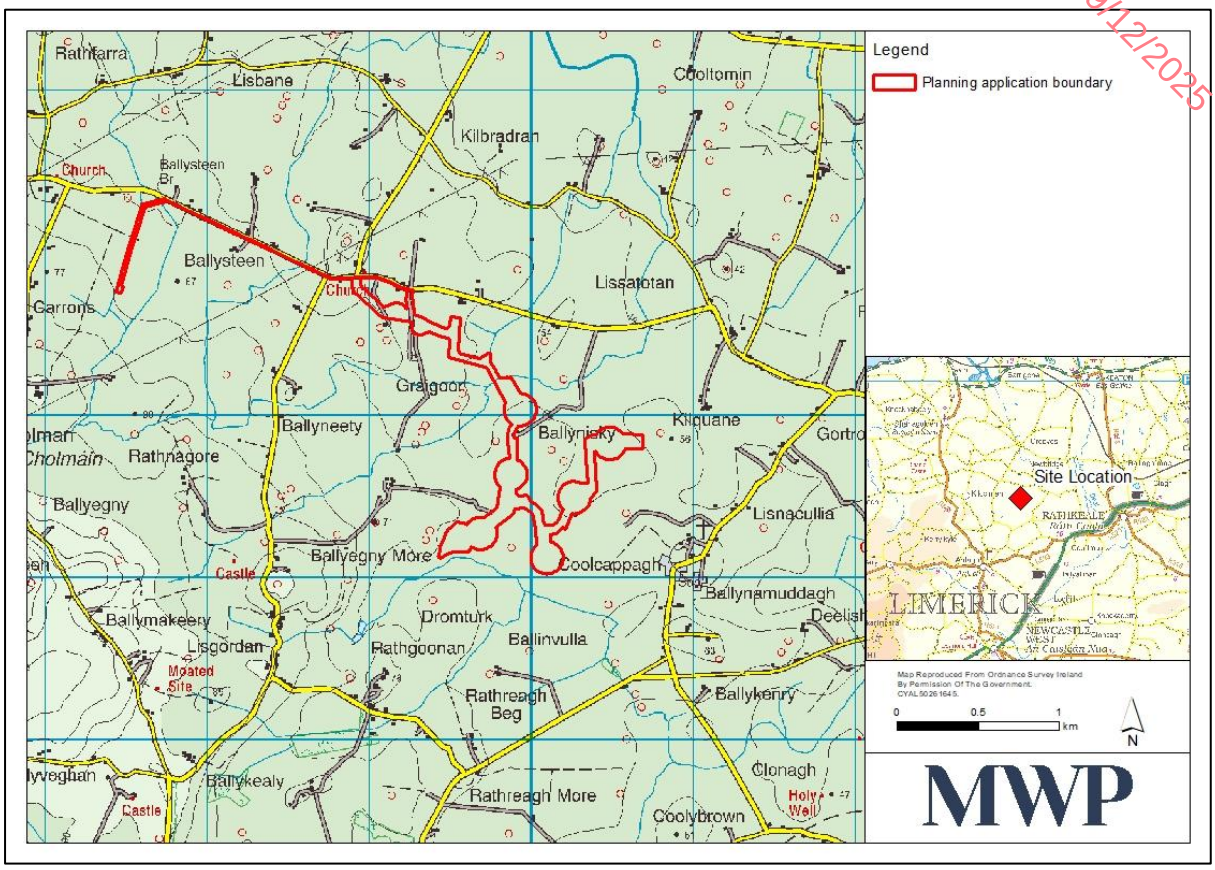

Figure 7: Location of the proposed development site at Ballynisky in County Limerick.

4.2 Description of the Existing Site

4.2.1 General Site Description

The proposed wind farm site is located within the Electoral Divisions (EDs) of Lismakeery (ED Code: 21122), Riddlestown (ED Code: 21129), and Dunmoylan East (ED Code: 21116). During the 2022 Census, Lismakeery ED was found to have a population of 479 residents within 167 private households, Dunmoylan East ED a population of 523 residents within 180 private households, and Riddlestown ED a population of 601 residents within 200 private households[10]. Lismakeery ED and Riddlestown ED mainly comprise one-off housing and ribbon development along the local road network while housing within Dunmoylan East ED occurs primarily within the small rural settlement of Kilcolman.

The proposed development site is comprised predominantly of farmland (a mixture of both marginal and more improved areas), used primarily as grazing for cattle. Lands surrounding the site are mainly used for agricultural purposes, interspersed with conifer plantations, small urban areas, and single residential dwellings.

[10] Census Local Statistics interactive mapping app | CSO Ireland Accessed: 12th June 2025

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There are three operational quarries located within 10 kilometres of the proposed development site - Knockbowheen Quarry and Michael O'Donovan Quarries to the southwest, and Hogans Quarry to the north (see **Section 6.7**, below, for more quarry details). The Aughinish Alumina refinery is located approximately 7.2 kilometres north of the proposed development, while the 4.6MW Carrons Wind Farm substation lies approximately 1.8 kilometres to the west of the proposed permanent entrance on the L1219 local road.

The CORINE[11] (2018) land cover category for the entire development site and most of the surrounding area is classed as 'Pastures'. Newcastle West Golf Club House is situated approximately one kilometre south of the nearest proposed turbine (T3) with landcover at the Golf Course categorised as 'Sport and leisure facilities' (see **Figure 8**, below). Small pockets of 'Non-irrigated arable land' lie to the north and northeast while areas of 'Coniferous forests', 'Peat bogs' and 'Transitional woodland scrub' are located to the west[12].

A review of bedrock mapping determined that the geological units underlying the north and east of the site are 'Dark muddy limestone and shaly mudstone' of the Rathkeale Formation while to the south and west are 'Undifferentiated limestones'. A small section of the proposed grid route passes over 'Massive unbedded lime-mudstone' of the Waulsortian Limestones Formation. Soils at the proposal site are categorised[13] as 'Grey Brown Podzolics, Brown Earths' (derived from mainly calcareous parent materials), 'Surface water Gleys, Ground water Gleys' (derived from mainly calcareous parent material), 'Variable' (mineral alluvium), and 'Renzinas, Lithosols' (derived from mainly calcareous parent material)[14].

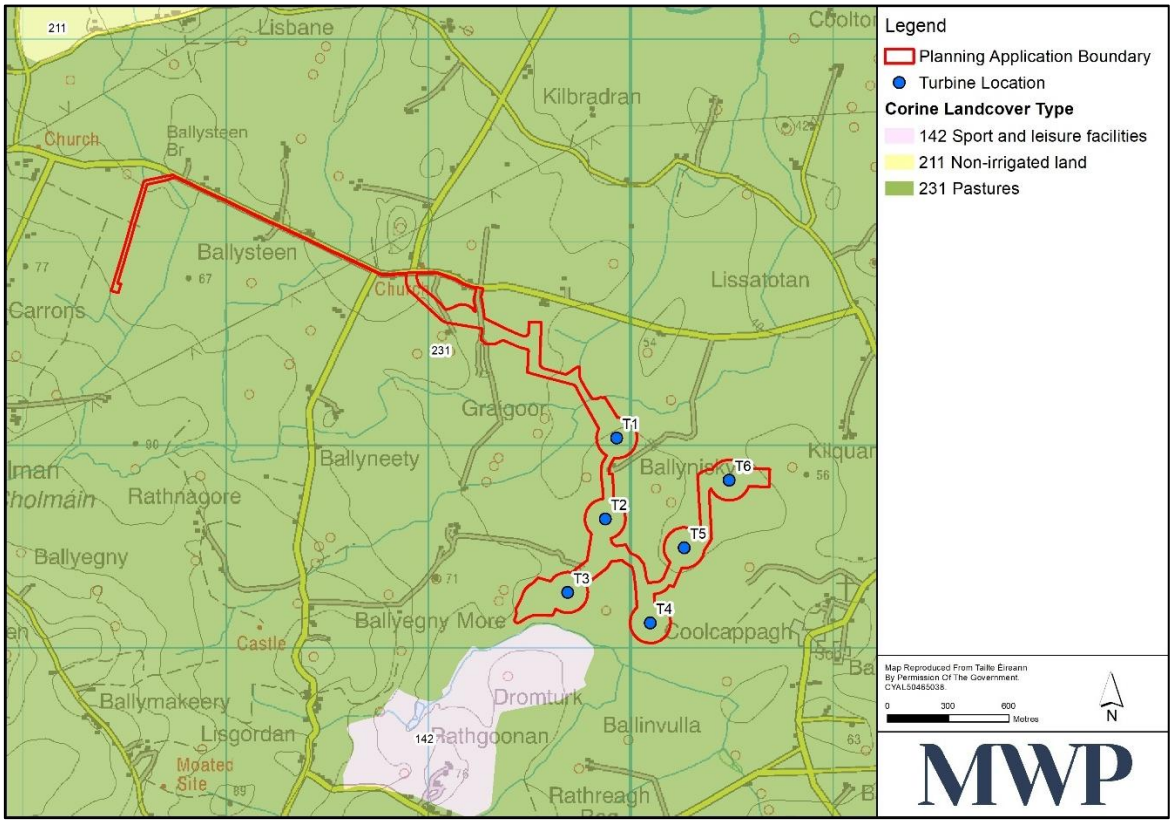

Figure 8: CORINE landcover classification of the proposed Ballynisky Wind Farm site in County Limerick.

[11] **C**o-**OR**dinated **IN**formation on the **E**nvironment – data series initiated in 1985 by the European Commission to gather environmental data.
[12] EPA Maps Accessed: 12th June 2025
[13] Teagasc Soils - classifies soils on a categorically simplified but cartographically detailed basis into 25 classes using an expert rule-based methodology. Produced by Teagasc (Kinsealy), EPA and GSI, it identifies and maps soils in the Republic of Ireland by parent material. Teagasc Soils - Overview Accessed: 26th May 2025
[14] https://www.heritagemaps.ie Accessed: 12th June 2025

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4.2.2 Hydrology and Hydrogeology

The entire development site is situated within the Shannon Estuary South (24) Water Framework Directive (WFD) catchment. Most of the site is located within the Shanagolden[Stream]_SC_010 WFD sub-catchment, with only T3 and T4 at the southern extreme of the site situated within the Deel[Newcastlewest]_SC_040 sub-catchment -- refer to **Figure 9**, below.

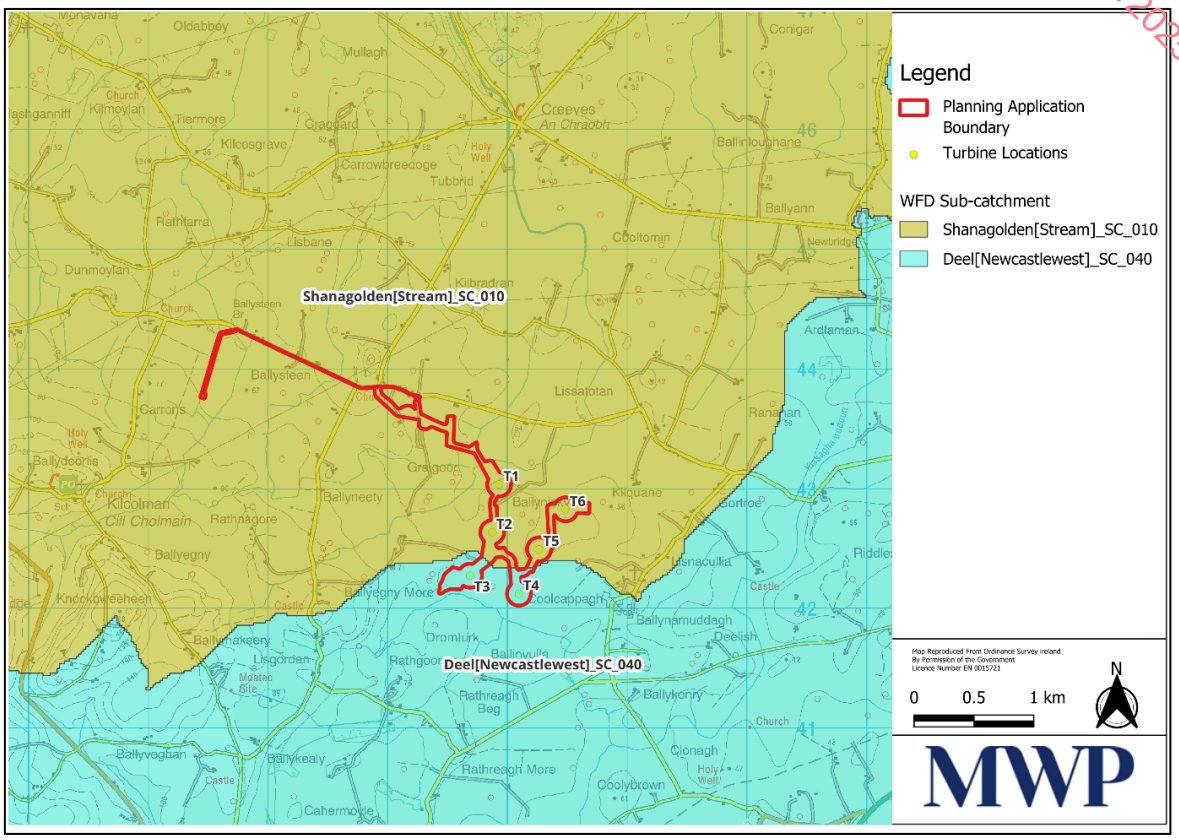

Figure 9: Layout of the proposed development site in relation to Shanagolden[Stream]_SC_010 sub-catchment and Deel[Newcastlewest]_SC_040 sub-catchment.

A review of the EPA map-viewer determined that there are several watercourses within and around the proposed wind farm site boundary – see **Figure 10**, below. The 1st Order 'RATHNAGORE 24' Stream (EPA Code: 24R22) lies approximately 50 metres south of the larger material storage area at T3 and approximately 217 metres south of T3 forming the site's southern border before merging with the 2nd Order Riddlestown River - both watercourses are part of the Deel(Newcastlewest)_130 River Waterbody[15]. The Riddlestown River continues southeastwards before veering north and eventually joining the 6th Order Deel River, approximately 7.5 river kilometres (rkm)[16] downstream. The aquatic habitats of the local watercourses are discussed in **Section 4.2.7.1**, below.

Within the mid-section of the site, both the 1st Order 'Rathnagore_24' Stream (EPA Code: 24R40) and the 1st Order Ahacronane Stream flow from southwest to northeast towards the proposed development site before merging to form the 2nd Order Ahacronane River approximately 215 metres northwest of T1 and approximately 120 metres southeast of the smaller material storage area - refer to **Figure 10**, below. These watercourses form part of the Ahacronane_010 River Waterbody[17]. The Ahacronane River continues northwards from the proposal site for approximately 8.7 river kilometres before emptying into the Lower Shannon Estuary at Oorla.

[15] EPA River Waterbody Code: IE_SH_24D021320
[16] River kilometres (rkm): measure of the distance in kilometres along the path of a watercourse (as opposed to a linear measure such as "as the crow flies").
[17] EPA River Waterbody Code: IE_SH_24A010400

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The 1st Order Lissatotan Stream rises within a field approximately 65 metres east of the proposed met mast location before continuing north and eventually merging with the Ahacronane River. Similarly, the 1st Order Creeves Stream crossed by the proposed grid connection route approximately 680 metres west of the proposed permanent site entrance flows northwards before also joining the Ahacronane River. Both the Lissatotan Stream and the Creeves Stream are part of the Ahacronane_020 River Waterbody[18]. Refer to **Figure 10**, below.

Finally, as it continues westwards along the local road from the new on-site substation to the existing substation at Carrons Wind Farm, the proposed grid connection route crosses the 2nd Order Knockardnacorlan River approximately 1.74 kilometres from the proposed permanent site entrance. The Knockardnacorlan River flows from south to north past Carrons Wind Farm approximately 180 metres east of the existing Carrons Substation and is part of the Dooncaha Stream_010 River Waterbody[19]. Refer to **Figure 10**, below. From where it is crossed by the proposed grid cable, the Knockardnacorlan River flows northwards, eventually merging with the 4th Order Shanagolden (Stream) and emptying to the Lower Shannon Estuary at Churchfield, approximately 7.4 river kilometres downstream from the grid connection river crossing point.

Within a field immediately southeast of the proposed T6 location and approximately 540 metres south of the Ahacronane River there is a seasonal waterbody known as Ballynisky Pond. The local drainage network connects the pond to the Ahacronane River via a drainage ditch and minor drain to the west of the field. The extent of the pond is not entirely dependent on groundwater levels and instead is governed by drainage features at the site - once rising water within the field reaches the drain level, water is conveyed to the Ahacronane River, approximately 0.65 river kilometres downstream. Refer to **Section 4.2.3**, below, for Ballynisky Pond habitat details.

There will be three watercourse crossings necessary for the construction and operation of the proposed development – the crossings are shown as WC1, WC2, and WC3 in **Figure 10**, below. A clear span bridge crossing (WC1) will be constructed where the internal site access track crosses the Ahacronane River between the temporary site compound and T1. There will be two watercourse crossings (WC2 and WC3) below ground level along the proposed Option A grid connection route. All three watercourse crossings are located between 7.4 river kilometres and 9 river kilometres upstream of the Lower River Shannon SAC [002165] and the River Shannon and River Fergus Estuaries SPA [004077]. These watercourse crossings are discussed further in **Section 5.4.6**, below.

The aquifer underlying the site is classified as a locally important aquifer - bedrock which is moderately productive only in local zones. The groundwater vulnerability ranges from moderate vulnerability along the south-western area of the site to high and extreme along the northeast sections of the site. There are also areas of rock at or near the surface, identified in the northeast of the site.

Compliance with the reporting requirements of the WFD (Directive 2000/60/EC) obliges each member state to publish reports providing summary information about individual waterbodies relating to their status, risks and objectives. The Deel(Newcastlewest)_130 River Waterbody has a WFD Status (2016 – 2021) of 'Moderate' and is located within the Deel [Newcastlewest]_SC_040 sub-catchment. There are no EPA water quality monitoring stations located along this waterbody and, therefore, no Q-values[20] available. The Deel(Newcastlewest)_130 River Waterbody has been assigned a WFD risk status of 'Review' as there is no monitoring data currently available. A review of the '*Deel [Newcastlewest]_SC_040 Sub-catchment Assessment WFD Cycle 2*' report (EPA, 2019b) determined that the main pressures exerted on waterbodies within the sub-catchment are those associated with agriculture (specifically some large dairy farms) and industrial discharges. The Transitional Waterbody WFD latest status (2016 – 2021) of the Deel Estuary[21] into which these waterbodies drain is 'At risk'.

[18] EPA River Waterbody Code: IE_SH_24A010900
[19] EPA River Waterbody Code: IE_SH_24D071200
[20] Quality Rating (Q) System devised by Toner *et al.* (2005). Further details in **Section 4.2.7.5**, below.
[21] EPA Transitional Waterbody Code: IE_SH_060_0600

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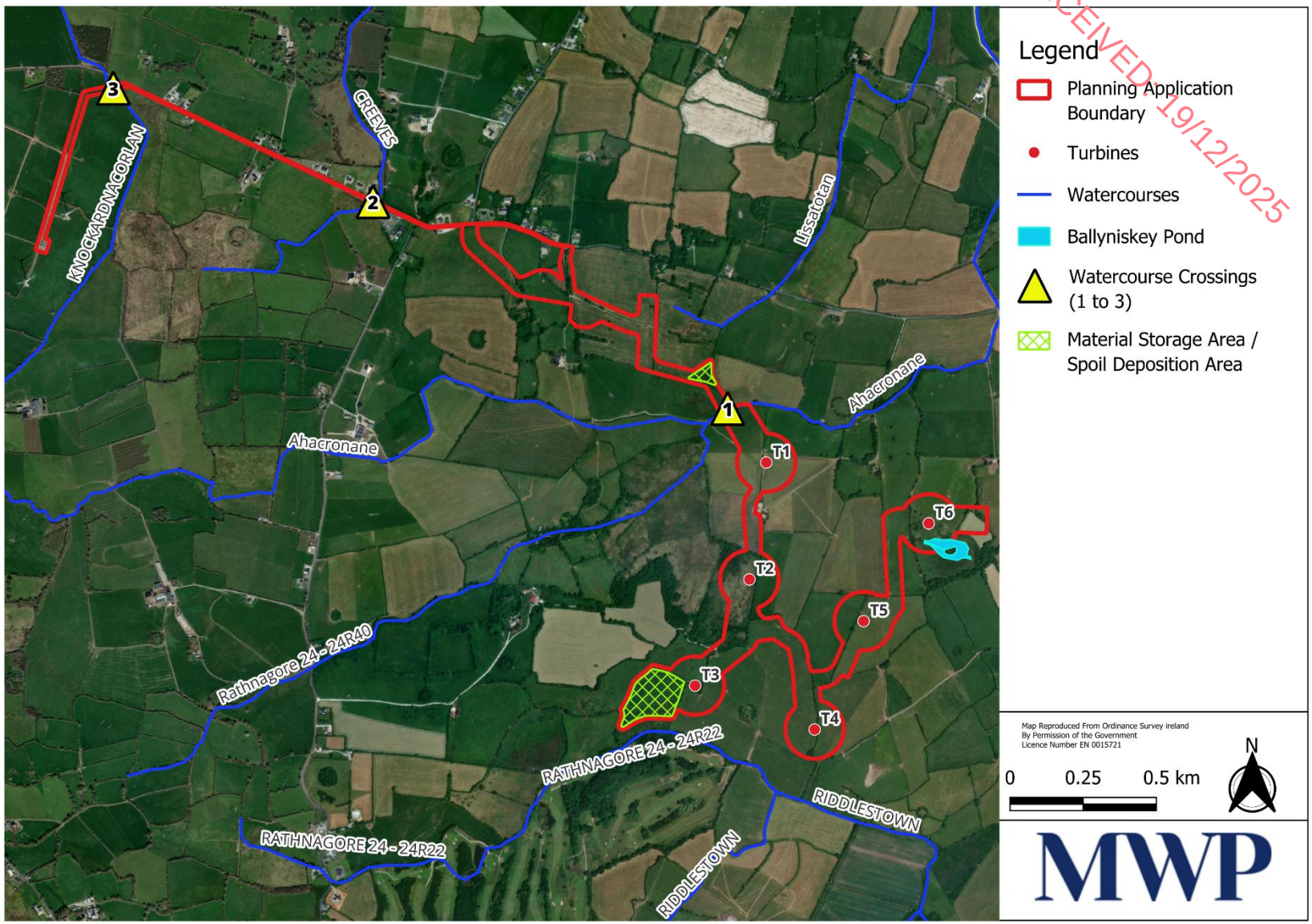

Figure 10: Hydrological features at Ballynisky with locations of three watercourse crossings and two Material Storage/Spoil Deposition Areas.

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The WFD Status (2016 – 2021) of the Ahacronane_010 River Waterbody is 'Poor'. The nearest downstream EPA water quality monitoring station is located at the 'Bridge south of Spa Wells' (Station ID: RS24A010400), approximately 1.7 river kilometres downstream of the proposed new clear span bridge crossing. The latest river Q value at this location is 'Q3, poor', recorded by the EPA in 2020.

The WFD Status (2016 – 2021) of the Ahacronane_020 River Waterbody is also 'Poor'. The nearest downstream EPA water quality monitoring station is located at the 'Ahacronane Bridge (north of Nutgrove House)' (Station ID: RS24A010700), approximately 5.2 river kilometres downstream of where the proposed Option A grid connection route crosses Creeves Stream. The latest river Q value at this location is 'Q3, poor', recorded by the EPA in 1989. More recently, a monitoring station further downstream was recorded as having a Q value of 'Q3, poor' in 2020.

The WFD Status (2016 – 2021) of the Dooncaha Stream_010 River Waterbody is 'Poor'. The nearest downstream EPA water quality monitoring station is located at the 'Bartholomew's Bridge (R6)' (Station ID: RS24D071200), approximately 4.8 river kilometres downstream of where the proposed Option A grid connection route crosses Knockardnacorlan River. The latest river Q value at this location is 'Q3, poor', recorded by the EPA in 1989. More recently, a monitoring station further downstream was recorded as having a Q value of 'Q3, poor' in 2020.

The three waterbodies located within the Shanagolden[Stream]_SC_010 sub-catchment - Ahacronane_010, Ahacronane_020, and Dooncaha Stream_010 - have all been assigned a WFD risk status of 'At risk'. A review of the '*Shanagolden [Stream]_SC_010 Sub-catchment Assessment WFD Cycle 2*' report (EPA, 2019a) determined that the following pressures are exerted on waterbodies within this sub-catchment: agriculture, quarries, riverbank erosion, wastewater discharge and peat extraction. The Transitional Waterbody WFD latest status (2016 – 2021) of the Lower Shannon Estuary[22] into which these waterbodies drain is 'Not at risk'.

4.2.3 Habitats

Refer to **Appendix 2** of this report for a habitat map of the entire proposed development site.

The dominant habitat[23] of the proposed development site is intensively managed and highly modified **Improved agricultural grassland (GA1)** comprised of a relatively uniform sward of perennial ryegrass (*Lolium perenne*) with other typical agricultural plant species indicative of ongoing enrichment such as broad-leaved dock (*Rumex obtusifolius*), white clover (*Trifolium repens*), dandelion (*Taraxacum officinalis* agg.), common mouse-ear chickweed (*Cerastium fontanum*) and common chickweed (*Stellaria media*). See **Plate 1**, below. At the time of site surveys, most of the improved agricultural fields were being strip-grazed by cattle herds.

Hedgerows (WL1) is the second most commonly occurring habitat at the site forming much of the agricultural field boundaries system and consisting of native hedgerow flora including abundant hawthorn (*Crataegus monogyna*) along with ash (*Fraxinus excelsior*), blackthorn (*Prunus spinosa*), grey willow (*Salix cinerea* agg.) and gorse (*Ulex europaeus*) with occasional instances of hazel (*Corylus avellana*). Hedgerow understory species include abundant bramble (*Rubus fruticosus* agg.) and ivy (*Hedera helix*), and less frequently dog rose (*Rosa canina*) and honeysuckle (*Lonicera periclymenum*). Cleavers (*Galium aparine*) and nettle (*Urtica dioica*) are frequent along the narrow verges of hedgerow and agricultural fields. All hedgerows at the proposed development site are managed to varying degrees of intensity. Many of those to the east and southeast of the site are maintained as lower-growing, box-shaped hedgerows while in other areas, hedgerows are laterally cut and are overgrown and top-heavy. See **Plate 1**, below.

[22] EPA Transitional Waterbody Code: IE_SH_060_0300
[23] Habitats as categorised by Fossitt (2000), available at A Guide to Habitats in Ireland - Fossitt.pdf (npws.ie) Accessed: 14th June 2025

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Plate 1: Improved agricultural grassland (GA1) habitat found throughout the proposed development site (left), and low-growing, managed Hedgerows (WL1) to the southeast of site near T5 (right).

Drainage ditches (FW4) occasionally occur in tandem with hedgerows along field boundaries within the proposed development site. These ditches are relatively wide and straight-sided muddy channels containing shallow and stagnant or slow-moving water. They are considered a human-made or modified watercourse feature and are managed for the purpose of enhancing drainage from the surrounding agricultural lands. Overall, the drainage ditches within the proposal site appear to be regularly maintained resulting in only the occasional or rare occurrence of wetland vegetation such as watercress (*Nasturtium officinale*). See Plate 2, below.

There is an area of Scrub (WS1) to the west and southwest of the proposed T2 location and onwards south along a proposed access track to T3. The scrub at T2 is comprised of abundant gorse, blackthorn and dense and impenetrable bramble progressing into an open area that appears largely unmanaged except for low intensity cattle grazing (see Plate 2 and Plate 3, below). Further south from T2, the proposed access track to T3 runs through an area of more established and mature scrub containing a greater number of grey willow and small trees resulting in a more open understorey that despite cattle poaching, supports ground flora such as lesser celandine (*Ranunculus ficaria*), nettle, ground ivy (*Glechoma hederacea*), primrose (*Primula vulgaris*), ivy, meadowsweet (*Filipendula ulmaria*) and bramble.

Plate 2: Drainage ditches (FW4) found throughout the site (left), and Scrub (WS1) with dense gorse and bramble stands at location west of T2 (right).

At the proposed location for T2's hardstand area and adjacent to the scrub areas, the habitat is classified as Wet grassland (GS4) since the land is open, wet/damp, appears largely unmanaged except for low-intensity cattle grazing, and is dominated by purple moor grass (*Molinia caerulea*) (see Plate 3, below). Other grassland species recorded include soft rush (*Juncus effusus*), creeping bent (*Agrostis stolonifera*), carnation sedge (*Carex panicea*), red fescue (*Festuca rubra*), meadowsweet, tormentil (*Potentialla erecta*), Devil's-bit scabious (*Succisa pratensis*),

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and occasionally water mint (*Mentha aquatica*). Young grey willow and blackthorn shrubs have also become established in this area. This open grassland habitat extends north-westwards away from the proposed development site where it becomes more extensive and may include other wetland habitat types.

Areas of **Wet grassland (GS4)** can also be found at T6 extending southeastwards towards the eastern boundary, and includes species such as abundant creeping bent, Yorkshire fog (*Holcus lanatus*), hard rush (*Juncus inflexus*) and occasional perennial ryegrass.

Plate 3. Western areas associated with the proposed location of T2 - *Molinia*-dominated Wet grassland (GS4) (left), and Wet grassland (GS4) and Scrub (WS1) (right).

Within the northern section of the proposed development site, an area of **Wet grassland (GS4)** occurs between T1 and the met mast, close to an existing farm track that will be bisected by a new access track (see **Plate 4**, below). This wet grassland community is comprised of abundant creeping bent, Yorkshire fog, hard rush, and occasional perennial rye-grass, daisy (*Bellis perennis*), lesser spearwort, creeping buttercup (*Ranunculus repens*) and yellow flag iris (*Iris pseudacorus*). The area is grazed by livestock and poaching is common, often resulting in bare ground. Finally, two pockets of wet grassland occur in the southwestern region – one located outside the proposed development site approximately 200 metres to the southwest of the boundary, and one located within the proposed development site's boundary immediately west of T3.

A small area of **Poor fen and flush (PF2)** habitat, sometimes known as Ballynisky Pond (see **Section 4.2.2**, above), occurs southeast of the proposed location for T6 at the eastern side of the site. The principal species of Ballynisky Pond is bottle sedge (*Carex rostrata*) along with bogbean (*Menyanthes trifoliata*), marsh horsetail (*Equisetum fluviatile*), pondweed (*Potamogeton natans*), common spike-rush (*Eleocharis palustris*), yellow iris (*Iris pseudacorus*) and water mint (see **Plate 4**, below).

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Plate 4: Small areas of Wet grassland (GS4) within Improved agricultural grassland (GA1) in northern areas of the proposed development site (left), and Poor fen and flush (PF2) at Ballynisky Pond southeast of T6 (right).

Most existing farm tracks within the site are classified as **Spoil and bare ground (ED2)** while access tracks, farm buildings and yards and several derelict buildings are classified **Buildings and artificial surfaces (BL3)**. **Stone walls and other stonework (BL1)** are also present in the northeast of the site in areas of agricultural grassland and are heavily vegetated with climbing ivy (*Hedera hibernica*) (see **Plate 5**, below). Some stands of **(Mixed) broadleaved woodland (WD1)** occur at T6 and west of T2 consisting mainly of ash, with some sycamore (*Acer pseudoplanatus*) and, on wetter ground, whitethorn, hazel, blackthorn and willow. Some field boundaries featuring continuously occurring semi-mature and mature trees are categorised as **Treelines (WL2)** (see **Plate 5**, below), the most frequently encountered species being ash, with some sycamore and lime (*Tilia* spp.) also present.

Plate 5. Stone walls and other stonework (BL1) with ivy cover east of T1 (left), and Treelines (WL2) and Spoil and bare ground (ED2) northwest of T3 (right).

As discussed in **Section 4.2.2**, above, there are three semi-natural watercourses within the proposed development site boundary - the Ahacronane River crossing the development site north of T1, and the Knockardnacorlan Stream and Creeves Stream both crossed by the grid connection route as it runs along the local road network. Watercourses draining the proposed development site are slow-flowing and depositing and are classified as **Lowland/depositing river (FW2)**. Refer to **Figure 10**, above, and **Plate 6**, below.

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Plate 6: Lowland/depositing river (FW2) at the lower reaches of Ahacronane River downstream of N69 (left), and Knockardnacorlan Stream at Ballysteen Bridge on L1219 Local Road (right).

4.2.4 Rare and Protected Flora

No rare or protected flora species were recorded at the proposed development site during any of the ecological surveys.

4.2.5 Invasive Alien Plant Species (IAPS)

Documented NBDC records of high-impact invasive plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011, as amended) exist within the hectads R23 and R34 encompassing the study area for Indian balsam (*Impatiens glandulifera*), Canadian waterweed (*Elodea canadensis*), cherry laurel (*Prunus laurocerasus*), and Japanese knotweed (*Fallopia japonica*). Documented records of medium-impact invasive plant species listed on the Third Schedule also exist for hairy rocket (*Erucastrum gallicum*) and sycamore (*Acer pseudoplatanus*).

During ecological field surveys of the proposed development site no invasive plant species were recorded. For more details, refer to Chapter 06 Biodiversity, of Volume II of the EIAR.

4.2.6 Mammals

The importance of the proposed development site is discussed hereunder with respect to otter. However, badger (*Meles meles*), Irish hare (*Lepus timidus hibernicus*) and several other terrestrial mammals were also recorded within the survey area - for more details on all mammals documented during the surveys and the methodologies, refer to the Chapter 06 Biodiversity, of Volume II of the EIAR. No invasive alien mammal species were observed on site during surveys but those listed as having previously been recorded within hectads R23 and R34 according to publicly available NBDC datasets[24] include mink (*Mustela vison*), rabbit (*Oryctolagus cuniculus*), and bank vole (*Myodes glareolus*).

A suite of bat surveys was also carried out at the site – for full details on methodology and results, see the Bat Reports in Appendices 6D and 6E of Volume III of the EIAR, and Chapter 06 Biodiversity, of Volume II of the EIAR.

[24] Maps - Biodiversity Maps (biodiversityireland.ie) Accessed: 3rd July 2025.

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4.2.6.1 Otter (*Lutra lutra*)

No evidence of otter (*Lutra lutra*) was recorded at the proposed development site during any of the ecological field surveys nor during any of the dedicated terrestrial mammal surveys carried out in Autumn 2022, Spring 2023, and January 2025 – refer to **Figure 11**, below, for an indication of the extent of suitable watercourses surveyed for otter at the proposed development site. There were no otter breeding/resting places identified within the study area. Additionally, there are no NBDC documented records of otter within the proposed development site.

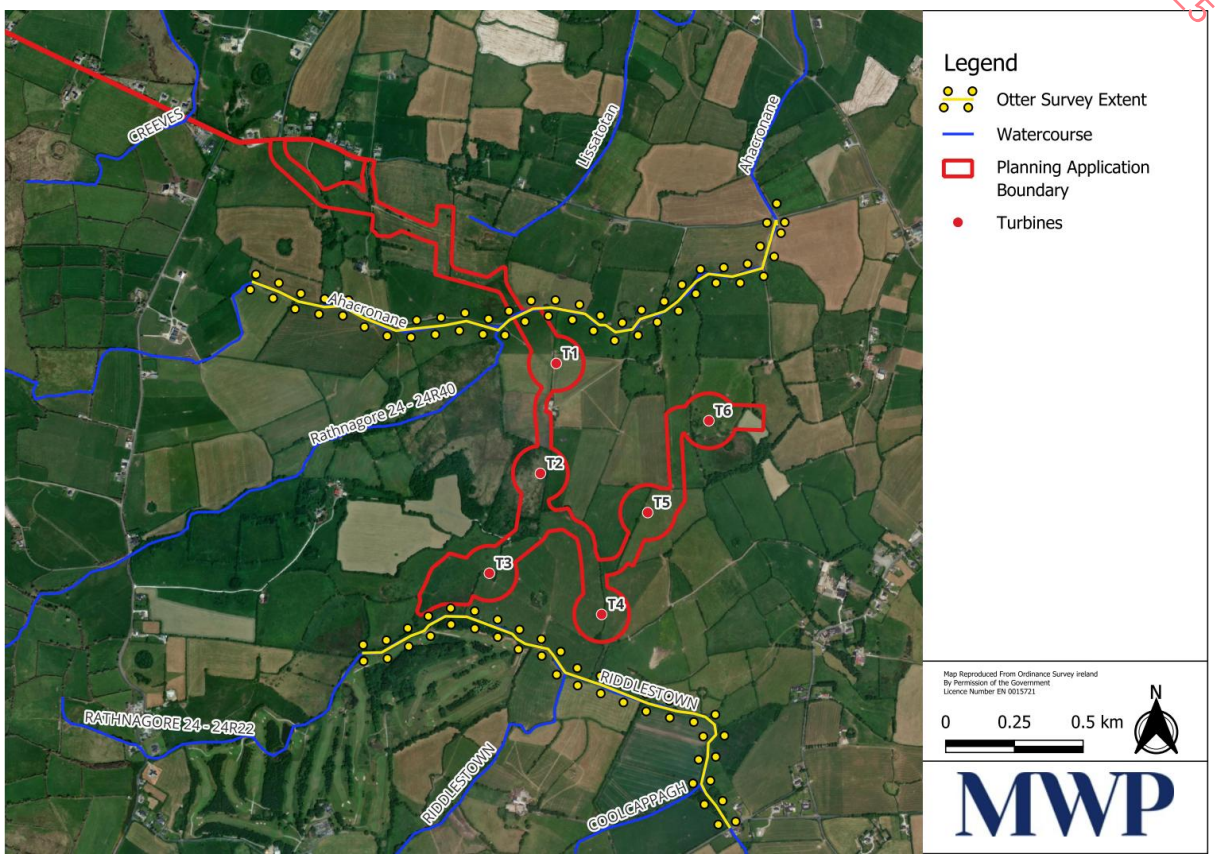

Figure 11: Extent of otter surveys carried out along suitable watercourses at the proposed development site.

There are several NBDC otter records for locations in the surrounding area that are hydrologically connected to the proposed development site. To the west of the site, spraints were recorded in 1981 at locations on/near the Knockardnacorlan River – one record occurred at a stream in Kilcolman approximately 2.3 river kilometres upstream of the proposed grid route river crossing, and another record at Kilcosgrave House approximately 1.7 river kilometres further downstream from the proposed grid route crossing. Spraints were recorded in 1980 at Ahacronane River northwest of Creeves at a location downstream of between 3.7 river kilometres and 5.5 river kilometres from different points of the proposed development site. Finally, to the south of the site, spraints were recorded in 1981 at a stream southeast of Coolcappa near the Riddlestown River approximately 3.8 river kilometres downstream of the proposal site's southern border.

The most recent downstream otter record is a live sighting of an individual in 2013 at a location beside the Quay on the River Deel in Askeaton town approximately 15.5 river kilometres downstream of the proposed development site's southern border (or 8.9 kilometres over land from the site's northern border). Minor watercourses crossing the proposed development site may have some potential for foraging otter but generally these watercourses are judged to comprise sub-optimal otter habitat because of their small size, poor water quality status, and since they do not support any notable fish populations. The lower reaches of the watercourses draining the proposed development site support fish species such as brown trout (*Salmo trutta*) and European

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eel (*Anguilla anguilla*) and, therefore, it is highly likely that the larger watercourses further downstream are more suitable for foraging and possibly breeding otter.

For more details, refer to **Chapter 06 Biodiversity**, of Volume II of the EIAR.

4.2.7 Aquatic Ecology

For further details on the results of the aquatic ecology surveys carried out, refer to **Chapter 06 Biodiversity** of Volume II of the EIAR and the Aquatic Ecology Survey Report in **Appendix 6C** of Volume III of the EIAR.

4.2.7.1 Aquatic Habitats

The watercourses draining the proposed development site are low gradient streams with a lotic[25] carrying capacity limited by certain characteristics including morphological condition, small size, riparian conditions (e.g. overshading) and/or pollution. The stream substrates consist predominantly of cobble and gravel with significant silt deposits and are characterised by riffle-glide-pool sequences in reaches of higher gradient with more glide-pool sequences in lower gradient reaches. The watercourses are generally shallow with a mean summer depth of 10 to 20 centimetres. Aquatic habitat surveys were carried out at fifteen sites (see **Figure 2** and **Table 1**, above). The physical attributes of the watercourses at each survey site are presented in **Table 4**, below.

Table 4. Physical characteristics of aquatic survey sites shown in Figure 2, above (apart from Site 4 at Ballynisky Pond which was unsuitable for this assessment).

Physical Characteristic	Survey Site Number													
	1	2	3	5	6	7	8	9	10	11	12	13	14	15
Wetted width (m)	0.4	0.9	1.1	1.5	0.7	0.4	2.2	0.6	0.5	0.7	1	1.7	1.8	1.1
Riffle (%)	5	10	20	35	10	15	10	0	0	5	30	10	15	25
Glide (%)	25	50	20	45	60	25	25	50	85	65	35	50	20	25
Pool (%)	70	40	60	20	40	60	65	50	15	30	35	40	70	50
Instream vegetation cover (%)	5	75	50	5	100	0	40	100	60	65	30	10	60	10
Mean depth (%)	10	5	5	3	10	3	15	5	30	20	10	20	50	10
Max depth (%)	20	30	15	10	2	10	45	10	40	35	30	45	1.5	20
Boulder (%)	5	10	5	0	5	5	10	5	0	5	15	0	15	25
Cobble (%)	15	45	40	45	20	15	50	5	5	10	50	35	20	35
Gravel (%)	20	35	35	35	25	5	20	15	10	5	20	35	20	20
Sand (%)	20	5	10	10	10	10	5	5	10	5	10	10	15	5
Mud/silt (%)	40	5	10	10	40	70	15	70	75	75	5	20	30	15
Shade (%)	60	60	65	25	15	100	50	25	20	10	25	50	10	30
Buffer strip[1]	N	N	N	N	N	N	Y	Y	N	N	Ve	N	Y	Nar
Bank erosion[2]	B	S	N	N	SV	SV	N	N	N	S	N	M	M	SV
Siltation[3]	H	H	H	H	H	H	H	M	H	H	H	M	M	M
Plume[4]	H	H	H	H	H	H	H	M	H	H	H	H	M	M
Main land-use[5]	WG	IAG	IAG	IAG	IAG	IAG	IAG	IAG	IAG	IAG	IAG	TIL	IAG	IAG

[1] **Buffer Strip** N = none, Y = yes, Nar = narrow, Ve = very narrow
[2] **Bank Erosion** N = none, B = both banks, S = slight, M = mild, SV = severe
[3] **Siltation** NV = not visible, C = clean, S = slight, M = moderate, H = heavy
[4] **Plume** N = none, H = heavy, M = moderate, S = slight
[5] **Main land-use** WG = wet grassland, IAG = improved agricultural grassland, TIL = tillage.

[25] of organisms or habitats inhabiting or situated in rapidly moving freshwater

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The Ahacronane River, of which Creeves Stream is a tributary, is somewhat modified but maintains more semi-natural characteristics overall. The riverbed is approximately 2 to 3 metres wide with a predominately rock/stone substrate and shallow, relatively fast-flowing water with a restricted establishment of wetland vegetation within the river channel. The river's western bank is bordered by agricultural wet grassland where some bank erosion is evident while the eastern bank consists mainly of hedgerow.

Heavy substrate siltation present in the Ahacronane River, and the Creeves, Lissatotan, Rathnagore (both streams) and Knockardnacorlan Streams could likely be attributed to local agricultural practices. The proposed development site and surrounding lands are used primarily for milk and beef production and impacts to riparian and instream habitats because of cattle access (see **Plate 7**, below) and/or run-off from denuded riparian areas were commonly observed during surveys. Enrichment in the form of luxuriant macrophytes and/or filamentous algae was also evident at the survey sites.

Plate 7: Signs of eutrophication and siltation in the Ahacronane River at Site 8 (left), and cattle entering the water on the Ahacronane River downstream of the proposed development site (right).

4.2.7.2 Macroinvertebrates

4.2.7.2.1 *Macroinvertebrate Habitat*

Based on the physical attributes of the surveyed sites and on assessment criteria, the sites are generally all rated between Marginal and Suboptimal due to the domination of substrates by one size class (rock/cobble), the high gradient of the sites, the suboptimal habitat complexity and mainly marginal pool quality (<1m deep), the bank stability (eroding in some instances), and canopy conditions (heavily shaded). Habitats of these classifications can limit taxa richness as there are fewer ecological niches available. The macroinvertebrate suitability of a watercourse generally increases with distance downstream as the watercourse increases in size and depth. This is demonstrated for the Ahacronane River which scored an average of 11.7 at Sites 2 and 3 which are located nearer the proposed development site but scored 12.5 at Site 8 located further downstream at Creeves Cross.

The physical habitat suitability assessment of the fifteen survey sites for macroinvertebrate production is provided in **Table 5**, below.

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Table 5. Physical habitat assessment of survey sites with regards suitability for macroinvertebrate production (adapted from Barbour & Stribling, 1991) (Site 4 was unsuitable for this assessment).

Site	Watercourse	Bottom substrate	Habitat complexity	Pool quality	Bank stability	Bank protection	Canopy	Score	Average score	Overall assessment*
1	Rathnagore_24 (24R40)	5	10	5	15	15	10	60	10.0	Marginal
2	Ahacronane River	10	10	5	20	15	10	70	11.7	Marginal
3	Ahacronane River	15	10	10	15	10	10	70	11.7	Marginal
4	Ballynisky Pond	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5	Ahacronane River	10	10	5	15	10	5	55	9.2	Marginal
6	Lissatotan	10	10	5	10	5	5	45	7.5	Marginal
7	Creeves	5	5	5	5	5	5	30	5.0	Poor
8	Ahacronane River	10	10	10	20	15	10	75	12.5	Suboptimal
9	RATHNAGORE 24 (24R22)	5	10	5	20	15	10	65	10.8	Marginal
10	Riddlestown	5	5	5	10	10	10	45	7.5	Poor / Marginal
11	Riddlestown	5	5	5	15	5	5	40	6.7	Marginal
12	Riddlestown	15	10	10	15	15	5	70	11.7	Marginal
13	Riddlestown	10	5	5	15	10	15	60	10.0	Marginal
14	Deel (Newcastlewest)	20	15	15	15	15	15	95	15.8	Suboptimal
15	Knockardnacorlan	20	15	10	10	15	5	75	12.5	Suboptimal / Marginal

*Scale: Poor – 5, Marginal – 10, Suboptimal – 15, Optimal – 20.

4.2.7.2.2 *Macroinvertebrate Diversity and Abundance*

The bulk of macroinvertebrates recorded across the survey sites belong to pollution sensitivity group C (pollution-tolerant), as per Toner *et al.* (2005). The greatest diversity of macroinvertebrates was found at Site 3 on the Ahacronane River where 18 taxa were recorded while the lowest family diversity was encountered at Site 1 (Rathnagore_24 Stream) and Site 11 (Riddlestown River) where only 7 taxa were recorded at each.

Pollution-tolerant larvae of *Baetis rhodani, Seratella ignita* and *Caenis* sp. were the only Ephemeroptera (mayflies) encountered and were present at all sites, apart from Sites 1, 4 and 9. The Order Plecoptera (stoneflies) were not recorded at any site. Trichopterans (caddisflies) were a well-represented group with three cased (Group B) and two caseless (Group C) families recorded. Cased caddisfly larvae in families Limnephilidae, Sericostomatidae and Glossosomatidae were generally scarce where they occurred and caseless caddisfly larvae of *Polycentropus* sp. and *Rhyacophila* sp. had a patchy distribution across the surveys.

Dipteran larvae accounted for a significant proportion of the macroinvertebrate community at the survey sites. The most frequently recorded true fly larvae were pollution tolerant Simuliidae (blackfly) and green chironomids while other true fly larvae recorded included *Dicranota sp*. and *Tipula sp.* Six different beetle families were recorded, namely Elmidae, Dytiscidae (diving beetles), Hydrophilidae, Hydraenidae and Gyrinidae (water beetles). Mollusc species observed were the snails *Potamopyrgus antipodarum, Bithynia tentaculata, Physa fontinalis*, *Lymnaea peregra* and *L. stagnalis* (see **Plate 8**, below). The crustacean *Gammarus duebeni* and hog louse (*Asellus aquaticus*) were the only members of Order Crustacea recorded during the current study, the former accounting for a significant proportion of the macroinvertebrate biomass at most locations.

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Plate 8: The freshwater snail *Lymnaea peregra* at Site 2 (left), and dragonfly larva recorded at Site 4 (right).

4.2.7.3 Fish

The distribution and range of protected fish species that have previously been recorded within the hectads R24 and R34 are detailed in **Table 6**, below, based on Article 17 (2013-2018) Assessments in NPWS (2019).

Table 6. Distribution and range of aquatic Annex II species in hectads R24 and R34.

Species	R24		R34		Likely reason for distribution within hectads
	CD*	CR^	CD*	CR^	
Sea lamprey (*Petromyzon marinus*) [1095]	No	No	No	No	n/a
River lamprey (*Lampetra fluviatilis*) [1099]	No	No	No	No	n/a
Brook lamprey (*Lampetra planeri*) [1096]	No	Yes	No	Yes	Common species likely to occur in most fluvial habitats with suitable spawning and nursery habitats.
Atlantic salmon (*Salmo salar*) [1106]	Yes	Yes	Yes	Yes	Owvane River ca. 7km west of and beyond ZOI of proposed development site supports salmon in R24. River Deel in R34 also supports salmon.
White-clawed crayfish (*Austropotamobius pallipes*) [1092]	No	No	Yes	Yes	River Deel in R34 once supported species but population decimated in 2017. Not recorded in 2020 EPA biological sampling.

* CD: Current Distribution, ^ CR: Current Range

A total of 85 individual fish were recorded – 63 three-spined stickleback (*Gasterosteus aculeatus*), 11 European eel, and 11 brown trout during the summer 2022 electrical fishing surveys at sites detailed in **Figure 2** and **Table 1**, above. The length descriptive statistics for each individual encountered are presented in **Table 7** and **Plate 9**.

Site 11 at the upper reaches of the Riddlestown River was the only site surveyed where no fish were recorded, presumably due to a reduced habitat suitability and poor provision of cover for fish at the site. Electrical fishing surveys could not be carried out at Site 4 (Ballynisky Pond) or at Site 7 (Creeves Stream) due to their small size/unsuitable habitat. Electrofishing surveys were not carried out at Sites 13, 14, and 15 which were subjected to habitat assessment and physico-chemical water sampling only.

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Table 7. Length descriptive statistics for fish species captured during the 2022 electrofishing surveys.

Site	Species	Total number of fish captured	Fish Length (cm)			Standard deviation
			Mean	Min	Max	
1	Three-spined stickleback	2	3.3	3.5	0.1	3.4
2	Three-spined stickleback	14	3.7	2.4	5.3	0.8
3	Three-spined stickleback	6	3.8	3.2	5.4	0.8
5	European eel	6	33.2	29.5	37.0	2.4
	Three-spined stickleback	11	3.6	2.3	5.8	1.0
6	Three-spined stickleback	5	4.3	3.4	5.2	0.8
8	Brown trout	11	10.8	8.6	17.6	2.8
	European eel	5	29.2	22.0	35.7	4.8
	Three-spined stickleback	11	4.0	2.8	6.0	1.2
9	Three-spined stickleback	5	3.7	3.3	4.2	0.3
10	Three-spined stickleback	3	3.5	3.1	3.8	0.3
11	No fish detected	-	-	-	-	-
12	Three-spined stickleback	6	4.2	3.1	5.8	0.9

Three spined stickleback was the most widespread species encountered, occurring at all survey locations apart from Site 11, and ranged in length from 2.4 centimetres to 6 centimetres (see **Plate 9**, below). Three-spined stickleback is one of the most widely distributed fish in the country and is commonly recorded in rivers, lakes and transitional waters (Maitland & Campbell, 1992). Within the proposed development site, three-spined stickleback likely occur in the larger drainage ditches and may possibly occur within Ballynisky Pond near T6. European eel were recorded at two sites on the Ahacronane River in areas of deepest water where rock provided ideal cover – at Site 5, six eel were recorded just below the bridge, while at Site 8, five eel were recorded just above the bridge. The lengths of all eels captured ranged from between 29.2 centimetres and 37 centimetres (see **Plate 9**, below).

Plate 9: Three-spined stickleback recorded at Site 8 (left), and European eel captured at Site 5 (right).

Brown trout was recorded at only one site during the summer 2022 electrical fishing surveys – at Site 8 on the Ahacronane River at Creeves Cross, approximately 3.5 river kilometres downstream from the proposed development site. Most trout captured were juvenile fish, ranging in length from 8.6 centimetres to 17.6 centimetres (10.8 centimetres mean length). Several brown trout redds (nests in shallow river gravel) were observed on 20th December 2022 at Site 3 on the Ahacronane River approximately 0.6 river kilometres downstream from the proposed development site near T1 (see **Plate 10**, below).

Plate 10: Brown trout captured at Site 8 (left), and brown trout redds at Site 3 on the Ahacronane River in December 2022 (right).

Although the watercourses within the proposed development site itself are considered too small, the watercourses draining the site are deemed to be of variable suitability for the early life stages of salmonids[26]. Salmonid juveniles and smolts have similar general requirements to those of sexually mature fish, and as they grow, the juveniles of both species of *Salmo* tend to move into deeper water (Crisp, 2000). Consequently, the lower reaches of the Ahacronane and Riddlestown Rivers are more suitable for adult salmonids due to the greater fluvial area and presence of larger pools, a point illustrated by the fact that the only trout recorded during the 2022 electrofishing surveys was at Site 8 on the Ahacronane River a considerable distance downstream of the proposed development site. The brown trout redds encountered at Site 3 (see Plate 10, above) indicate that trout spawning occurs within this reach of the Ahacronane River, and that juvenile trout are likely to occur downstream from the proposed development site with the likelihood of occurrence increasing with distance downstream.

No salmon were recorded during the electrofishing surveys of 2022, and the species is not considered to be supported within these watercourses. Inert suspended solids can have a variety of effects upon salmonid fishes, both indirectly and directly. They may have indirect effects through reduction of light input and, when they settle out in slower flows, they may occlude gravel interstices and reduce the number of hiding places for small fish and/or their invertebrate prey. More directly, they may abrade or clog delicate membranes (e.g. fish gills) and they may cause skin irritation and abrasions, which may facilitate various secondary infections (Crisp, 2000). The obvious water quality problems encountered at the survey sites summarised in Figure 2 and Table 4, above, reduce the salmonid habitat value of all watercourses and silt is identified as one of the main problems.

Deeper parts of the subject streams are important refugia for trout and European eel, the latter of which occurred in good numbers in the rocky substrate pools of the Ahacronane River. The drainage ditches within the proposed development site may support a nominal population of three-spined stickleback. However, based on the habitats recorded and the results of the electrical fishing surveys, salmon (*Salmo salar*) or migratory lampreys (river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*)) are highly unlikely to occur in the reaches of watercourses potentially affected by the proposed development. The only nearby freshwater receptor that supports salmon is the River Deel into which the Riddlestown River discharges, approximately 7.5 river kilometres downstream from the proposed development's southern border.

Overall, the watercourses draining the proposed development site collectively support brown trout, European eel, three-spined stickleback, and possibly brook lamprey (*Lampetra planeri*) but are highly unlikely to support salmon or migratory lamprey species.

[26] Salmonids – family (*Salvelinus*) of fishes that include salmon, trout, and chars.

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4.2.7.4 Freshwater Pearl Mussel (*Margaritifera margaritifera*)

The proposed development site is not located within a freshwater pearl mussel (*Margaritifera margaritifera*) (FPM) catchment (*Margaritifera* Sensitive Area) according to EPA data maps available online[27] and there was no live FPM nor evidence of FPM (e.g. shells) recorded during the aquatic ecology surveys carried out at sites within and around the proposed development site. In general, the sedimentation levels recorded were generally indicative of artificially induced siltation with these conditions considered unfavourable in terms of FPM habitat.

4.2.7.5 Biological Water Quality

Surveying determined that the watercourses within the study area are impacted to such a degree that no 'Group A' pollution-sensitive taxa were recorded. It is also notable that there were no records obtained of Plecoptera (stoneflies), a major group of macroinvertebrates containing mostly pollution-sensitive indicators, while, Salmonidae, another important biological metric of water quality was also absent from most survey sites (refer to **Section 4.2.7.3**, above, for more on Salmonidae).

Biological water quality surveying could not be carried out at Site 7 due to an insufficient volume of water flow at the survey site. Apart from Site 1, Site 7 and Site 4, biological water quality at all sites was assigned a Q-rating[28] of 'Slightly polluted (Q3)' (equivalent to a WFD 'Moderate status') due to the paucity of pollution-sensitive taxa. Site 1 was unsuitable for the Q-rating scheme due to its small size and/or poor habitat, and Site 4 at Ballynisky Pond was also unsuitable since the index is relevant only for flowing waters.

The Average Score Per Taxa (ASPT)[29] ratings ranged from 3.8 (Site 1) to 6.3 (Site 5). A value of more than 5.5 indicates good water quality and was achieved only at Site 5 and Site 12. The EPT (Ephemeroptera, Plecoptera, Trichoptera)[30] index of water quality scores varied between 0 (Site 1) and 7 (Site 5) which signifies a highly variable macroinvertebrate richness and is generally indicative of degraded water quality. Furthermore, cyanobacteria observed at Site 2 indicates organic pollution of the river stretch.

Q-ratings, EPT and BMWP indices derived from the diversity and relative abundance of the macroinvertebrates at the study sites are given in **Table 8**, below.

Table 8. Biological water quality results and interpretations at study sites on watercourses potentially affected by the proposed Ballynisky Wind Farm.

Site	Watercourse	Q-rating	Quality status	Corresponding WFD status	ASPT	EPT
1*	Rathnagore	n/a	n/a	n/a	3.8	0
2	Ahacronane (River)	Q3	Moderately polluted	Poor	4.6	3
3	Ahacronane (River)	Q3	Moderately polluted	Poor	5.0	5
4^	Ballynisky Pond	n/a	n/a	n/a	4.2	0
5	Ahacronane (River)	Q3	Moderately polluted	Poor	6.3	7
6	Lissatotan	Q3	Moderately polluted	Poor	5.3	4
7†	Creeves	n/a	n/a	n/a	n/a	n/a
8	Ahacronane (River)	Q3	Moderately polluted	Poor	4.2	3

[27] EPA Maps Accessed: 17th June 2025
[28] Quality Rating (Q) System devised by Toner *et al.* (2005). This method categorises invertebrates into one of five groups (A-E), depending on their sensitivity to pollution. Q values range from Q1-Q5 with Q1 being the poorest quality and Q5 being pristine/unpolluted conditions. The system is used by the EPA and is the standard biological assessment technique used when surveying rivers in Ireland under the WFD.
[29] Based on average value of each taxa sampled - calculated by summing indicator values and dividing by number of taxa sampled. Index values range from 0 to 10. High ASPT index value (more than 5.5) indicates high ecological status; low values indicate bad/degraded ecological status.
[30] Uses three orders of easily identifiable aquatic insects: mayflies (Ephemeroptera), stoneflies (Plecoptera) and caddisflies (Trichoptera), and is commonly used as an indicator of water quality (Lenat, 1988) - calculated by summing the number of taxa represented by the three insect orders. Index is based on premise that many aquatic insect species are pollution-intolerant and will not be found in polluted waters meaning that the greater the pollution, the lower the species richness expected.

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Site	Watercourse	Q-rating	Quality status	Corresponding WFD status	ASPT	EPT
9	Rathnagore	Q3	Moderately polluted	Poor	5.1	3
10	Riddlestown	Q3	Moderately polluted	Poor	4.8	2
11	Riddlestown	Q3	Moderately polluted	Poor	5.0	2
12	Riddlestown	Q3	Moderately polluted	Poor	6.2	6

** unsuitable for Q-rating scheme due to small size/poor habitat*
^ unsuitable for Q-rating scheme due to absence of flowing water within waterbody
† unsuitable for biological water quality surveying due to insufficient volume of water

4.2.7.6 In-Situ Physico-chemical Water Quality Results

Results of the on-site physico-chemical measurements of water samples taken in summer 2022 from survey sites 1 to 12 are presented in **Table 9**, below. Since the watercourses drain soil over limestone formations, conductivity levels are relatively high while water hardness is elevated as indicated by the degree of bed calcification within the Ahacronane River at Site 8 (almost complete cementation).

Table 9. Results of the on-site physico-chemical water measurements.

Site	Watercourse	pH	Temperature (°C)	Conductivity (µS/cm)
1	Rathnagore	8.43	14.0	757
2	Ahacronane (River)	8.40	13.8	738
3	Ahacronane (River)	8.36	13.6	731
4^	n/a	n/a	n/a	n/a
5	Ahacronane (River)	8.62	14.2	728
6	Lissatotan	8.44	13.9	725
7	Creeves	8.52	14.0	752
8	Ahacronane (River)	8.15	14.0	779
9	Rathnagore	8.50	13.9	763
10	Riddlestown	8.44	13.8	662
11	Riddlestown	8.64	13.5	541
12	Riddlestown	8.45	14.5	688

^ unsuitable for physico-chemical water sampling due to small size and absence of flowing water within pond.

4.2.7.7 Ex-Situ Physico-chemical Water Quality Results

Laboratory results of the comprehensive water quality analyses carried out by Southern Scientific at Farranfore in County Kerry are presented in **Table 10**, below.

In general, total ammonia within samples is low (0.02 mg/l to 0.06 mg/l) apart from Site 14 on the River Deel which has significantly higher total ammonia levels of 0.34 mg/l. For salmonid waters, the 'Freshwater Directive (78/659/EEC)' guidance limit for Biochemical Oxygen Demand (BOD) is 3 mg/l O_2, and except for Site 9 (Rathanagore Stream) and Site 14 (River Deel), all sites remain within these BOD guidance limits.

The relatively high levels of nitrate across all sites indicate poor water quality. Nitrate concentrations below 8 mg/l NO_3 are indicative of good water quality but only five survey sites (Sites 2, 9, 10, 11 and 15) meet this level. Conversely, Site 6 (Lissatotan Stream) has the highest nitrate levels at 26.26 mg/l NO_3. Water hardness varies significantly between samples - Sites 1, 2, and 3 are classified as 'moderately soft' (79 mg/l $CaCO_3$) while Site 15 (Knockardnacorlan Stream) is categorised as 'hard' (286 mg/l $CaCO_3$). All other sites (5 to 14) have 'very hard' water (>300 mg/l $CaCO_3$) indicating mineral enrichment.

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Overall, the laboratory results are presented in **Table 10**, below, reveal that water quality varies across the survey sites and that pollution concerns are localised. Agricultural run-off and nutrient enrichment appearing to be the main pressures affecting the water quality of watercourses nearest the proposed development site.

The full laboratory report, including detailed results and parameter breakdowns, is available in the Aquatic Ecology and Fish Survey Report in **Appendix 6C** of Volume III of the EIAR.

Table 10. Summary laboratory results of physico-chemical water quality analyses.

Site	Watercourse	pH	Temp. (°C)	Conductivity (µS/cm)	BOD (mg/l O_2)	Total ammonia (mg/l N)	Nitrate (mg/l NO_3)	Total hardness (mg/l $CaCO_3$)
1	Rathnagore_24 (24R40)	7.5	14.3	603	3.7	0.03	16.34	79
2	Ahacronane River	7.9	13.9	619	<1.0	<0.02	6.8	79
3	Ahacronane River	7.9	14.6	605	<1.0	<0.02	10.55	79
4^	Ballynisky Pond	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5	Ahacronane River	7.9	13.2	612	<1.0	0.04	15.12	474
6	Lissatotan	7.6	14.2	699	<1.0	<0.02	26.26	508
7	Creeves	7.7	13.2	648	<1.0	0.06	12.25	487
8	Ahacronane River	7.9	14.3	641	2.4	0.03	15.25	503
9	RATHNAGORE 24 (24R22)	7.8	13.8	612	5.2	<0.02	7.5	452
10	Riddlestown	8.0	13.7	580	<1.0	<0.02	7.4	431
11	Riddlestown	7.9	13.2	597	<1.0	<0.02	4.68	469
12	Riddlestown	8.0	14.1	618	<1.0	0.05	11.26	474
13	Riddlestown	7.8	13.6	647	<1.0	0.03	13.68	471
14	Deel (Newcastlewest)	8.0	13.5	465	5.3	0.34	11.75	305
15	Knockardnacorlan	8.1	13.0	407	<1.0	0.04	5.35	286

^ unsuitable for physico-chemical water sampling due to small size and absence of flowing water within pond

4.2.8 Ornithology

Full details of the survey results have been presented in **Chapter 07 Ornithology**, of Volume II of the EIAR. The results of the surveys are summarised in the following sections.

4.2.8.1 Vantage Point (VP) Surveys and Transect Surveys

Table 11, below, lists the primary and secondary target species (23 species in total) recorded during the vantage point (VP) surveys and transect surveys at the proposed wind farm site (species listed on Annex I of the Birds Directive[31] are highlighted in bold) from April 2020 to March 20205, inclusive. Observed species include eight Special Conservation Interest (SCI) species for which two nearby European sites are designated – refer to **Section 4.2.8.6**, below.

[31] Annex I lists 194 species and sub-species of birds that are particularly threatened. EU Member States must designate Special Protection Areas (SPAs) for them and all migratory bird species.

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Table 11. Primary and secondary target species recorded during VP and transect surveys undertaken between April 2020 and March 2025, inclusive.

Species	Summer 2020	Winter 20/21	Summer 2021	Winter 21/22	Summer 2022	Winter 22/23	Summer 2023	Winter 23/24	Summer 2024	Winter 24/25
Black-headed gull (*Chroicocephalus ridibundus*)*		X	X	X		X	X	X	X	X
Buzzard (*Buteo buteo*)	X	X	X	X	X	X	X	X	X	X
Common gull (*Larus canus*)		X	X					X		X
Cormorant (*Phalacrocorax carbo*)*			X				X	X	X	X
Curlew (*Numenius arquata*)*			X					X		X
Golden plover (*Pluvialis apricaria*)*						X		X		X
Great black-backed gull (*Larus marinus*)	X		X			X				
Great white egret (*Ardea alba*)								X		
Grey heron (*Ardea cinerea*)	X						X		X	X
Hen harrier (*Circus cyaneus*)^						X				
Herring gull (*Larus argentatus*)	X	X	X							
Kestrel (*Falco tinnunculus*)	X	X	X	X	X	X	X	X	X	X
Lapwing (*Vanellus vanellus*)*										X
Lesser black-backed gull (*Larus fuscus*)	X	X	X	X	X		X	X	X	X
Little egret (*Egretta garzetta*)	X	X	X	X		X	X	X	X	X
Mallard (*Anas platyrhynchos*)		X				X		X	X	X
Mute swan (*Cygnus olor*)								X	X	X
Peregrine (*Falco peregrinus*)						X			X	X
Snipe (*Gallinago gallinago*)	X	X		X		X	X	X	X	X
Sparrowhawk (*Accipiter nisus*)	X	X		X		X	X	X	X	X
Whimbrel (*Numenius phaeopus*)							X		X	
Whooper swan (*Cygnus cygnus*)*				X						

*Special Conservation Interest (SCI) species for which the River Shannon and River Fergus Estuaries SPA (004077) is designated. The SPA is located 6 km north of proposal site. Refer to **Section 8.3**, below.
^SCI species for which Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA (004161) is designated. The SPA is located 3.7 km west of proposed T1 location. Refer to **Section 8.1**, below.

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4.2.8.2 Hen Harrier Roost Surveys

During the dedicated roost surveys carried out over the winter 2022/23 months, hen harrier was observed on three occasions – twice in February 2023 and once in March 2023. All observations involved the bird flying from east to west, away from the proposed development site over Carrigkerry Bog in an area nearly seven kilometres southwest of the proposed development site boundary at T3. No roosting behaviour was confirmed but a female flew low over the bog on 23rd February 2023 and possibly landed in an area of suitable roosting habitat.

Hen harrier surveys were also carried out during the 2023 breeding season at the same location resulting in two observations of the species, one approximately five kilometres southwest of the proposed development site boundary at T3, and another at more than seven kilometres to the southwest of the site boundary. No hen harrier breeding/territorial behaviour was observed during the surveys.

Similarly, during the winter 2023/24 roost surveys, there were three separate observations of a single adult male hen harrier moving westwards over the bog, hunting low to the ground on two occasions (2nd January and 12th February) and flying at heights of up to 30 metres on the third occasion (12th February). No roosting behaviour was confirmed, and all observations occurred nearly seven kilometres southwest of the proposed development site. Finally, a ringtail hen harrier (either a juvenile bird or female adult) was observed on 6th November 2024 flying low to the ground over the bog before eventually roosting at a location approximately seven kilometres southwest of the proposed development site's westernmost boundary.

Refer to **Table 12**, below, for summary details of hen harrier observed during the roost surveys. Further details on locations of hen harrier flights are provided as Confidential Information within Annex D of the Ornithology Baseline Report in **Appendix 7A** in **Volume III** of the **EIAR**.

Table 12. Hen harrier roost surveys results from Carrigkerry Bog from February 2023 to November 2024.

Season	Date	Time flight first observed	Number observed	Age & sex of hen harrier observed	Height of flight (m)
Winter 2022/23	13/02/23	16.52	1	Adult male	40 - 60
	23/02/23	17.12	1	Adult female	2 - 4
	13/03/23	18.03	1	Adult male	20 - 25
Breeding 2023	05/05/23	10.15	1	Adult female	100 - 200
	02/06/23	09.17	1	Adult male	n/a
Winter 2023/24	02/01/24	15:55	1	Adult male	2 - 15
	12/02/24	16:45	1	Adult male	4
	12/02/24	17:45	1	Adult male	30
Winter 2024/25	06/11/24	16:54	1	Ringtail (Juv/Fem)	5

4.2.8.3 Breeding Raptor Surveys

Kestrel and buzzard were the only two raptor species observed during the dedicated breeding raptor surveys carried out in the summer months of 2023 and 2024. Kestrel was recorded on one occasion in May 2023 while buzzard was observed six times over the course of the surveys in June and July 2023. All observations occurred outside the proposed development site boundary, and no evidence of breeding was recorded.

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During the 2024 breeding season, one kestrel was observed hunting in May while buzzard was recorded individually on two occasions – once flying while being mobbed by corvids and once perched. In June 2024, kestrel and buzzard were seen on one occasion each, with the former recorded hunting over grassland and the latter observed soaring at heights of up 100 metres. No evidence of breeding for either species was recorded.

4.2.8.4 Breeding Wader Surveys

No wader species were recorded during breeding wader surveys undertaken during the 2023 breeding season along a transect route to the west of the proposed development site's western boundary - see **Figure 5**, above.

4.2.8.5 Hinterland Surveys

Four SCI species of the River Shannon and River Fergus Estuaries SPA were observed during the driven hinterland surveys carried out within a five-kilometre radius of the proposed development site in December 2022, February 2023, and January 2024, namely black-headed gull, cormorant, teal, and shoveler. All records occurred to the east and north of the proposed development site and at a distance of at least four kilometres from the site's boundary.

Flocks of black-headed gull ranged in size with the smallest consisting of three individuals observed 4.5 kilometres to the northwest, while the largest group consisted of approximately 300 individuals observed foraging within agricultural farmland. A pond situated approximately four kilometres east of the proposed development site was the site of multiple SCI species observations including 25 black-headed gull, one cormorant, two shoveler, and 35 teal – refer to **Figure 12**, below.

Further details on the hinterland surveys are outlined in **Chapter 07**, **Ornithology**, in Volume II of the EIAR, and in the Ornithology Baseline Report in **Appendix 7A** in **Volume III** of the **EIAR**.

Figure 12: Approximate locations of SCI species of River Shannon and River Fergus Estuaries SPA observed during hinterland surveys carried out within a 5-kilometre radius of the proposed development site.

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4.2.8.6 Special Conservation Interest (SCI) Bird Species of Nearby European Sites

Eight Special Conservation Interest (SCI) species for which the River Shannon and River Fergus Estuaries SPA (004077) is designated and the one SCI species for which the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161) is designated were recorded during the suite of ornithological surveys described in the preceding **Sections 4.2.8.1** to **4.2.8.5**. A summary of each of these nine SCI species observations follows in the sub-sections hereunder.

The peak counts of each species are summarised in **Table 13**, below, and the flightpaths maps of SCI species observed during VP surveys are presented in in the Ornithology Baseline Report in **Appendix 7A** in **Volume III** of the **EIAR**.

Hen Harrier (*Circus cyaneus*) [A082] - Stack's to Mullaghareirk Mountains: West Limerick Hills & Mt. Eagle SPA

There was one hen harrier flight recorded during the VP surveys, and it consisted of a single bird on 6th March 2023 flying from southeast to northwest away from the proposed wind farm site north of T1.

The dedicated hen harrier roost surveys of Carrigkerry Bog, at least five kilometres west of the proposed development site, recorded both males and females on several occasions but did not observe any breeding/territorial behaviour during the surveys. However, a ringtail (either a juvenile bird or female adult) was observed settling on the bog to roost in November 2024 at a location approximately seven kilometres southwest of the proposed development site's westernmost boundary.

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of hen harrier reported during any of the other surveys described in **Sections 4.2.8.1** to **4.2.8.5**, above.

Black-headed Gull (*Chroicocephalus ridibundus*) - River Shannon and River Fergus Estuaries SPA

Black-headed gull was the most frequently observed SCI species during VP surveys, occurring over the proposed development boundary and surrounding areas in every survey season bar two (summer 2020 and summer 2022).

During all five winter survey seasons, large flocks of black-headed gull were observed with the largest comprising approximately 200 individuals circling outside the western edge of the 500-metre buffer and west of T1 in October 2021. Black-headed gull flocks were also observed on the ground feeding in agricultural fields to the south and southeast of VP2 during several winter VP surveys – see **Figure 23** below, for locations. Black-headed gulls were recorded only rarely in the breeding (summer) season - a single bird in April 2021, a flock of three in September 2023, and a pair together in July 2024.

As discussed already in **Section 4.2.8.5**, above, black-headed gull were also encountered relatively frequently during the hinterland surveys with a flock of 300 seen feeding in agricultural fields, 4 km north west of the proposed development and 25 at a pond situated approximately four kilometres east of the proposed development site – see **Figure 12**, above.

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of black-headed gull reported during any of the other surveys described in **Sections 4.2.8.1** to **4.2.8.5**, above.

Cormorant (*Phalacrocorax carbo*) [A017] - River Shannon and River Fergus Estuaries SPA

During VP surveys, a cormorant pair was observed in April 2021 flying from north to south towards T1 just outside the northern border of the proposed development area, while in mid-September 2023, two single-bird flights were observed, both occurring outside the proposed development area southwest of T3. An individual cormorant in flight was also recorded in each of February, May, and December 2024 - the former two occurred at the eastern

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side of the proposed development site moving from northwest to southeast, while the latter moved from north to south past VP1. All occurred outside the airspace above the redline boundary apart from one that briefly passed over the area between T6 and T5. Cormorant was also recorded once during the hinterland surveys (see **Figure 12**, above) at a small pond approximately 4 kilometres east of the proposed development site.

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of cormorant reported during any of the other surveys described in **Sections 4.2.8.1** to **4.2.8.5**, above.

Curlew (*Numenius arquata*) [A160] - River Shannon and River Fergus Estuaries SPA

There were two curlew flights observed during VP surveys – one in July 2021, and one in February 2024. Both occurred outside the 500-metre buffer of the proposed development site – one to the north of the site near VP2 and the other to the southwest of the site. Both flights involved one curlew flying over agricultural grassland from south to north away from the proposed wind farm site.

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of curlew reported during any of the other surveys described in **Sections 4.2.8.1** to **4.2.8.5**, above.

Golden Plover (*Pluvialis apricaria*) [A140] - River Shannon and River Fergus Estuaries SPA

Golden plover was seen during VP surveys during the winter 2023/24 season only. Both observations concerned flocks of golden plover - 36 birds from VP2 moving north to south, and 24 birds from VP1 moving southwest to northeast – with both flights moving directly through the centre of the proposed wind farm's airspace. A peak count of twelve golden plover was also recorded during the transect surveys in March 2023.

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of golden plover reported during any of the other surveys described in **Sections 4.2.8.1** to **4.2.8.5**, above.

Lapwing (*Vanellus vanellus*) - River Shannon and River Fergus Estuaries SPA

During the VP surveys, two lapwing flights were observed in the winter 2024/25 survey season. The first involved two birds flying over farmland from north to south past VP1 away from the proposed development site and outside the 500-metre buffer area. The second flight concerned a flock of twelve lapwing moving in from the west before veering south towards T1 and the proposed wind farm site.

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of lapwing reported during any of the other surveys described in **Sections 4.2.8.1** to **4.2.8.5**, above.

Shoveler (*Anas clypeata*) - River Shannon and River Fergus Estuaries SPA

Two shoveler were observed in February 2023 at a pond approximately 4 kilometres east of the proposed development site during hinterland surveys (see **Figure 12**, above).

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of shoveler reported during any of the other surveys described in **Sections 4.2.8.1** to **4.2.8.5**, above.

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Teal (*Anas crecca*) - River Shannon and River Fergus Estuaries SPA

Two groups of teal – a flock of 10 during December 2022, and a flock of 35 during February 2023 - were observed at two separate ponds approximately 4 kilometres east of the proposed development site during hinterland surveys (see Figure 12, above).

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of teal reported during any of the other surveys described in Sections 4.2.8.1 to 4.2.8.5, above.

Whooper Swan (*Cygnus cygnus*) [A038] - River Shannon and River Fergus Estuaries SPA

There was one whooper swan flight observed during the VP surveys which involved a single bird flying southeast to northwest away from the proposed development site. The flight occurred in November 2021 and occurred outside the 500-metre buffer around the proposed development site.

The species was not observed on the ground within the footprint of the proposed development site during any of the bird surveys carried out. There were no other records of whooper swan reported during any of the other surveys described in Sections 4.2.8.1 to 4.2.8.5, above.

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Table 13. Summary of peak counts of SCI species, for which two nearby SPAs are designated, recorded during the suite of ornithological surveys described in Sections 4.2.8.1 to 4.2.8.5, above (unless specified, values pertain to VP surveys).

River Shannon and River Fergus Estuaries SPA										
	Summer 2020	Winter 20-21	Summer 2021	Winter 21-22	Summer 2022	Winter 22-23	Summer 2023	Winter 23-24	Summer 2024	Winter 24-25
Black-headed gull (*Chroicocephalus ridibundus*)		120	1	200		60 120 - Hinterland	3	72 300 - Hinterland	2	89
Cormorant (*Phalacrocorax carbo*)			2			1 - Hinterland	1	1	1	1
Curlew (*Numenius arquata*)			1							1
Golden plover (*Pluvialis apricaria*)						12 - Transect		36		
Lapwing (*Vanellus vanellus*)										12
Shoveler (*Anas clypeata*)						2 - Hinterland				
Teal (*Anas crecca*)						35 - Hinterland				
Whooper swan (*Cygnus cygnus*)				1						

Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA										
	Summer 2020	Winter 20-21	Summer 2021	Winter 21-22	Summer 2022	Winter 22-23	Summer 2023	Winter 23-24	Summer 2024	Winter 24-25
Hen harrier (*Circus cyaneus*)						1 1 – Hen harrier survey	1 – Hen harrier survey	1 – Hen harrier survey		1 – Hen harrier survey

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4.2.8.7 Wintering Waterbird Distribution Surveys

Species recorded during winter waterbird distribution surveys at Lough Doohyle shown in **Figure 6**, above, were typical estuarine species associated with the River Shannon and River Fergus Estuaries SPA and the entire Shannon and Fergus estuarine complex (see description of SPA and associated waterbirds in **Section 8.3**, below). The peak counts for the Special Conservation Interest (SCI) wintering waterfowl species for which the River Shannon and River Fergus Estuaries SPA is designated that were counted in the winter 2022/23 season are set out in **Table 14**, below, with further details outlined in the Ornithology Baseline Report in **Appendix 7A** of **Volume III** of the **EIAR**.

Table 14. Special Conservation Interest (SCI) wintering waterfowl species for which the River Shannon and River Fergus Estuaries SPA is designated counted at Lough Doohyle in the winter 2022/23 season.

Waterbird Species	Peak Count
Black-headed gull (*Chroicocephalus ridibundus*)	3
Curlew (*Numenius arquata*)	17
Teal (*Anas crecca*)	45
Wigeon (*Anas Penelope*)	5

5. Description of the Proposed Development

5.1 Brief Development Description

It is proposed to erect a six (6) No. turbine wind farm at a location in northwest County Limerick, approximately 31.5 kilometres southwest of Limerick City Centre. The total footprint of the site encompassing six wind turbines, access tracks, crane hardstand areas, 38kV underground electrical cable, permanent meteorological mast, material deposition areas, clear span bridge crossing, and temporary construction compound is approximately 43.02 hectares (see **Figure 14**, below).

There are two proposed grid route options under consideration to connect the electrical energy generated by Ballynisky Wind Farm to the National Electricity Grid (NEG) – Option A and Option B. However, the final selected grid route and connection strategy will be confirmed via a future grid connection offer process as determined by EirGrid.

Option A involves installation of a new 38kV underground cable (UGC) will connect a proposed new Ballynisky Wind Farm substation with the existing Carrons Wind Farm substation located approximately 1.8 kilometres west of the proposed permanent entrance on the L1219 Local Road. The UGC will be mainly installed along the L1219 with the total route between the two substations measuring approximately 2.5 kilometres (see **Figure 14**, below). Alternatively, Option B is to loop into the existing 38kV overhead line that transects the site. The line would be cut, and an unground line ran to the proposed 38kV substation on site and back out to connect to the existing line continuing towards the Rathkeale 110kV substation.

The characteristics of the proposed development and the design are described in detail in **Section 5.3**, below, with a site layout map shown in **Figure 14**, below. More detailed site layout drawings are provided in **Planning Drawings 22569-5005**, **22569-5007** and **22569-5406** enclosed with the Planning Application.

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The proposed development lands span several property folios owned by private landowners and will be developed by agreement and with the consent of the relevant landowners. All proposed turbines are located within areas that are designated as 'preferred areas' for wind energy development (see **Figure 13**, below) in Chapter 9 of Volume 1 of the Limerick Development Plan 2022-2028[32].

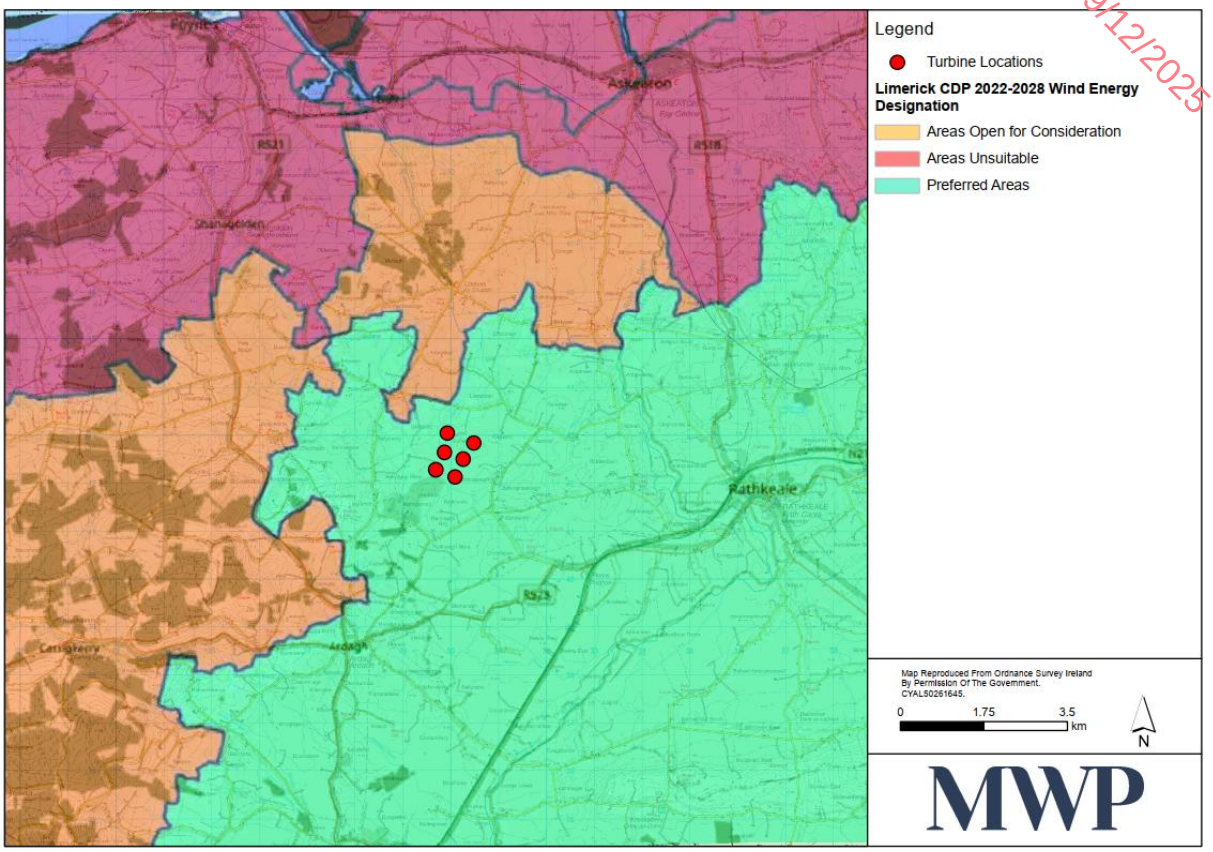

Figure 13: Wind energy zoning of lands within and around the proposed development site as designated in the Limerick Development Plan 2022 – 2028.

5.2 Purpose of the Proposed Development

The purpose of the proposed development is for the generation of electricity from a renewable resource by means of a commercially viable six-turbine wind farm which will supply electricity to the National Electricity Grid (NEG).

5.3 Characteristics of the Proposed Development

5.3.1 Development Components and Infrastructure

The proposed wind farm will comprise six wind turbines and associated infrastructure including electrical cable connection to the NEG within a total site area of 43.02 hectares - refer to **Figure 14** and **Figure 15**, below.

Table 15, below, sets out the elements of the proposed development for which development consent is being sought and all other associated development components:

[32] Limerick-Development-Plan-Volume-1-Written-Statement-including-Variation-No-1.pdf Accessed: 24th June 2025

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Table 15. Characteristics of the proposed Ballynisky Wind Farm development in County Limerick.

Proposed development for which consent is sought	Core Wind Farm Components ▪ Six (6) No. wind turbines with a tip height of 158 m, a rotor diameter of 136 m and all associated foundations and hardstanding areas. ▪ One (1) No. 38kV on-site substation compound containing a substation building, associated electrical equipment and transformers with separate client side and ESB entrances. The building will contain a control room, switchgear room, ESB room and storeroom. ▪ Underground electrical and communications cabling between wind turbines and on-site substation. ▪ Grid Connection Option A: 2.54km-long 38kV underground cable connection from the on-site substation to the existing Carrons Wind Farm substation to the west of site. ▪ Grid Connection Option B: Loop into existing 38kV overhead line via the proposed new 38kV substation. ▪ A new temporary site entrance off the L1219 local road to the west of the permanent site entrance for the duration of the construction phase only. ▪ Upgrade of existing farm entrance and access track off L1219 local road at the northwest of site to serve as a permanent site entrance for the operational wind farm. ▪ Approximately 3.4 km of new site access tracks with associated turning areas and drainage. This includes approximately 490 m of temporary access tracks that will be reinstated following construction. ▪ Upgrade of approximately 470 m of existing site access tracks. ▪ A 9 m-long clear span bridge crossing of the Ahacronane River by an internal site access track to the northwest of turbine T1, and an associated 1.5 m x 1.0 m relief culvert. ▪ A permanent meteorological mast with a height of 90 m, a foundation and hardstand. ▪ Two (2) material storage areas with a total capacity of approximately 39,300 m^3. ▪ A temporary construction compound with an area of approximately 1,375 m^2. ▪ All associated site development works, including drainage, diversion or undergrounding of low voltage powerlines, landscaping and revegetation.

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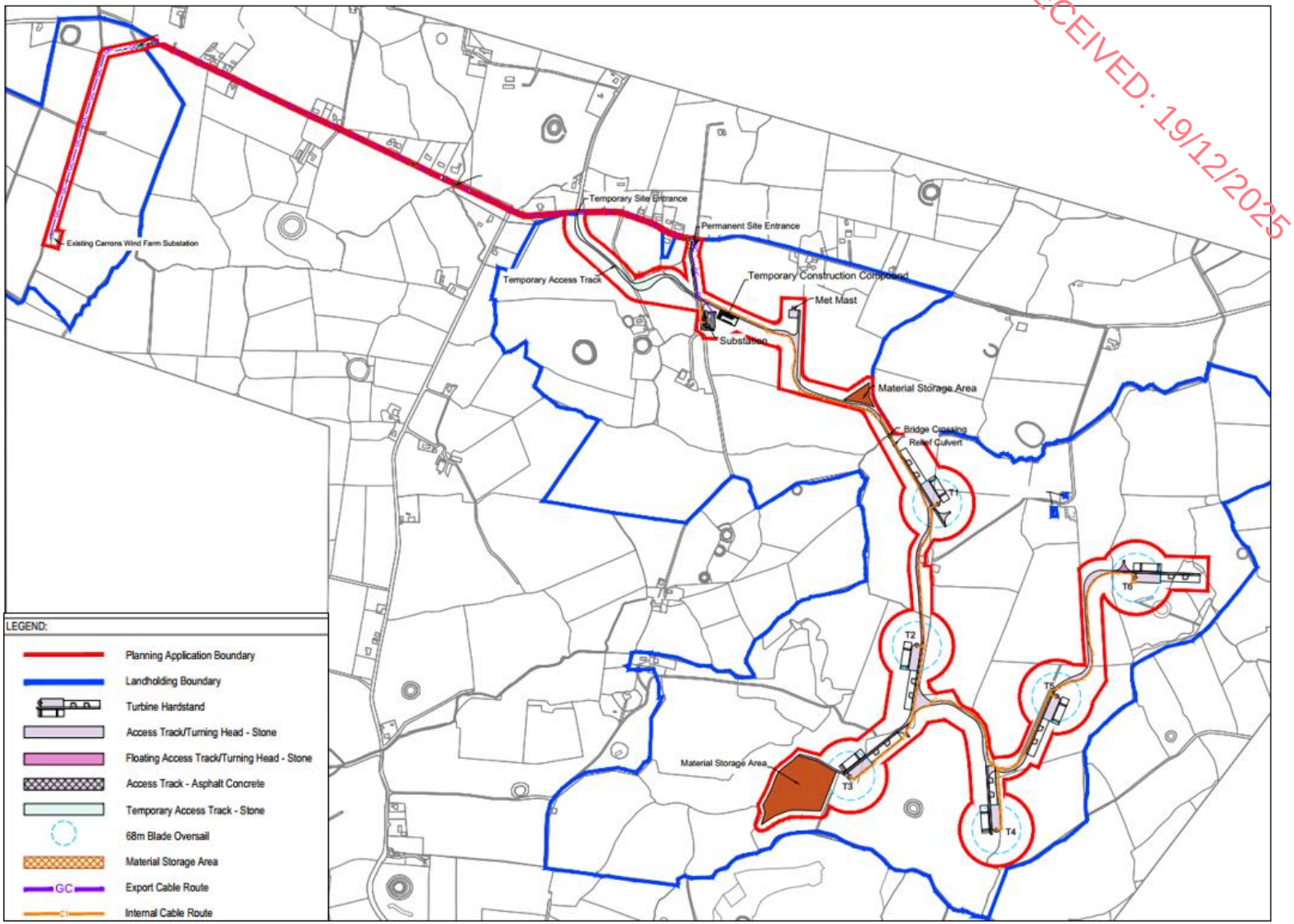

Figure 14: Site layout of proposed Ballynisky Wind Farm in County Limerick.

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5.3.2 Site Access

Primary access to the proposed development site will be provided from the local public road the L1219 via two site entrances – one temporary and one permanent. The temporary entrance will be located to the northwest of the site on the L1219 close to its junction with the L1220 and will be used only for the duration of the construction phase. Approximately 0.36 kilometres east along the L1219, an existing farm access track will be upgraded to become the permanent site access point during the operational life of the wind farm - refer to **Figure 15**, below.

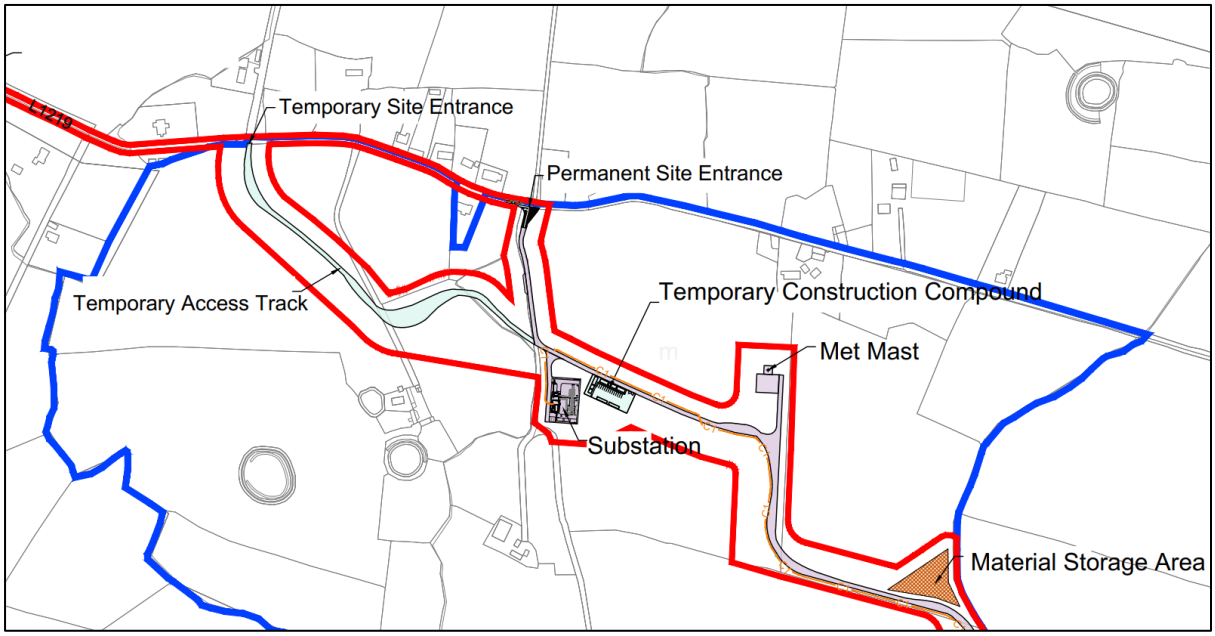

Figure 15: Locations of site entrances (temporary and permanent) on L1219, temporary site construction compound, and new substation and met mast.

5.3.3 Wind Turbines

It is proposed to install six (6) No. wind turbines each with a maximum tip height of up to 158 metres and with an approximate total installed capacity of 27 MW. The rotor diameter of the turbines will be 136 metres, and each turbine will have a tower hub height of 90 metres. Turbines have been laid out to achieve the most suitable layout based on the site's specific environmental and physical characteristics. The co-ordinates of the proposed turbines are set out in **Table 16**, below.

The turbine model is expected to be the Vestas 136 which is certified under the International Electrotechnical Commission IEC 61400-1 safety standards and designed to withstand the environmental conditions encountered on site. The proposed turbines will be of a typical modern design, incorporating tubular towers and three blades attached to a nacelle. The tower supports a nacelle and rotor hub. Commercial wind turbine hubs and towers are typically made of steel, while the blades can be made of a matrix of glass-fibre reinforced polyester or wood-epoxy or a similar composite material. The turbines will be finished to a white, off-white, or light grey colour and will have a matt non-reflective finish as specified in the 2006 Wind Energy Development Guidelines[33] and the

[33] Wind Energy Development Guidelines (2006) Accessed: 5th May 2025

2019 Draft Revised Wind Energy Development Guidelines[34]. It is proposed to install lighting on the turbines in a pattern that is acceptable to the Irish Aviation Authority for aviation visibility purposes.

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Table 16. ITM co-ordinates for the 6 turbines of the proposed Ballynisky Wind Farm.

Turbine Number	ITM Grid Coordinates	
T1	529899	643084
T2	529841	642685
T3	529655	642322
T4	530064	642172
T5	530232	642542
T6	530454	642876

5.3.3.1 Wind Turbine Foundations

Each wind turbine will have a reinforced concrete base pad foundation with a central plinth above the base to support the turbine tower. Each turbine base will bear onto rock or other such suitable bearing stratum and will be constructed using a wide and shallow spread foundation (see **Plate 11**, below). A typical foundation will be approximately 28 metres in diameter and will usually be installed to a depth of approximately 3 metres below ground level (BGL). Approximately 800 m^3 of concrete and 80 tonnes of steel will be used to construct each turbine base. If poor ground conditions are encountered during pre-construction geotechnical ground investigations or during excavations and a significant depth to sub-formation is necessary, a piled foundation may be required. Final dimensions of the turbine bases will be confirmed as part of detailed engineering. Refer to **Drawing No. 22569-00-00-DR-C-5401** enclosed with the Planning Application for further turbine foundation details.

Plate 11: Typical construction of a wind turbine base.

[34] Draft Revised Wind Energy Development Guidelines December 2019 Accessed: 5th June 2025

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5.3.3.2 Turbine Hardstands

Each wind turbine will have an associated main crane hardstand area, two support crane hardstanding areas and a temporary laydown area adjacent to the foundation to lay the turbine blades across once delivered. Crane hardstands are required to accommodate delivery of the turbine components prior to their erection and to support the cranes during erection. Hardstands are also used for maintenance during the operation of the turbine (see **Plate 12**, below).

The main hardstand will be rectangular in shape measuring approximately 69 metres long by 25 metres wide with an approximate area of 1,725 metres^2. The hardstand areas will be excavated and bear onto rock (or other suitable bearing stratum) with a foundation of 0.5 to 1.5 metres, depending on the local bedrock profile. The two support crane hardstanding areas will each have an area of approximately 174 metres^2. The additional temporary laydown area for turbine blades and tower components adjacent to the main crane hardstand will measure approximately 77 metres by 21 metres wide and have an approximate area of 1,617m^2. The hardstand areas will remain in place during the lifetime of the wind farm to facilitate turbine maintenance and final decommissioning and will be reinstated with a layer of soil and revegetated after the commissioning phase is complete.

Each turbine will generate electricity at a nominal voltage and will have its own internal transformer to step-up to an on-site distribution voltage. The transformer and associated switchgear will be located within the turbine tower. The turbines will be connected to each other via underground cables which will then link back to the substation compound.

Plate 12: Example of typical finished hardstand on wind farm.

5.3.4 Internal Site Service Tracks

Internal site service tracks are required to interconnect elements of the site and allow access to all wind turbines and wind farm infrastructure. Existing tracks will be upgraded where possible and new tracks will be constructed to access each of the turbines, substation compound and meteorological mast. The routing of internal site service

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tracks is shown in **Figure 14**, above. Overall, almost 4 kilometres of access track infrastructure within the proposed development site will be required, comprising approximately 3.5 kilometres of new internal service tracks and 0.47 kilometres of existing internal access tracks to be upgraded and widened.

Existing or new surface water collection drains will be located on either side of the service tracks - drains on the lower side of the track will be used as part of the site's dirty water drainage system, while drains on the higher side will be retained as clean water drains (refer to **Section 5.4.9**, below).

5.3.5 Wind Farm Electrical Network

5.3.5.1 Internal Underground Cables

Each turbine will generate electricity at a nominal voltage and will have its own internal transformer to step-up to an on-site distribution network voltage. The transformer and associated switchgear will be located within the turbine tower. Each turbine will be serviced with electrical power and signal transmission via a network of new underground cabling to be installed along internal service tracks. The cables will also collect electricity from each turbine and connect them to the new onsite substation. Cabling will be installed in PVC ducting laid in trenches adjacent to the access track edge (as illustrated in **Drawings 22569-MWP-00-00-DR-C-5006** to **22569-MWP-08-00-DR-C-5006** enclosed with the Planning Application). Access to the cable ducting is provided by intermittent chambers and pull pits at defined locations adjacent to the access track infrastructure.

There are existing overhead low voltage powerlines at the proposed development site. The overhead lines near the proposed substation, T1 and meteorological mast may need to be diverted or undergrounded if required by ESB Networks, the distribution network operator. Any diversion or undergrounding works undertaken will be completed following agreement with ESB Networks and in accordance with their specifications and requirements.

5.3.5.2 Substation

The proposed 38kV substation compound will occupy an area of approximately 1,110 metres^2 and will comprise an outdoor electrical yard and a single storey substation building. The substation building will measure approximately 140 metres^2 and will contain a control room, a communications room, a switchgear room, a storeroom, a staff room, an office, and a toilet, and will be located approximately 275 metres south of the proposed permanent site entrance - refer to **Figure 14**, above.

The substation building will be approximately 6.2 metres high with pitched roofs and an external blockwork and plastered finish. Since the requirement for water will be limited to toilet-flushing and handwashing, it is proposed that water from the roof of the building be harvested. The discharge from the toilet within each building will go to a holding tank located within the substation compound where the effluent will be temporarily stored and removed at regular intervals by an approved contractor. Vehicular parking will be located within the compound area and the substation building and associated compound will be contained within a 2.6-metre-high powder-coated steel palisade fence. Access to the substation compound will be directly from the L1219 local public road via the proposed permanent entrance and access track (refer to **Figure 14**, above, for entrance location).

Full details of construction methodologies to be used for the substation building and substation compound can be found in **Chapter 03 Description of the Proposed Development** in **Volume II** of the **EIAR**. Enclosed in the Planning Application are **Drawings 22569-MWP-00-00-DR-C-5406** to **5410** with further layout details of the proposed substation compound.

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5.3.5.3 Grid Connection

Electrical energy generated by the proposed wind farm will be exported to the National Electricity Grid (NEG) via a new 38kV underground collector cable of which there are two possible route options - Option A and Option B - under consideration. The two proposed routes and associated connection point options for connection to the National Grid are summarised in the following sub-sections. ESB/Eirgrid will ultimately determine which option will be used.

5.3.5.3.1 *Option A*

To connect the proposed wind turbines to the National Grid, approximately 2.54km of 38kV underground electrical cable will be installed to link the new substation to an existing off-site substation at Carrons Wind Farm. The cable will run along the L1219 Local Road extending westwards for approximately 1.7km before turning southwards through private lands before connection to Carrons Wind Farm substation.

Laying of underground cabling will require trenching in accordance with standard ESB Networks requirements, to a typical depth of approximately 1.2m and width of 0.60m, insertion of ducting, backfilling of trenches and subsequent pulling of cable (typically 400mm^2 XLPE insulated cable). Trenching and surface finishing will be completed in accordance with '*Guidelines for Managing Openings in Public Roads*'[35] as discussed with Limerick City and County Council (LCCC). A typical cable trench detail is provided in **Drawing 22569-MWP-00-00-DR-C-5415**.

Cable trenching in the public road will be carried out within the road edge. This will be done under the terms of road opening licences from Limerick City and County Council. Road closure applications may also be required. All works will be planned and undertaken in full consultation with Limerick City and County Council, in particular the Roads Department and the Roads Engineer for the area.

5.3.5.3.2 *Option B*

The connection route and connection point consists of an underground electrical cable running through private lands along the proposed new access track within the townland of Graigoor, extending northeastwards to the proposed new 38kV substation.

This proposed connection route will loop into an existing 38kV overhead line that transects the site before continuing to the 110kV substation in Rathkeale. To facilitate this loop-in connection to the proposed new 38kV substation, the existing electricity line will be terminated at two poles to the south of the proposed location of the new Meteorological Mast. The line will then be routed underground to the substation and back out to reconnect with the overhead line.

As outlined above, laying of underground cabling will require trenching in accordance with standard ESB Networks requirements, to a typical depth of approximately 1.2m and width of 0.60m, insertion of ducting, backfilling of trenches and subsequent pulling of cable (typically 400mm^2 XLPE insulated cable). All works are also encompassed within the proposed red line boundary.

5.3.6 Communication Links

To provide communication links between the wind turbines, meteorological mast and substation, ducted fibre-optic cables will be laid in the same trench as the network of underground electrical cables around the site. Furthermore, an antenna will be positioned on the permanent met mast at a height of 40 metres for radio communications for the SCADA (Supervisory Control and Data Acquisition) equipment. This antenna is for internal

[35] guidelines-for-managing-openings-in-public-roads.pdf Accessed: 19th September 2025

wind farm site communications only. It is not for the provision of any public telecommunications services and there is no agreement with any telecommunications service providers.

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5.3.7 Temporary Construction Compound and Welfare Facilities

When the construction phase commences, one (1) No. temporary construction compound will be set up in the northwest corner of the site adjacent to the proposed substation area (refer to **Figure 14**, above). The compound will have a total footprint of approximately 1,375m^2 as shown on **Drawings 22569-MWP-00-00-DR-C-5411** enclosed with the Planning Application. All excavated material will be taken to the on-site material storage areas.

The compound will be used as a secure storage area for construction materials and contain temporary site cabins to provide welfare facilities for site personnel. Facilities will include an office space, meeting rooms, canteen area and mobile sanitary facilities. The temporary compound facilities will include an enclosed wastewater management system (holding tank) capable of handling demand during the construction phase. The wastewater holding tank will be emptied as required by a licensed permitted contractor. Upon completion of the proposed development, the compound will be decommissioned by backfilling the area with material arising from excavation and landscaping with topsoil.

5.3.8 Imported Materials & Management of Excavated Materials

Since there will not be an on-site borrow pit, all construction materials, including stone and quarry-run material, will be imported from local quarries to provide most of the fill material required for internal tracks, passing bays, hardstands, foundations, and temporary compound. Graded crushed limestone will be used as a running course on all internal access tracks to assist in reducing sediment run-off during rainfall events.

Some surplus excavated topsoil and subsoils will be re-used for on-site reinstatement, revegetation and landscaping works. Upon completion of the construction phase, the crane hardstanding areas, delivery vehicle turning heads and temporary tracks will be revegetated by covering the crushed rock material with a geotextile layer before the surplus topsoil generated during access track construction is placed on top. Finally, the topsoil will be reseeded where necessary.

Any remaining surplus material will be stored onsite in one of two (2) permanent storage areas – one southwest of T3 with an approximate storage volume of 36,000 m^3, and a second to the east of the temporary compound with an approximate storage volume of 3,300 m^3. Refer to **Figure 14**, above. Material will be stored to a maximum height of two metres with a maximum batter ratio of 1V:3H. It is envisaged the areas will be covered by surplus topsoil and revegetated/planted in line with the Biodiversity Enhancement Management Plan (BEMP) set out in **Appendix 6F** in Volume III of the EIAR. The shallow batter angle allows for the plants and vegetation to be maintained using agricultural vehicles. Dirty water drains will be installed around the perimeter of the material storage areas to convey runoff to settlement ponds prior to being discharged overland. Outfalls from settlement ponds will be located outside the 50-metre river and stream buffer.

Table 17, below, outlines approximate quantities of materials to be excavated from site, reused/stored onsite, and imported to the site during the construction phase of the proposed development. Refer to **Drawing 22569-MWP-00-00-DR-C-5412** enclosed with the Planning Application for layouts and sections of the proposed material storage areas.

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Table 17. Summary of indicative construction material and spoil storage volumes for proposed development

Excavations	Unit	Quantity
Excavation for turbine bases	m^3	14,778
Excavation for crane hardstands	m^3	7,830
Excavation for substation compound	m^3	700
Excavation for cable route	m^3	5,184
Excavation for met mast	m^3	430
Excavation for construction compound	m^3	705
Volume of subsoil to be excavated	m^3	28,064
Volume of topsoil to be excavated	m^3	20,042
Total volume of excavated material	**m^3**	**48,107**
Material Reuse and Storage Onsite	**Unit**	**Quantity**
Volume of subsoil to be reused onsite	m^3	1,555
Volume of topsoil to be reused onsite	m^3	11,694
Volume of subsoil/topsoil/rock to be stored onsite	m^3	34,858
Total volume of material retained onsite	**m^3**	**48,107**
Imported Stone	**Unit**	**Quantity**
Imported stone for access tracks	m^3	20,700
Imported stone for turbine bases	m^3	4,825
Imported stone for crane hardstands	m^3	11,745
Imported stone for met mast hardstand	m^3	750
Imported stone for substation compound	m^3	1,400
Imported stone for construction compound	m^3	963
Imported stone for cable route	m^3	2,160
Total volume of imported stone required	**m^3**	**42,543**
Imported Concrete and Steel Reinforcement	**Unit**	**Quantity**
Concrete for bases (6 @ 800 m^3 each)	m^3	4,920
Concrete for substation and met mast foundations	m^3	90
Reinforced steel for turbine bases (6 @ 80 tonnes each)	tonnes	480

5.3.9 Permanent Meteorological Mast

A permanent meteorological mast will be erected within the site to monitor the local wind regime during the operational phase of the wind farm. The mast will be located approximately 260 metres east of the proposed onsite substation and will be installed to a height of up to 90 metres (representative of turbine hub height). The mast will have a base foundation of approximately 36 metres[2] and hardstanding area of approximately 572 metres[2] (22 m wide x 26 m long).

The meteorological mast will be equipped with tower-mounted meteorological instruments and telecommunication equipment and will be enclosed by a powder-coated steel palisade fence measuring 2.4 metres in height. The mast will also have an antenna for internal radio communications for the on-site SCADA (Supervisory Control and Data Acquisition) equipment. Details of the meteorological mast are shown in **Drawing 22569-MWP-00-00-DR-C-5403** enclosed with the Planning Application.

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5.4 Description of Construction Phase

This section describes the methods that will be implemented when constructing the turbines, associated infrastructure and grid connection. Detailed method statements will be developed and implemented by the appointed Main Contractor in advance of construction works commencing. The construction phase of the development begins with site preparation works and is complete when the turbines are built and ready for commission. Refer to **Chapter 03 Description of the Proposed Development**, in Volume II of the EIAR for further details of the construction phase of the proposed development.

5.4.1 Construction Phase Temporary Features and Land-use Requirements

Temporary on-site features will include the compound facilities, plant, and equipment along with safety fencing and building materials. Large excavators and turbine erection cranes are also a temporary feature on site during the construction phase. There will be some temporary stockpiling of soils on site. Any surplus material will be placed within the material deposition areas.

Land use requirements during the construction phase will be greater than that of the permanent land take area. The temporary land take required during the construction phase is set out below, in **Table 18**, below.

Table 18. Approximate measurements of temporary land-use requirements of the construction phase.

Item	Area/Length
Construction compound	1,375 m² Site Compound No. 1 only
Wind turbine construction	9, 702 m² (1,617 m² per turbine) of temporary storage area. Wind turbine generator (WTG) construction requires temporary workspaces during the erection of the different turbine components. These workspaces include storage areas for turbine blades and temporary areas for assembly of the auxiliary cranes and parking.
Temporary access tracks	0.49 km Access tracks will be temporarily constructed to facilitate delivery of materials and construction of turbines. Tracks will be reinstated once construction phase is complete.
Construction of bridge	Construction of bridge over Ahacronane River will require construction of an adjacent temporary crane hardstanding that will be reinstated after installation is complete.

5.4.2 Construction Environmental Management Plan (CEMP)

A **Construction and Environmental Management Plan (CEMP)** has been prepared and is included in **Appendix 3B** of **Volume III** of the EIAR. The **CEMP** will be a key construction contract document that will ensure all mitigation measures considered necessary to protect the environment, prior to construction, during construction and during operation of the proposed development are implemented. The **CEMP** will collate and manage the proposed and agreed mitigation measures, monitoring and follow-up arrangements and management of environmental impacts. The environmental commitments of the proposed development will be managed through the **CEMP** and will be secured in contract documentation and arrangements for construction and later development stages.

The **CEMP** will mainly address the construction phase, however, where monitoring is to continue into the operational phase, these commitments will be communicated and transcribed into operational process documentation. The **CEMP** will be updated as required throughout pre-construction and construction to address, for example, any conditions stipulated in the planning permission. The primary objective of the **CEMP** is to provide a framework for actions, responsibilities and protocols associated with environmental management with which

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the Appointed Contractor(s) are required to adhere to ensure construction of the proposed development in accordance with regulatory requirements and to reduce and/or avoid any adverse environmental impacts.

5.4.3 Proposed Works

Construction works will be carried out in a phased manner to minimise disruption to local communities, minimise environmental impact and create the safest working conditions possible, and will principally comprise the following works:

- Clearance of vegetation (if required) prior to establishment of construction site;
- Construction of site entrances and any internal access tracks necessary to facilitate access to the temporary construction compound and proposed onsite deposition areas;
- Erection of temporary construction compound including fencing (for security and ecology), site offices, parking, and storage areas, etc;
- Establishment of onsite deposition areas and material storage areas;
- Earthworks and drainage infrastructure associated with construction of new and upgraded internal access tracks, crane hardstand, turbine foundations and substation compound;
- Upgrading of existing watercourse crossings or construction of new watercourse crossings for installation of underground cables and internal access tracks including construction of a new clear span bridge across Ahacronane River;
- Excavation of turbine bases and permanent met mast foundations, and associated turbine hardstand areas;
- Installation of sections of underground cabling between turbines;
- Installation of sections of Option A underground cabling to Carrons Wind Farm substation;
- Construction of the substation compound;
- Turbine delivery, installation and commissioning; and,
- Meteorological mast delivery, installation and commissioning.

5.4.4 Construction Methods

Table 19, below, provides a summary of the types of proposed construction techniques for the various elements of the proposed development. Additional details on the construction methods for turbine foundations, hardstands and internal access tracks are provided.

Full details on the construction methods are fully set out in Chapter 03 in Volume II of the EIAR and in the CEMP in Appendix 3B in Volume III of the EIAR.

Table 19. Proposed construction methodologies for Ballynisky Wind Farm.

Project Element	Construction Method
Wind turbine foundations and hardstands	Wind turbine locations will be cleared, graded, and foundations will be either excavated or piled by rotary core technique. Localised sheet steel piling may be required to facilitate soil excavation for formation of the hardstand and turbine base footprint. All excavated soil will be removed and deposited in the soil storage areas on site. An engineered concrete foundation will be installed in the excavated/piled structure location. Backfill will

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Project Element	Construction Method
	be provided, and grading will be performed in a manner to allow for immediate drainage away from each tower. Construction activities include scrub removal, vegetation clearing, topsoil and/or soil stripping, excavation and or piling, grading, foundation construction, final grading and landscaping of temporary works areas.
Permanent meteorological mast	Construction includes vegetation removal, topsoil stripping, excavation, grading, foundation construction, final grading, and landscaping of temporary works area.
Site access	Sightline improvements at the two site access junctions will be required. Construction activities include vegetation clearing, topsoil and/subsoil stripping, aggregate placement and grading, and landscaping of temporary works areas.
Internal tracks	Upgrading/widening existing site access tracks and construction of new excavated tracks: Construction activities will include vegetation clearing, topsoil and/or subsoil stripping, excavation, placement of geogrid/ geotextile layer and aggregate, compaction, grading, berm placement and landscaping. Construction of new floated tracks: Construction activities will include removal of major protrusions/obstructions, placement of geogrid/geotextile layer and aggregate, importation and placement of stone and aggregate, compaction, grading, berm placement and landscaping.
Internal underground electrical cables	In as much as possible, the underground electrical collector cables will mainly be co-located within access tracks to minimise the area of construction disturbance. Construction activities include topsoil stripping, trenching, installing electrical cables, and revegetation of disturbed areas where cables are not under the tracks. Any diversion or undergrounding of existing overhead low voltage power lines required by the power distribution network operator will be completed following agreement with ESB Networks and in accordance with their specifications and requirements.
Substation compound and grid connection options	Substation compound construction will include vegetation clearing, topsoil stripping, and excavation of soil overburden, grading, foundation construction, building construction, final grading and landscaping of temporary works area. Grid Connection Option A - the underground cable link to the existing substation at Carrons Wind Farm will involve an excavated trench with ducting, approximately 2.54 km in length. The trench will follow the local road and pass through an agricultural field. Grid Connection Option B - the underground cable connection to the proposed 38kV substation will require a trench with ducting along the proposed access track within the development site in the townland of Graigoor. This route will be entirely within private lands and will not traverse the public road. In both cases, the works will involve trench excavation, ducting bed and surround to ducts with concrete and backfill of trenches with suitable material.
Temporary construction compound	Construction includes topsoil stripping, excavation of overburden and soil, grading, aggregate placement, compaction and landscaping.
Watercourse crossings	No in-stream works. Construction of a new 9-metre clear span bridge over Ahacronane River (WC1) to facilitate the proposed new internal site track across the river between the onsite substation and T1. To provide additional flow volumes during extreme flooding events, a 1.5 metre x 1.0 metre flood relief box culvert will also be installed under the access track within the Ahacronane River floodplain between the new bridge and T1. Where internal site tracks will cross existing agricultural field drains, pipe culverts will be installed to maintain existing flow paths through the drain and under the track. Grid Connection Route Option A: Horizontal directional drilling (HDD) will be used to facilitate the cable route's two watercourse crossings – WC2 and WC3. Refer to **Figure 10**, above, for watercourse crossing (WC) locations.

Project Element	Construction Method
Temporary turbine delivery route works	Any construction activities which might be required may include temporary widening via vegetation clearing, topsoil/subsoil stripping, aggregate placement and grading, and landscaping of temporary works areas along with hedge or tree trimming, and temporary relocation of powerlines/poles, lampposts, signage.

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5.4.5 Internal Site Service Tracks

Depending on the ground conditions, the new service tracks will be constructed using either excavated or floating track techniques and will have a general running width of 5 metres with localised wider areas at bends to accommodate transport of the wind turbine components.

New excavated tracks will be constructed by placing stone aggregate imported from the nearby quarry over a layer of geogrid once all organic and soft subsoil material is excavated to formation level. Geotextile material will also be laid at formation level to separate the track building material from the subsoil. The access track will be finished with imported 150 mm crushed stone of Clause 804 or similar aggregate type material.

New floating tracks will be constructed by placing a combination of geogrid and geotextile over the existing surface vegetation to be traversed with the floating track. A minimum thickness of 450 mm of stone will be placed over the bottom layer of geogrid/geotextile and finished with a 150 mm surface layer of Clause 804 or similar material.

Existing internal tracks will be used where possible and widened by removing organic material and soft subsoil to formation level before constructing a track on a layer of geogrid or geotextile in the same manner as described in the previous paragraph for excavated track construction. The new width of access track and existing track surface, where required, will be capped with a 150 mm layer of crushed stone of Clause 804 or similar aggregate type material.

See **Drawing 22569-00-00-DR-C-5404** enclosed with the Planning Application and **Chapter 03 Description of Proposed Development** in **Volume II** of the **EIAR** for more details on access tracks layout and construction details.

5.4.6 Watercourse Crossings

The network of internal site tracks will require the crossing of one watercourse, namely the Ahacronane River. Two watercourses will require crossing for the grid connection route Option A, namely Creeves Stream and Knockardnacorlan River, while there are no watercourse crossings required for grid connection route Option B.

The location of each watercourse crossing and the expected crossing methodologies for each are summarised in **Table 20**, below, and in **Figure 10**, above, with further details provided in **Chapter 03 Description of Proposed Development** in **Volume II** of the **EIAR**.

All crossings will be in accordance with this application and/or conditions attached to a grant of planning permission and agreed with the Office of Public Works (OPW) and Inland Fisheries Ireland (IFI) prior to construction. No in-stream works will be necessary for any of the watercourse crossings.

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Table 20. Summary of watercourse crossings required to install infrastructure of the proposed development.

Watercourse crossing number	Watercourse	Infrastructure to cross watercourse	Crossing methodology	ITM coordinates of crossing
WC1	Ahacronane River	Internal site service track	9-m-long clear span bridge	529753, 643274
WC2	Creeves Stream	Grid connection cable – Option A	Horizontal directional drilling	528553, 643979
WC3	Knockardnacorlan River	Grid connection cable – Option A	Horizontal directional drilling	527662, 644377

5.4.6.1 Internal Access Track

A clear span bridge will be constructed where the internal site access track crosses the Ahacronane River northwest of the proposed T1 location (labelled as WC1 in **Figure 10** and **Table 20**, above). On the approach to the proposed crossing, the new internal access track will be raised above existing ground levels up to flood level. The bridge will consist of a 9-metre-long deck of precast concrete beams with an *in-situ* concrete slab poured on top. The deck will sit on *in-situ* concrete abutments pushed back from the riverbank, and edge protection for vehicles and pedestrians will be provided.

The deck soffit will allow for a 310-millimetre freeboard[36] ensuring the capacity of the bridge to operate should a 1-in-100-year flooding event occur. Bridge construction will require installation of a temporary crane hardstanding area adjacent to the bridge that will be reinstated after installation is completed. Cable ducting will be installed within the bridge structure and no in-stream works will be required.

Additionally, a flood relief culvert will be constructed under the site access track approximately 24 metres south of the southern riverbank within the Ahacronane River floodplain. A precast box culvert will be used to create a conduit with a width of 1.5 metres and a height of 1 metre while the culvert's base will be set a minimum of 300 millimetres below existing ground levels before being reinstated with spoil and topsoil. Cable trenching will be installed in a trench adjacent to the site access track above the top of the relief culvert.

Enclosed with the Planning Application are details of the bridge and culvert in, respectively, **Drawings 22569-MWP-00-00-DR-C-5413** and **5414**.

5.4.6.2 Grid Connection Route (Option A) Water Crossings

The proposed export cable route Option A will require two (2) watercourse crossings – see **Figure 10** and **Table 20**, above, for location details. Creeves Stream will be crossed (WC2) along the L1219 local public road, while the Knockardnacorlan River will be crossed (WC3) within private lands at the western end of the grid route. Horizontal directional drilling (HDD) will be employed to facilitate both watercourse crossings, a process that involves deepening the cable trench at a defined slope as it approaches the watercourse to a sufficient depth below the watercourse. The trench will then pass under the watercourse and begin to raise at a defined slope until it reverts to the standard trench depth of 1.2 metres. No in-stream works will be required.

Details and layouts of the directional drilling under the watercourses are shown on **Drawing 22569-MWP-00-00-DR-C-5415**, **5416** and **5417** enclosed with the Planning Application, and described in further detail in Section 3.5.5.5 in **Chapter 03 Description of Proposed Development** in **Volume II** of the **EIAR**.

[36] Freeboard is the additional clearance from the highest flood level to the bridge soffit.

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5.4.7 Turbine Delivery

The wind turbines have a proposed overall tip height of 158 metres. The components (nacelle, tower, blades) are expected to be delivered to Foynes Port in County Limerick by sea before transportation to the site via the national, regional and local road network and the proposed temporary site entrance. A permit for moving abnormal loads will be sought from An Garda Síochána for the delivery of oversized wind turbine components.

The delivery route extends southeastwards from Foynes along the N69 and onto the local road network as follows, and as illustrated in **Figure 16**, below:

- From Foynes Port use the port access road to reach the N69 junction;
- Turn left and head southwards on the N69 for 1.8 kilometres;
- Turn right onto the L1222 Local Road and travel southeast for 5.1 kilometres to Creeves Cross;
- At Creeves Cross, turn right (second exit) onto L1220; and,
- Travel southwest along L1220 for 2.5 kilometres to the temporary site entrance located opposite the T-junction with the L1219.

For further details, refer to the Turbine Delivery Assessment Report in **Appendix 3A** of **Volume III** of the **EIAR**.

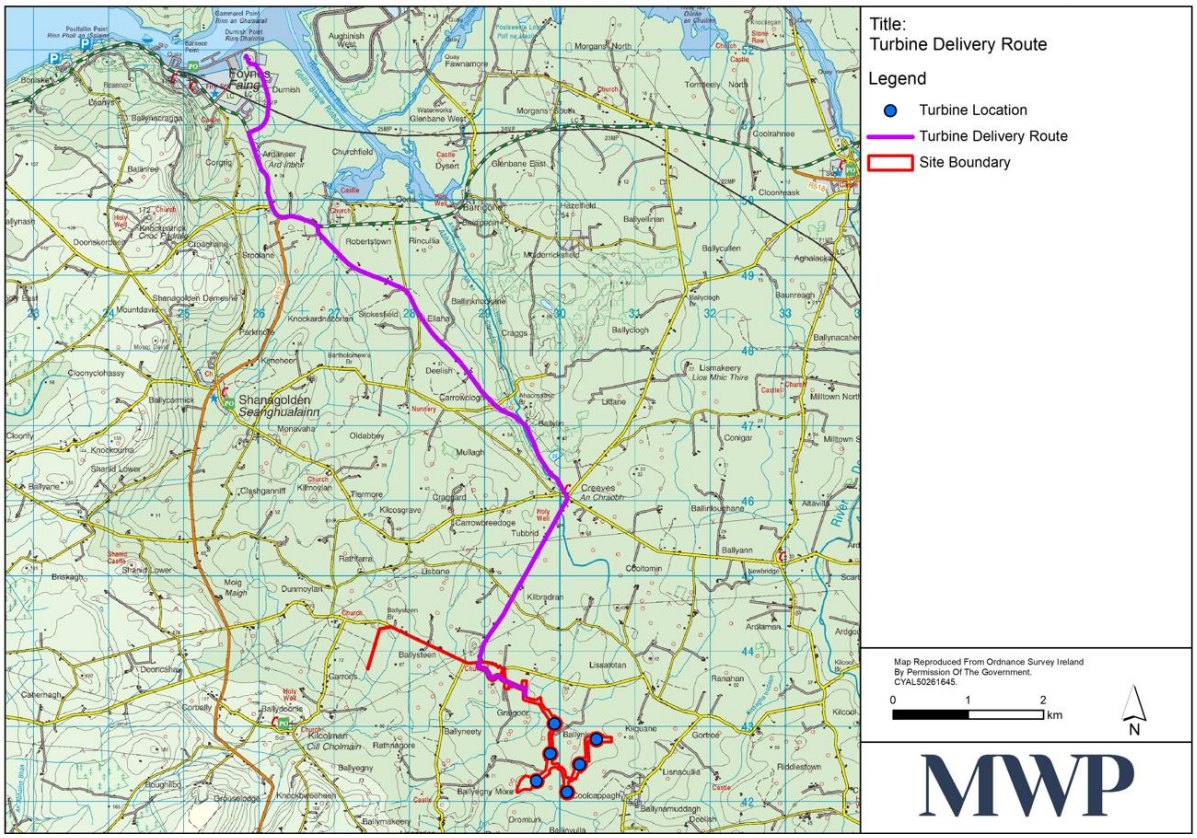

Figure 16: Proposed Turbine Delivery Route (TDR) from Foynes Port in County Limerick to site at Ballynisky.

5.4.8 Roads and Traffic

As discussed in **Section 5.3.2** and illustrated in **Figure 15**, above, access to the proposed development site will be provided by two site entrances from the public Local Road L1219 – one permanent and one temporary. It is intended to utilise the existing public road network to the proposed development site for the delivery of wind turbine components, the transportation of construction vehicles and the delivery of materials. The routing for the

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delivery of the wind farm components from Foynes Port is summarised in **Section 5.4.7**, above, while a detailed description can be found in **Appendix 3A**, **Turbine Delivery Route Assessment Report**, in **Volume III** of the **EIAR**.

To minimise the impact of the works on local residences and users of the public road networks, a **Traffic Management Plan (TMP)** for the construction phase has been prepared and is included in **Appendix 14A** in **Volume III** of the **EIAR**. This plan will be updated and adopted by the appointed contractor prior to the commencement of construction. It will be necessary to engage with the Roads and Transportation section of Limerick City and County Council and with An Garda Síochána to establish traffic volumes and local road usage.

Should planning be granted, the final TMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which may be conditioned by the planning authority. The **TMP** will be updated at the construction stage (or the update commenced during planning compliance stage) to ensure controls are in place for all users of the site.

5.4.9 Surface Water Management

A site-specific Surface Water Management System will be constructed to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The drainage system will be implemented along all work areas including all internal site access tracks, storage areas, crane hardstand areas and temporary site construction compound. Details of the proposed site drainage system are described in Section 3.4.7 in **Chapter 03 Description of Proposed Development** in **Volume II** of the **EIAR**, and in the **CEMP** in **Appendix 3B** in **Volume III** of the **EIAR**.

The site drainage system was designed integrally with the wind farm layout as a measure to ensure that the proposal will not change the existing flow regime across the site, will not deteriorate water quality and will safeguard existing water quality status of the catchments from wind farm related sediment runoff. A fundamental principle of the drainage design is that clean water flowing in the upstream catchment, including overland flow and flow in existing drains, is allowed to bypass the works areas without being contaminated by silt from the works. This will be achieved by intercepting the clean water and conveying it to the downstream side of the works areas, either by piping it or diverting it by means of new drains or earth mounds.

Settlement ponds and check dams will provide the essential mechanism for the removal of silt from construction-related runoff and the controlled return of the treated runoff to the downstream watercourses. Runoff from the internal access tracks, hardstands and other wind farm infrastructure will be isolated from the clean catchment runoff by means of a series of open drains that will be constructed within the works areas. These drains will be directed to settlement ponds that will be constructed throughout the site, downhill from the works areas, and will be discharged from settlement ponds to vegetation. Each drain will incorporate a series of check dams that will attenuate flow and provide storage for increased runoff from exceptional rainfall events.

Site drainage layout is presented in **Drawings 22569-MWP-00-00-DR-C-5006** to **22569-MWP-08-00-DR-C-5006** and **Drawing 22569-MWP-00-00-DR-C-5405** enclosed with the Planning Application.

5.4.10 Duration of Construction

Subject to a grant of planning permission, it is envisaged that construction of the proposed development will commence in 2027 with a construction period of approximately 12 to 16 months - see preliminary construction programme in **Table 21**, below. Accordingly, the proposed development is scheduled to be fully complete and operational by 2028/2029 subject to the ability of all works to be scheduled in a manner that coincides with each other and with environmental and other constraints.

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A number of these phases will run concurrently, outlined as follows:

- As internal site access tracks are constructed to each turbine, hardstanding areas for the crane, turbine foundations and building foundations will be prepared;
- Once the tracks are completed, the trenching and laying of underground cables will begin; and
- Construction of the site substation and control houses will commence so that they will be ready to export power as turbines are commissioned.

Table 21. Preliminary construction programme for the proposed Ballynisky Wind Farm.

	Activity	Expected duration
Phase 1	Vegetation clearance (to be completed prior to construction site set-up)	1 month
Phase 2	Site preparation, pre-construction activities, temporary compound, site entrances	2 months
Phase 3	Construction of internal tracks, watercourse crossings & drainage infrastructure	3 months
Phase 4	Crane hardstand construction	2 months (1.5 weeks per turbine)
Phase 5	Turbine foundation construction	4 months (3 weeks per turbine)
Phase 6	Trenching & ducting – onsite	2 months
Phase 7	38kV substation construction	6 months
Phase 8	Met mast construction	1 month
Phase 9	Turbine delivery	3 months
Phase 10	Turbine erection	4 months
Phase 11	Trenching & ducting – offsite for cable route (Option A)	1 month
Phase 12	Wind farm commissioning	4 months
	Expected Total	12 - 16 months

Note: phases are likely to overlap and will not be completed in isolation resulting in an estimated total programme duration of 12 to 16 months.

5.4.11 Major Temporary Features

Temporary onsite features will include the compound facilities, plant, and equipment along with safety fencing and building materials. Large excavators and turbine erection cranes are also a temporary feature on site during the construction phase of the proposed development. There will be some temporary stockpiling of soils on site. Any surplus material will be placed within the material deposition areas.

5.4.12 List of Plant and Materials Required

Mechanical machinery and electrical equipment typically used for construction projects will be required to facilitate the proposed Ballynisky Wind Farm development. The following is a non-exhaustive list of plant that is typically used for wind farm construction and heavy civil engineering works:

- 30-50T excavators;

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- 15-30T excavators;
- Rubber tired 15-20T excavators;
- 3-10T mini diggers;
- Mobile crane for construction;
- Rebar/shuttering/precast units/conc. pipes/box culverts etc. 60t to 120t;
- Cranes (1 main, 2 assist) erection 120t to 1000t;
- Telescopic handler;
- Tractors and trailers;
- Road grader;
- Double-contained fuel bowsers;
- 12T rollers;
- Diesel-powered generators; and
- Water bowsers.

The following is a non-exhaustive list of materials, and approximate quantities, that are expected to be used during construction of the wind farm (refer also to **Table 17**, above):

- 5,010 m^3 of concrete;
- 480 tonnes of reinforced steel;
- Wind turbine components;
- 42, 543 m^3 of imported stone for roads, hardstands, turbine bases, backfill, construction compound;
- Transformers/panels/cables;
- Electrical equipment;
- Stone, blocks, roofing;
- Palisade fencing;
- Wooden poles;
- Sand for duct bedding;
- Clause 804 material; and
- Coils of 400 mm^2 XLPE insulated cable.

5.4.13 Construction Working Hours

Typically, construction will occur between the hours of 07.00 am and 7.00 pm, Monday to Friday, inclusive, and 07.00 am and 2.00 pm on Saturdays. Since concrete pours need to occur continuously, the working day may extend beyond normal working hours to limit traffic impact to road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours and are normally completed in a single day per turbine. Turbine and crane erections may also occasionally occur outside of these times to take advantage of low wind periods. Working hours will be confirmed at the outset of the proposed development and any changes in hours will be agreed with the Local Authority.

Any works along public roads will be from 9.00 am to 5.00 pm Monday to Friday, inclusive, and 9.00 am to 2.00 pm on Saturdays. A permit for moving abnormal loads will be sought from An Garda Síochána for the delivery of oversized wind turbine components such as blades, nacelles and towers. There will be no work on Sundays or Bank Holidays without pre-approval from the Local Authority.

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5.4.14 Construction Personnel

During the construction phase, the number of onsite construction personnel will vary for each phase of the development. Overall, it is envisaged that the proposed development would generate employment for up to 30 to 35 persons during the construction phase to include site contractors, onsite vehicle and plant operators, engineers, materials delivery personnel, environmental personnel, and health and safety personnel.

It is expected that the civil works for the export cable route will require a further 3 to 5 personnel to complete the works.

5.5 Commissioning of the Wind Farm

Wind farm commissioning can take approximately two to four months to complete from erection of the final turbine to exportation of power. It involves commissioning engineers working through an entire schedule of SCADA (Supervisory Control and Data Acquisition) and electrical testing and control measures to ensure the wind farm will perform and export power to the National Energy Grid (NEG) as designed.

5.6 Description of Operational Phase

The proposed development is expected to have a lifespan of approximately 35 years. During the operational phase, the wind turbines will primarily operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction. The proposed development is designed to operate when wind speeds at the hub height are within the operating range of the wind turbines. Most turbine models have a cut-in wind speed of 3 metres per second (m/s) with optimum generation at approximately 12.5 m/s. The turbines are expected to have a cut-out wind speed of 25 m/s.

Each wind turbine will be computerised to control critical functions, monitor wind conditions and report data back to a SCADA system. An anemometer mounted to the top of the wind turbine nacelle provides wind speed information which is then used to automatically set blade pitch to control the wind. A windvane mounted on top of the nacelle provides information needed to yaw the wind turbine into the wind. The SCADA system monitors problems and diagnoses failures. If a problem causes a wind turbine to shut down, the wind turbine will either be restarted by the SCADA system operator, or service personnel will perform the necessary repairs and manually restart the turbines. The wind turbine can also be controlled manually at the nacelle, from a panel inside the base of the tower, or from a remote computer via the SCADA system. Using the tower top control panel, the turbine can be stopped, started, and turned out of the wind.

Turbines will be programmed to shut down during periods when shadow flicker is predicted to occur at receptors. Fitting of turbines with shadow flicker control modules ensures that the proposed wind farm will comply with existing guideline thresholds and the draft revised guidelines on shadow flicker. This is detailed in **Chapter 05 Population and Human Health**, in **Volume II** of the **EIAR**, and in **Appendix 5A** in **Volume III** of the **EIAR**.

5.6.1 Operational Phase Maintenance

During operation of the wind farm, the turbine manufacturer, the Developer, or service company will carry out regular turbine maintenance, creating at least two permanent jobs locally in the form of maintenance personnel/operators. Additionally, operation and monitoring activities may be carried out remotely with the aid

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of computers connected via a telephone broadband link. However, routine inspection and preventive maintenance visits will be necessary to ensure the smooth, efficient running of the wind farm.

Maintenance of site drains will also be required and is likely to include tasks such as removal of silt build-up and clearance of silt fences. The electricity substation components and site tracks will also require periodic maintenance in accordance with appropriate operation maintenance plans, procedures and a health and safety plan.

There may also be a requirement for unscheduled maintenance which could vary from resetting alarms to major component changes requiring a crane. Typically, maintenance traffic will consist of four-wheel drive vehicles/vans. It is unlikely that the underground cables will require much maintenance during the wind farm's operation but in the event a fault does occur, inspection of the fault can be carried out to determine what works may be required.

5.7 Description of Decommissioning Phase and Restoration

5.7.1 Wind Farm

At the end of the estimated 35-year lifespan of the proposed development, the Developer will make the decision to either repower the wind farm or decommission the turbines. Any further proposals for development at the site during or after this time will be subject to a new planning permission application. If planning permission is not sought after the end of life of the turbines, the site will be decommissioned and partially reinstated with all six (6) No. wind turbines and towers removed. Removal of infrastructure will be undertaken in line with landowner(s) and regulatory requirements and best practice applicable at the time. The information below outlines the likely decommissioning tasks based on current requirements and best practice.

Prior to the decommissioning work, the following will be provided to Limerick City and County Council for approval:

- A plan outlining measures to ensure the safety of the public workforce and the use of best available techniques at the time; and
- A comprehensive reinstatement proposal, including the implementation of a programme that details the removal of all structures and landscaping.

If the site is to be decommissioned, cranes of similar size to those used for construction will disassemble each turbine. The towers, blades and all components will then be removed from site. Hardstand and turbine foundation areas will be left *in situ* and covered with soil to match the existing landscape and access tracks will be left for use by the landowners. The new 38kV substation will remain in place under the ownership of ESB/EirGrid operating as an asset to the National Grid.

At present it is anticipated that underground cables connecting the turbines to the new substation will be cut back and left underground. The cables will not be removed if an environmental assessment of the decommissioning operation demonstrates that this would do more harm than leaving them *in situ*. This assessment will be carried out closer to commencement of the decommissioning operation so that any environmental changes incurred over the operational life of the proposed development can be considered.

Hardstand and turbine foundation areas will be left *in situ* and covered with soil to match the existing landscape. Access tracks will be left for use by the landowners.

Wastes generated during the decommissioning phase will be removed from site and disposed of at an authorised waste facility. Any materials suitable for recycling will be disposed of in an appropriate manner.

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6. Identification of Other Plans, Projects and Activities

6.1 Introduction

A cumulative impact arises from incremental changes caused by other past, present or reasonably foreseeable actions, together with the proposed development. The surrounding environment of the proposed development site is dominated by agricultural land. A review was undertaken of relevant existing and permitted projects activities and plans occurring in the environs of the proposed development site that could act in combination with the proposed wind farm development to determine whether any potential significant cumulative effects may arise, with results presented in the following sections. In-combination impacts, if any, will be considered in **Section 8.8**, below.

The main pressures that could act in combination with the proposed wind farm development in its various phases (construction, operation and decommissioning) relate to land management. The lands at the proposed development site and within the surrounding area are mainly managed for agriculture, and to a lesser extent for wind energy and mineral extraction.

6.2 Plans

Plans that are relevant to the region encompassing the proposed Ballynisky Wind Farm site include the Limerick County Development Plan (2010 – 2016)[37] and the Limerick Development Plan (2022 – 2028)[38].

At a special meeting on 17th June 2022, elected members of Limerick City and County Council adopted the Limerick Development Plan (2022 – 2028) which then came into effect on 29th July 2022. Included in Section 9.4.4 in Chapter 9 of Volume 1 of the Plan is 'Objective CAF O28 Assessment of Renewable Energy Projects' which asserts that one of the aims of LCCC is to

'*encourage the development of wind energy, in accordance with Government policy and having regard to the principles and planning guidance set out in the Department of Housing, Planning and Local Government publications relating to* Wind Energy Development *and the* DCCAE Code of Practice for Wind Energy Development in Ireland *and any other relevant guidance, which may be issued in relation to sustainable energy provisions*'[39].

6.3 Other Wind Energy Developments

Within County Limerick, there are sixteen operational wind farms including the 18-turbine Tournafulla Wind Farm to the south of the proposed development site and the 19-turbine Dromada Wind Farm to the southwest – refer to **Table 22** and **Figure 17**, below, for more details. Wind farms located within 20 kilometres of the proposed Ballynisky Wind Farm are highlighted in bold in **Table 22**, below.

Table 22. Operational wind farms within County Limerick and their locations in relation to the proposed Ballynisky Wind Farm site (those located within 20 km are highlighted in bold).

Wind Farm	Year connected to grid	Output (MW)	Number of turbines	Approximate distance & direction from proposed development site (PDS)
Mauricetown	2019	13.8	6	20.5 km south of PDS
Gortnacloghy	2018	4.4	2	**18.5 km south of PDS**
Vistakon, Castletroy	2017	2	1	36.2 km northeast of PDS

[37] limerick-county-development-plan-2010-2016-with-variation-1-3-and-5-6_0.pdf Accessed: 16th June 2025
[38] Limerick Development Plan 2022-2028 | Limerick.ie Accessed: 16th June 2025
[39] Limerick-Development-Plan-Volume-1-Written-Statement-including-Variation-No-1.pdf Accessed: 18th June 2025

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Ballagh	**2016**	**2.3**	**2**	**18.1 km south of PDS**
Athea	**2014**	**34.35**	**16**	**18.3 km southwest of the PDS**
Dromdeveen	2011	27.5	14	21.7 km south of the PDS
Grouselodge	**2011**	**15**	**6**	**4.5 km southwest of PDS**
Rathcahill	**2011**	**12.5**	**5**	**15.3 km southwest of PDS**
Carrons	**2010**	**4.6**	**2**	**2.5 km west of PDS**
Kilmeedy	**2010**	**4.7**	**2**	**14.5 km southeast of PDS**
Dromada	**2009**	**28.5**	**19**	**13 km southwest of PDS**
Knockastanna	2009	7.5	4	56.8 km northeast of PDS
Knockawarriga	2008	22.5	8	23 km southwest of PDS
Tournafulla	**2007**	**27**	**18**	**16.8 km southwest of PDS**
Total Output		**206.65**		

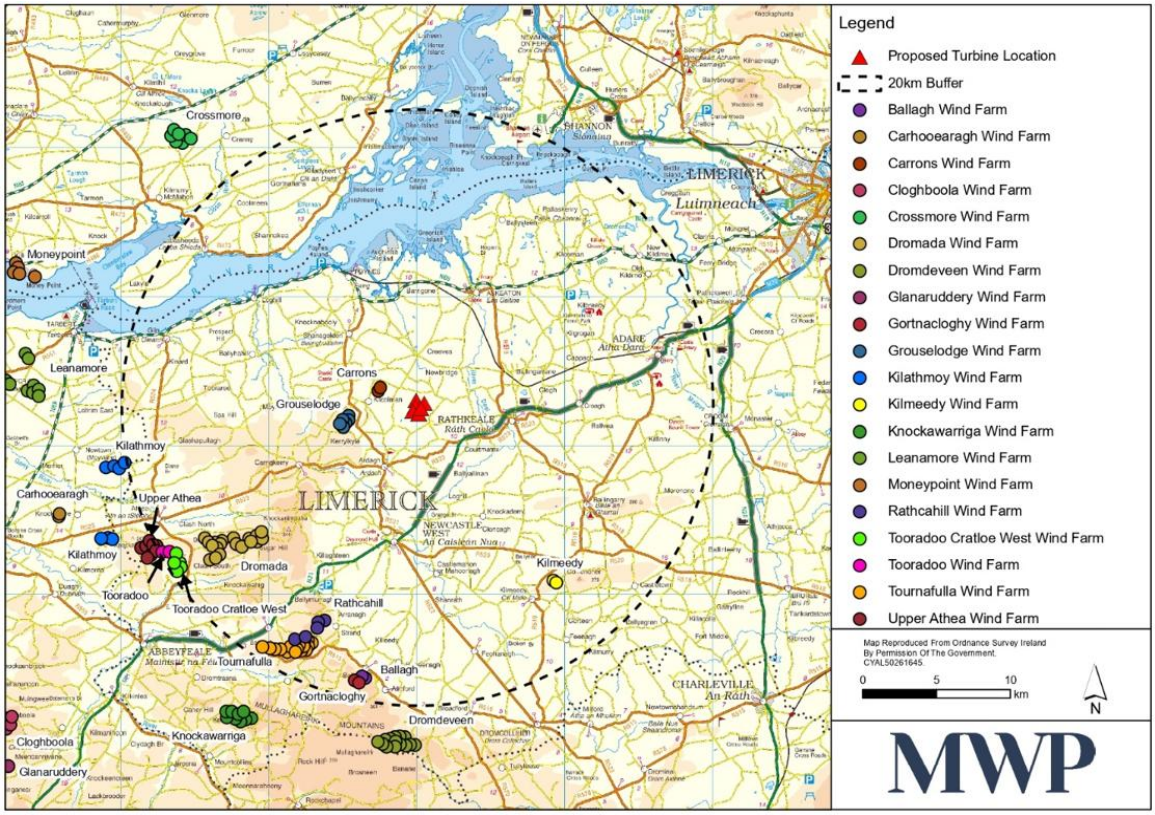

Figure 17: Operational wind farms located within County Limerick.

6.4 Solar Energy Developments

A search of LCCC's online planning enquiry system and the An Coimisiún Pleanála website on 21st May 2025 found that within a 20-kilometre radius of the proposed development site there are several planning applications for solar farm developments, as summarised in **Table 23**, below.

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Table 23. Status of solar energy projects located within 20 kilometres of the proposed Ballynisky Wind Farm.

Planning reference	Solar Farm location	Applicant	Application status	Approx. distance from development site
LCCC: 2460320 ACP: 321242	Ardgoulbeg, near Rathkeale, Limerick	Harmony Solar Rathkeale Ltd.	LCCC Refused: 22/10/24 ACP Granted: 27/03/25	3.2 km northeast of site
221258	Ellaha & Mullagh, Limerick	Solas Éireann Development Ltd.	Granted: 22/06/23	2.6 km north of site
1918	Deelish & Mullagh, Shanagolden, Limerick	Solas Éireann Development Ltd.	Granted: 26/04/19	2.5 km north of site
171220	Ellaha & Ballinknockane, Limerick	Solas Éireann Development Ltd.	Granted:23/08/18	4.3 km north of site

6.5 Other Permitted and Proposed Developments in the Locality

A search of LCCC's online planning enquiry system for granted or on-going planning applications for townlands encompassed within the site boundary, namely Ballynisky, Graigoor, Ballyegny More, Kilbradran, Ballysteen, Dunmoylan, Carrons, and Lisbane was undertaken on 21st May 2025 with results summarised in **Table 24**, below.

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Table 24. List of other granted and/or on-going planning applications within the vicinity of the proposed development site.

Application number	Applicant	Location	Proposed development	Decision	Decision date
221095	Dermot O'Connor	Lisbane, Shanagolden, Co. Limerick	The construction of a new slatted livestock house adjacent to existing slatted livestock house. Proposed livestock house to incorporate easy feed, flow channel & underground slatted slurry tank with external agitation points & ancillary concrete, and all associated ancillary site works.	Granted	17/02/25
2360864	Ashfort Green Ltd.	Dunmoylan, Shanagolden, Co. Limerick	Pump house and filtration shed and elevational changes to existing house.	Granted	28/02/24
23503	John McCarthy	Graigoor, Shanagolden, Co. Limerick	Dwelling house, wastewater treatment system, percolation area, site entrance and all associated site works.	Granted	14/12/23
221055	On Tower Ireland Limited	Knockbweeheen, Ardagh, Co. Limerick	Removal of an existing telecommunications support structure and the replacement of this structure	Granted	18/11/22
21478	Donal Donovan	Grouse Lodge, Kilcolman, Ardagh, Co. Limerick	Construction of machinery shed and all associated site works.	Granted	02/06/21
21166	David McDonnell	Carrons, Kilcolman, Ardagh & Dunmoylan, Shanagolden, Co. Limerick	Construction of poultry house, soiled water storage tank, rainwater harvesting tank, upgrade existing agricultural entrance and all associated ancillary site works.	Granted	20/05/21
20866	Allken Farms Ltd.	Ballynacally & Coolacokery, Ardagh, Co. Limerick	Construction of livestock underpass, effluent holding tank & associated siteworks	Granted	30/04/21
20718	Irish Forestry Unit Trust	Boughilbo, Ardagh, Co. Limerick	Construction of 2 no. new entrances and access road to existing forestry plantations on the site of existing entrances	Granted	01/04/21
201135	David & Rosanne McDonnell	The Old Presbytery, Carrons, Kilcolman, Ardagh, Co. Limerick	Demolition of existing porch & conservatory, modification to existing roof to accommodate changes, construction of 2 no. mixed single/two storey extensions to existing dwelling house, associated site works and services.	Granted	19/03/21
201082	Nigel Sheehy	Carrons, Kilcolman, Ardagh, Co. Limerick	Relocation of the existing site entrance and all associated site works	Granted	14/12/20
208004	PART 8	Ardagh Station House, Kilreash, Ardagh & Barnagh Station House, Ballymurragh East, Co. Limerick	Refurbishment of Ardagh Station House (which is a protected structure) and goods shed and change of use to commercial, community and tourism use.	Granted	11/12/20
20921	Noel O'Brien & Evelyn Scanlon	Kilcolman, Ardagh	Extension private residence	Granted	05/11/20

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Application number	Applicant	Location	Proposed development	Decision	Decision date
221095	Dermot O'Connor	Lisbane, Shanagolden, Co. Limerick	The construction of a new slatted livestock house adjacent to existing slatted livestock house. Proposed livestock house to incorporate easy feed, flow channel & underground slatted slurry tank with external agitation points & ancillary concrete, and all associated ancillary site works.	Granted	17/02/25
2360864	Ashfort Green Ltd.	Dunmoylan, Shanagolden, Co. Limerick	Pump house and filtration shed and elevational changes to existing house.	Granted	28/02/24
19819	Donie & Dympna O'Connor	Kilcolman, Ardagh	A change of site boundaries as previously granted 06/3318.	Granted	19/11/19
19774	Danny Mulcahy	Kilcolman, Ardagh	Extension for machinery storage to existing farm buildings.	Granted	20/09/19
1945	Vodafone Ireland Ltd	Grouselodge House, Grouselodge, Ardagh.	An existing 16.5-metre-high telecommunications support structure. The development forms part of Vodafone Ireland Ltd's existing GSM and 3G Broadband telecommunications network. (Previous Planning Ref. No. 11/279)	Granted	13/03/19
2460064	Adrian Dore	Ballysteen, Shanagolden, Co. Limerick	The construction of a new dwelling house, adjoining domestic garage, domestic wastewater treatment system, entrance & associated site works.	Granted	17/05/24

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6.6 Environmental Protection Agency (EPA) Licenced/Registered Facilities

A review of the EPA mapping tool determined that there are no IPPC, IPC, and IEL[40] facilities within five kilometres of the subject site. The nearest two to the proposed development site are the Gortadroma Landfill Site (IEL Registered Licence No. W0017-04) located 5.4 kilometres to the west, and Anglo Beef Processors Ireland t/a ABP Rathkeale (IEL Registered Licence No. P0191-02) located at Rathkeale approximately 5.5 kilometres to the east. There are two other licensed waste facilities and four other active Industrial Emissions Licenced (IEL) sites within 10 kilometres of the proposed development site, refer to **Table 25**, below. There are no active licensed Industrial Pollution Control (IPC) sites within 10 kilometres of the proposed development site.

Table 25. Licensed waste facilities and active Industrial Emissions Licensed (IEL) sites within 10 km of the proposed development site.

License type	Name	Active license number	Facility address	Approx. distance from nearest point of development site
Waste	Greenport Environmental Limited	W0271-01	Durnish, Harbour Rd, Foynes, Limerick	8.5 km north of site
	Irish Bulk Liquid Storage	W0193-01	Foynes Harbour, Foynes, Limerick	8.5 km north of site
Industrial Emissions License (IEL)	Gortadroma Landfill Site	W0017-04	Gortadroma, Ballynahill, Limerick	5.4 km west of site
	Anglo Beef Processors Ireland t/a ABP Rathkeale	P0191-02	Anglo Beef Processors Ireland t/a ABP Rathkeale, Limerick	5.5 km east of site
	Mr. Pat Kenny	P0929-01	Coolanoran, Newcastle West, Limerick	5.6 km south of site
	Mr. Tom O'Sullivan	P0899-01	South Cappa, Foynes, Limerick	8.3 km northwest of site
	Wyeth Nutritional Ireland Limited	P0395-03	Coolrahnee, Askeaton, Limerick	8.7 km northeast of site
	Aughinish Alumina Limited	P0035-07	Aughinish East, Aughinish West, Island Mac Teige, Glenbane West, Fawnamore, Askeaton	9.2 km north of site

There are twenty urban wastewater treatment plants (UWWTP) located within the Shannon Estuary South (24) Catchment – details of the ten closest to the proposal site are listed in **Table 26**, below, along with approximate distances and locations.

Table 26. Summary of the ten urban wastewater treatment plants within the Shannon Estuary South (24) Catchment located closest to the proposed development site (PDS).

Facility Name	Facility Type[41]	Active License Number	Approximate distance and location from PDS
Rathkeale	2,001 to 10,000 p.e.	D0112-01	5 km east of site
Askeaton	1,001 to 2,000 p.e.	D0315-01	8.7 km northeast of site
Foynes	500 to 1,000 p.e.	D0502-01	9.2 km northwest of site
Newcastle West	2,001 to 10,000 p.e.	D0108-01	9.2 km south of site
Ballingarry	500 to 1,000 p.e.	D0507-01	12.5 km southeast of site

[40] Integrated Pollution Control (IPC) Licence (formerly IPPC Licence), and Industrial Emissions Licence (IEL)
[41] Defined using population equivalent value (p.e.)

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Facility Name	Facility Type[41]	Active License Number	Approximate distance and location from PDS
Glin	500 to 1,000 p.e.	D0504-01	15 km northwest of site
Adare	1,001 to 2,000 p.e.	D0312-01	16 km east of site
Pallaskenry	1,001 to 2,000 p.e.	D0304-01	17.1 km northwest of site
Croom	1,001 to 2,000 p.e.	D0307-01	20 km east of site
Tarbert	1,001 to 2,000 p.e.	D0283-01	21 km northwest of site

There are also several smaller sewage treatment plants within the area that treat sewage produced by less than 500 people. The nearest two such plants are Ardagh (Reg No. A0214-01) located approximately 2.8 kilometres south of the proposed development site, and Shanagolden (Reg No. A0219-01) located approximately 4.6 kilometres to the northwest. Ardagh has a plant design capacity of 450 with an agglomeration p.e. of 372 while Shanagolden has a plant design capacity of 500 with an agglomeration p.e. of 440.

6.7 Existing Land-use and On-going Activities

Agricultural practices are the chief land-use activity in the Shannon Estuary South (24) that could act in combination with the proposed development to negatively affect water quality. Other land-uses within the catchment include peat/mineral extraction, industrial activities, village settlements, one-off housing, and urban settlements such as Limerick City, Newcastle West, Adare, and Rathkeale.

The WFD (2016 – 2021) ecological status of the Ahacronane_010 River Waterbody, which includes the upper reaches of the Ahacronane River and the Rathnagore_24 Stream (EPA Code: 24R40), is 'At risk'[42] with a water quality status of 'Poor'. Similarly, the Ahacronane_020 River Waterbody, containing the Ahacronane River, Lissatotan Stream and Creeves Stream, and the Dooncaha Stream_010 River Waterbody, containing the Knockardnacorlan River, are also classed as 'At risk' with a 'Poor' water quality status. The main pressures of concern for the waterbodies within this subcatchment, namely Shanagolden[Stream]_SC_010, are agricultural activities, wastewater discharge, and peat extraction and bog drainage (EPA, 2019a). Refer to **Figure 18**, below.

There are three operational quarries located within 10 kilometres of the proposed development site as presented in **Table 27**, below. Siltation because of quarrying activities has been cited as a significant pressure for waterbodies within the Shanagolden[Stream]_SC_010 sub-catchment (EPA, 2019a).

Table 27. Details of operational quarries located within 10 kilometres of the proposed development site (PDS).

Quarry name	Quarry number	Rock type	Operation type	Product summary	Approximate distance and direction from PDS
Hogans Quarry	LK009	Limestone	Crushed rock	General fill, aggregates, blocks	3.3 km north of site
Knockbowheen Quarry	LK004	Limestone	Crushed rock	Graded shale products	1.7 km southwest of site
Michael O'Donovan Quarries	LK005	Shale/pencil	Crushed rock	Variously sized screened shale rock	2.2 km southwest of site

[42] *At risk* - either the waterbody is currently not achieving its WFD environmental objective of Good or High Ecological Status or there is an upward trend in nutrients/ammonia and if the trend continues, the waterbody Status will decline by the end of Cycle 3 and will fail to meet its environmental objective (EPA, 2019a).

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To the south of the site, the proposed locations of T3 and T4 are located within the subcatchment Deel[Newcastlewest]_SC_040 where the Deel (Newcastlewest)_0130 Waterbody, containing the Riddlestown River and the RATHNAGORE_24 Stream (EPA Code: 24R22), has an ecological status of 'Review'[43] with a water quality status of 'Moderate'. The main pressures of concern for the waterbodies within this subcatchment involve intensive agricultural practices and industrial discharges (EPA, 2019b). Refer to **Figure 18**, below.

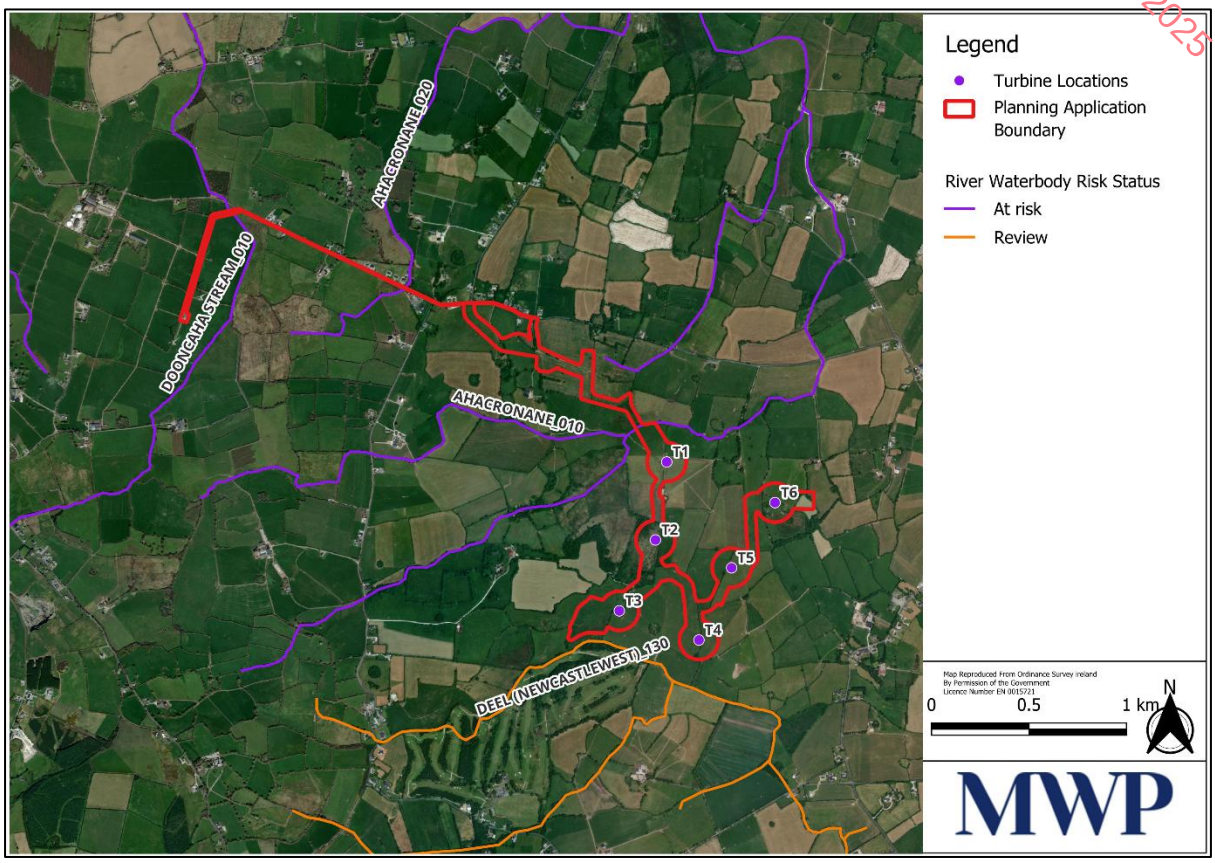

Figure 18: Risk status of waterbodies within the immediate vicinity of the proposed development site.

Excessive nutrient loss and alteration of the hydromorphological regime is an ongoing issue for many waterbodies in surrounding sub-catchments due to the combined pressures of agricultural practices and extractive industrial activities. Other significant pressures impacting waterbodies within both catchments include domestic wastewater, mines and quarries, urban wastewater/run-off and industry (EPA, 2021).

Within the Shannon Estuary South (24) Catchment, 51% of river waterbodies are classified as 'At risk' of not meeting their water quality objectives and 36% are in 'Review'. Excess nutrient levels and organic pollution impacts are the most prevalent issues, affecting 49.5% and 17% of the catchment's river waterbodies, respectively. Other significant issues impacting waterbodies within the catchment include sediment pollution, morphological impacts and hydrological impacts (EPA, 2021). Refer to map in **Figure 19**, below.

[43] *Review* – either additional information is needed to ascertain the waterbody's status, or measures have been undertaken but the results have not yet been monitored (EPA Maps Accessed: 15th June 2025)

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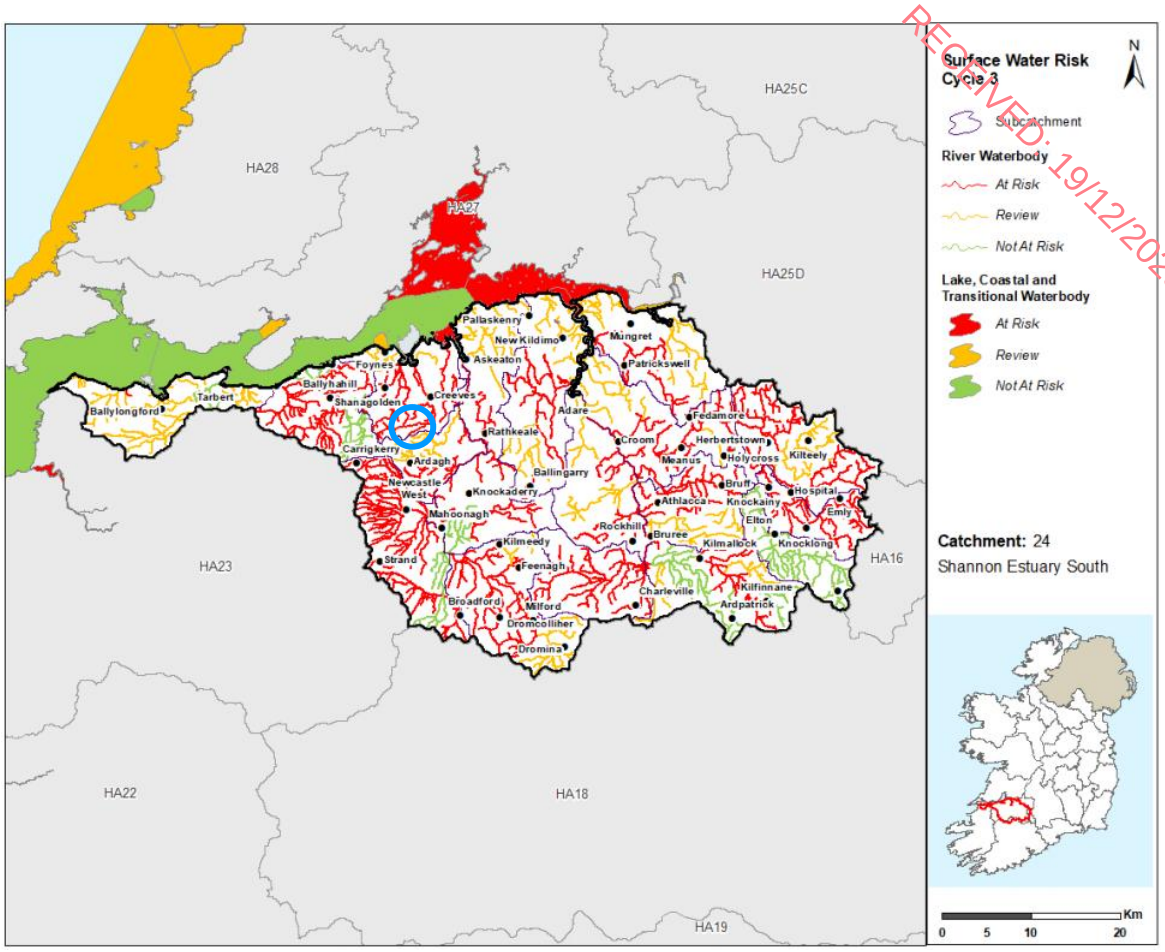

Figure 19: Risk status of waterbodies within Shannon Estuary South Catchment (24) of not meeting water quality objectives (approx. location of proposed development site circled in blue) [adapted from EPA, 2021].

6.8 Hydromorphology and Drainage

After agriculture, one of the most significant other pressures to watercourses within the Shannon Estuary South (24) Catchment is hydromorphological modification due to the presence of drainage schemes that have created high levels of siltation (EPA, 2021). Practices intended to improve the land for agricultural purposes and protect against flooding, such as the deepening of drains and channelisation, can change the morphological character of watercourses and result in an alteration of flows and substrate composition. These hydromorphological changes to drainage channels in the area may act in combination with the proposed development to negatively affect water quality of watercourses and/or physically alter their integrity.

6.9 Climate Change

Climate change is an important environmental influence on ecosystems. Changing climate affects ecosystems in a variety of ways and could act in-combination with the proposed development.

6.10 Potential for Significant In-combination Effects

Agriculture, hydromorphological changes, domestic and urban wastewater discharges, quarrying and industrial operations, other renewable energy developments (as highlighted in previous sections), and to a lesser extent

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forestry, peat extraction and one-off rural residential developments (EPA, 2021), comprise the land-uses and activities which could potentially interact synergistically with the proposed development to result in significant cumulative or in-combination effects.

The potential in-combination effects are discussed further in **Section 8.8**, below.

7. Identification of Potential Impacts

Potential likely direct, indirect or secondary ecological impacts arising from the proposed development (either alone or in combination with other plans or projects) are identified in this section.

Table 28. Description of proposed development elements likely to give rise to potential ecological impacts.

Construction Phase
▪ Excavations, vegetation clearance, ground moving, and heavy engineering required to construct windfarm tracks & hardstands, sub-station, underground cabling, grid connection, surface water drainage system, permanent met mast, buildings & fencing. ▪ Machinery: The presence and sustained use of heavy and light plant machinery on site, albeit at variable rates and numbers, during daylight hours for the duration of the works. ▪ Use of fuels/oils/lubricants, concrete and other such substances considered harmful to the aquatic environment. ▪ Human presence: Sustained increase in human activity, albeit at variable rates and numbers, during daylight hours for the duration of the works. ▪ Increased noise and air emissions associated with construction activity. Erection of turbines. Introduction of large physical structures in previously unoccupied and uninterrupted air space. ▪ Two (2) permanent storage areas onsite – one approximately 53 m from the nearest watercourse, and the other approximately 90 m from the nearest watercourse. Potential for ingress of material into the aquatic environment leading to reduction of water quality. ▪ Temporary storage of excavated material. ▪ Temporary site compound. ▪ Temporary surface water flow management systems for specific engineering elements as required.
Operational Phase
▪ Operation of wind turbines at 6 locations (rotation of turbine blades). ▪ Operation of substation. ▪ Operational maintenance works. ▪ Human presence (wind farm staff).
Decommissioning Phase
▪ Decommissioning of wind farm infrastructure including excavation and heavy engineering works, ground moving, use of machinery, temporary storage of spoil, temporary site drainage. ▪ Increased human activity, increased noise and air emissions. ▪ Permanent disassembly and removal of wind farm components including turbines. ▪ Permanent disposal and storage of excavated materials. ▪ Temporary site compound.

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Table 29. Direct, indirect or secondary ecological impacts of the construction, operational and decommissioning phases (either alone or in combination with other plans or projects) which have the potential to significantly affect the QIs of nearby designated sites.

Describe any likely direct, indirect or secondary ecological impacts of the project (either alone or in combination with other plans/projects) by virtue of: ▪ *Size and scale;* ▪ *Land-take;* ▪ *Distance from Natura 2000 Site or key features of the Site;* ▪ *Resource requirements;* ▪ *Emissions;* ▪ *Excavation requirements;* ▪ *Transportation requirements;* ▪ *Duration of construction, operation etc; and,* ▪ *Other.*	**Construction Phase** ▪ No spatial overlap of subject site and any European site; therefore, no direct habitat loss/alteration/land-take of European site will occur. ▪ There will be loss and direct alteration of habitats (mainly agricultural grassland and hedgerows) within construction footprint. ▪ Potential for species disturbance/displacement from construction activity such as fugitive noise emissions from machinery, human activity. ▪ Site hydrologically connects to two European sites - Lower River Shannon SAC and River Shannon & River Fergus Estuaries SPA. Potential for water quality impacts via erosion and run-off of silt, ingress of fuels/oils, cementitious material or other substances via overland flow and existing/proposed drainage network draining to local watercourses and estuarine waters of River Shannon into which they drain. ▪ Potential for groundwater contamination through spillage of oils, fuels and chemicals. ▪ Potential for indirect alteration of habitats outside of but hydrologically linked to the development site. ▪ Potential for indirect species disturbance/displacement due to *in-situ* or *ex-situ* habitat loss/alteration impacts, impairment of water quality and/or impacts on prey availability. ▪ Potential for spread of invasive alien species. **Operational Phase** ▪ Risk of bird mortality through collision or interaction with turbine blades or other wind farm infrastructure. ▪ Potential for species disturbance/displacement (indirect habitat loss) due to operation/maintenance of wind turbines and substation. ▪ Potential for species displacement because of 'barrier effects' whereby birds are deterred from using normal routes to access breeding, foraging or roosting habitats elsewhere. For example, behavioural responses to the presence of turbines could cause some species to stop using or reduce their use of foraging grounds in proximity to turbine envelope. ▪ Potential for water quality impacts through the erosion and run-off of silt, and/or ingress of fuels/oils via overland flow and/or the drainage network to local watercourses and the estuarine waters of the River Shannon into which they drain. ▪ Potential for groundwater contamination through spillage of oils, fuels and chemicals. ▪ Potential for indirect alteration of habitats outside of but hydrologically linked to the development site. ▪ Potential for indirect species disturbance/displacement due to impairment of water quality and/or impacts on prey availability. **Decommissioning Phase** ▪ Potential for water quality impacts, as above. ▪ Potential for groundwater contamination, as above. ▪ Potential for direct species disturbance/displacement due to fugitive noise emissions associated with disassembly and removal of wind farm components and human activity. ▪ Potential for indirect alteration of habitats outside of but hydrologically linked to the development site. ▪ Potential for indirect species disturbance/displacement due to impairment of water quality and/or impacts on prey availability. ▪ Potential for spread of invasive alien species.

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8. Stage 2 - European Sites Selected for Further Assessment

It has been concluded that without appropriate mitigation measures, the proposed construction, operation and decommissioning of a 6-turbine wind farm at Ballynisky in County Limerick is likely to have a significant effect, or significant effects cannot be ruled out at this stage, on the three European sites listed in **Table 30**, below. The Screening for Appropriate Assessment Report is included in **Appendix 1** of this report.

The description of these sites in the following sections is based largely on the NPWS site synopses. When European sites are selected for appropriate assessment, all qualifying features of conservation interest must be included in the assessment stage. However, when assessing impact, qualifying features are only considered relevant where a credible or tangible source-pathway-receptor link exists between the proposed development and a protected species or habitat type. For an impact to occur, there must be a risk initiated by having a 'source' (e.g. nearby watercourse), a 'receptor' (e.g. a protected species associated with aquatic/riparian habitats), and an impact pathway between the source and the receptor (e.g. a watercourse which connects the proposed development site to the site designated for the protection of the aforementioned species).

Table 30. European sites included for Stage 2 Appropriate Assessment

Designated site and code	Approx. distance of designated site to nearest point of development site	Hydrological/Ecological Connection
Stack's to Mullaghareirk Mountains: West Limerick Hills & Mount Eagle SPA (004161)	3.7 km west of T1 1.7 km west of Carrons substation	Yes – site within maximum foraging range for hen harrier (SNH, 2016).
Lower River Shannon SAC (002165)	6 km to the north 7.4 rkm downstream from closest point (WC3) (see **Figure 10**, above).	Yes – hydrological connection
River Shannon and River Fergus Estuaries SPA (004077)	6.8 km to the north 7.4 rkm downstream from closest point (WC3) (see **Figure 10**, above).	Yes – hydrological connection

Identifying a risk that could, in theory, cause an impact does not automatically mean that the risk event will occur or that it will cause or create an adverse impact. However, identification of the risk does mean that there is a latent possibility of ecological or environmental damage occurring, with the level and significance of the impact depending upon the nature of the risk, the extent of the exposure to the risk and the characteristics of the receptor. Therefore, bearing in mind the scope, scale, nature and size of the proposed development, its location relative to the distribution of the species and habitats listed, and the degree of connectedness that exists between the development and potential receptors, it is considered that not all are within the zone of potential impact of the proposal.

An evaluation based on these factors to determine which species and habitats are the plausible ecological receptors for potential impacts of the unmitigated proposal has been conducted in **Sections 8.1.2**, **8.2.2** and **8.3.2**, below, for the proposed development in County Limerick. This evaluation determined the specific qualifying features of the SAC (listed in **Table 34**, below) and the SPAs (listed in **Table 31** and **Table 33**, below), that should be selected for further assessment as plausible ecological receptors.

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8.1 Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA (004161)

8.1.1 Description of the European Site

The following text summarises the Natura 2000 Standard Data Form for the site[44]. Refer to **Figure 20**, below.

The Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA is a large, upland site measuring approximately 566.49 km^2 (56,648.84 hectares) positioned amongst the borders of counties Cork, Kerry and Limerick. Refer to **Figure 20**, below. The mountains of the area are all relatively low in altitude with the highest, Knockfeha, measuring just 451 metres. Notable rivers that rise within the SPA include the Blackwater, Clydagh, Oolagh, Feale, and Smerlagh.

This upland site contains a variety of habitats, although almost half (45%) is afforested with coniferous stands of Sitka spruce (*Picea sitchensis*) and Lodgepole pine (*Pinus contorta*) including first and second rotation plantations and areas of both pre-thicket and clearfell. A significant fraction (28%) of the site is unplanted blanket bog and wet and dry heath with the remainder of the SPA predominantly comprised of rough grassland.

The SPA is a stronghold for hen harrier in Ireland and supports the largest concentration of the species in the country, approximately 21% of the all-Ireland population. Optimum hen harrier habitat conditions are provided via the mix of forestry and open areas. The species most frequently nests in new and second-rotation conifer plantations, although some pairs may still nest in tall heather of unplanted bogs and heath. Moorland, open bog, young conifer plantations and hill farmland provide excellent foraging habitat.

Short-eared owl (*Asio flammeus*), a rare breeding bird in Ireland, has nested within the SPA and has been recorded infrequently in recent years. Additionally, merlin (*Falco columbarius*) and red grouse (*Lagopus lagopus hibernicus*) both also occur at the site, although the population size of both species is unknown.

The Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA is designated for the protection of the following qualifying feature of conservation interest:

- Hen harrier (*Circus cyaneus*) [A082]

[44] Natura 2000 SDF - IE0004161 Accessed: 6th June 2025

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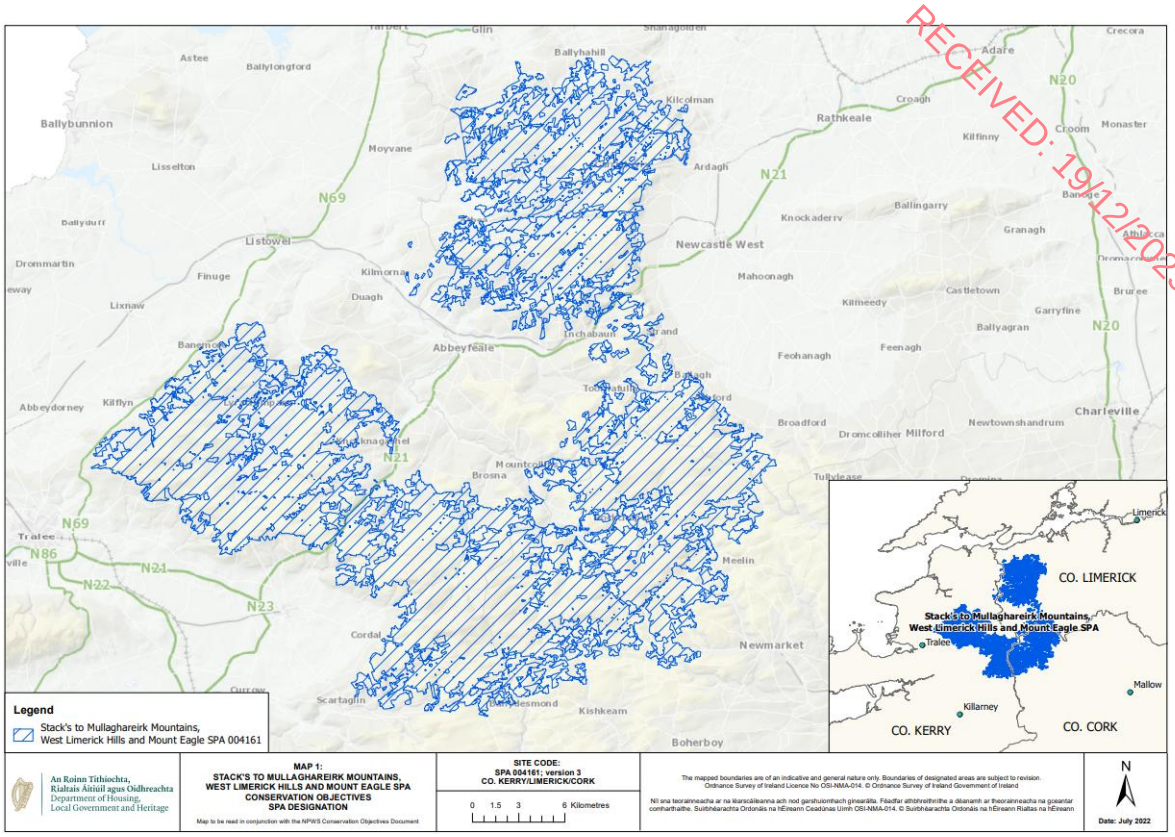

Figure 20: Extent of Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA (004161) (adapted from NPWS, 2022b).

8.1.2 Identification of Potentially Significant Impacts to Qualifying Features

Table 31, below, lists the qualifying feature of the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA and evaluates through a scientific examination of evidence and data whether this feature should or should not be selected for further assessment within the NIS.

Table 31. Qualifying feature of the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA (004161) selected for impact assessment.

Qualifying feature	Potential for significant impacts	Rationale
Hen harrier (*Circus cyaneus*) [A082]	Yes	Habitat at the proposed development site is predominantly agricultural and not considered preferable nesting/foraging hen harrier habitat. There is some potential for hedgerows and other linear features at the site to be used by foraging individuals, and since all six of the proposed turbines lie within the optimal foraging range of 5 km for hen harrier (SNH, 2016), there is potential for loss of foraging habitat. There was a single hen harrier observed during the VP surveys flying northwest past T1 outside the proposed development site boundary. During the hen harrier roost surveys at Carrigkerry Bog there were several observations of hen harrier at locations more than 5 km from the proposed development site (refer to Sections 4.2.8.2 and 4.2.8.6, above). Additionally, a review of the 2015 National Hen Harrier Survey determined that there were two confirmed breeding sites for the species within the hectad R24 (Ruddock *et al.*, 2016). Therefore, the species is deemed within the ZOI and will be considered further.

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It has been determined in **Table 31**, above, that the proposed development has the potential to result in significant effects to the conservation objectives of the following Special Conservation Interest (SCI) species of the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA and will be considered further in this NIS:

- Hen harrier (*Circus cyaneus*) [A082]

8.2 Lower River Shannon SAC [002165]

8.2.1 Description of the European Site

The following text summarises the Natura 2000 Standard Data Form for the site[45]. The full site synopsis is available on the NPWS website[46]. Refer to **Figure 21**, below.

The Lower River Shannon SAC is a large, narrow site that measures approximately 14 kilometres wide and 120 kilometres long. It encompasses the Shannon River Estuary, the broader River Fergus Estuary and several smaller estuaries such as Poulnasherry Bay along with the freshwater lower reaches of the Shannon River between Killaloe and Limerick and some freshwater stretches within the Feale and Mulkear catchments. The SAC also includes a marine area at the mouth of the Shannon estuary with high rocky cliffs to the north and south; ericaceous heath on Kerry Head and Loop Head; and several lagoons. Refer to **Figure 21**, below. The underlying geology ranges from Carboniferous limestone (east of Foynes) to Namurian shales and flagstones (west of Foynes) to Old Red Sandstone (at Kerry Head). The ebb and flood of the tide and annual seasonal rainfall fluctuations ensure that the salinity of the system varies daily.

The Lower River Shannon SAC contains many Annex I habitats including the most extensive area of estuarine habitat in the country. A wide range of Annex II species are also present within the SAC including all three Irish species of lamprey, a good population of Atlantic salmon, and the only known resident population of Common bottlenose dolphin in Ireland. Many bird species listed on the EU Birds Directive either winter or breed at the site. The site is internationally important for waterfowl with more than 50,000 individuals occurring in winter. Several plant species listed in the Irish Red Data Book are also found within the SAC including two species of stonewort (*Chara canescens* and *Chara cf. connivens*) at Shannon Airport Lagoon, and the only known Irish populations of triangular club-rush (*Scirpus triqueter*).

The Lower River Shannon SAC is designated for the protection of the following qualifying features of conservation interest:

Habitats

- Sandbanks which are slightly covered by sea water all the time [1110];
- Estuaries [1130];
- Mudflats and sandflats not covered by seawater at low tide [1140];
- Coastal lagoons [1150];
- Large shallow inlets and bays [1160];
- Reefs [1170];
- Perennial vegetation of stony banks [1220];
- Vegetated sea cliffs of the Atlantic and Baltic coasts [1230];
- *Salicornia* and other annuals colonising mud and sand [1310];
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330];

[45] N2K IE0002165 dataforms (europa.eu) Accessed: 6th June 2025
[46] SITE SYNOPSIS (npws.ie) Accessed: 16th June 2025

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- Mediterranean salt meadows (*Juncetalia maritimi*) [1410];
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260];
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]; and,
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0].

Species

- Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029];
- Sea Lamprey (*Petromyzon marinus*) [1095];
- Brook Lamprey (*Lampetra planeri*) [1096];
- River Lamprey (*Lampetra fluviatilis*) [1099];
- Salmon (*Salmo salar*) [1106] (QI status pertains only to freshwater phases of life cycle);
- Common Bottlenose Dolphin (*Tursiops truncatus*) [1349]; and,
- Otter (*Lutra lutra*) [1355].

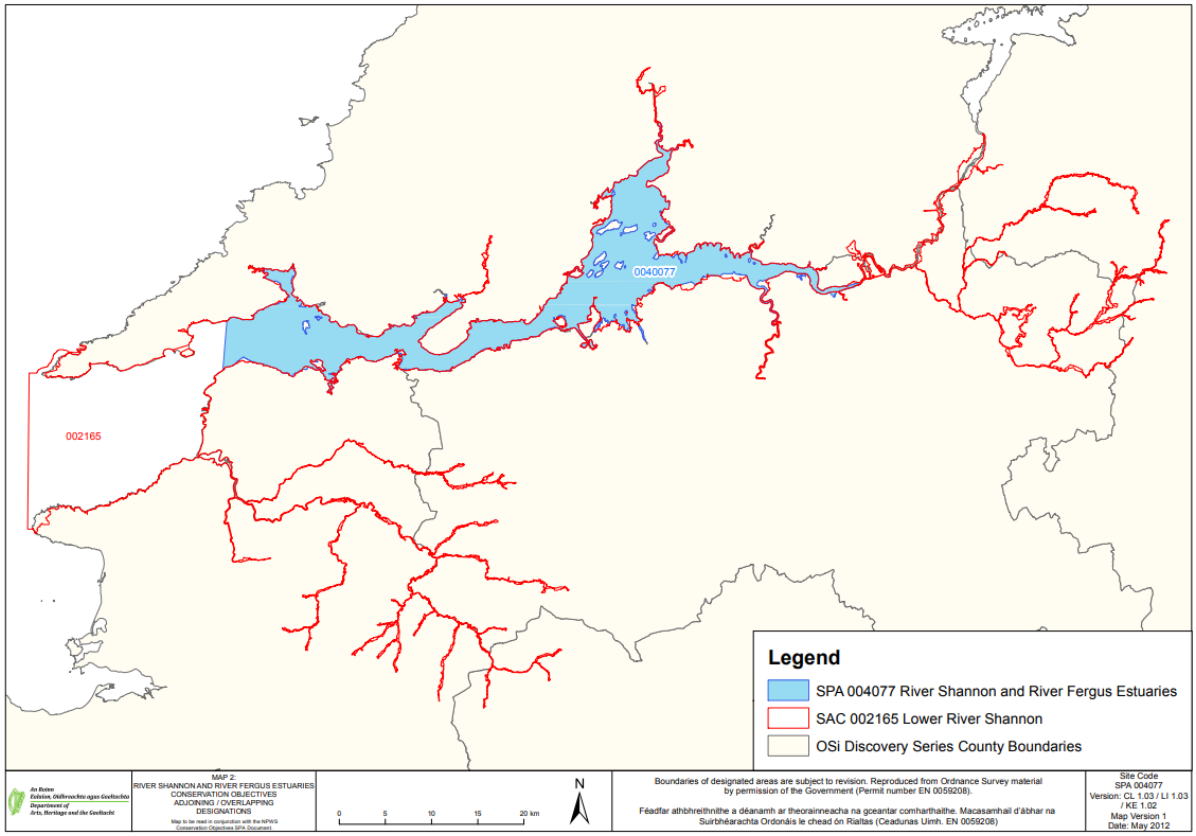

Figure 21: Extent of Lower River Shannon SAC (002165) and River Shannon and River Fergus Estuaries SPA (004077) (adapted from NPWS, 2012a).

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8.2.2 Identification of Potentially Significant Impacts to Qualifying Features

Table 32, below, lists the qualifying features of the Lower River Shannon SAC and evaluates through a scientific examination of evidence and data whether these features should or should not be selected for further assessment in the NIS.

Table 32. Selection of qualifying features of the Lower River Shannon SAC (002165) for impact assessment.

Qualifying features	Potential for significant impacts	Rationale
Sandbanks which are slightly covered by sea water all the time [1110]	No	The likely extent of sandbanks within the SAC occurs south of Rinevella Point, Co. Clare and west of Ballybunion, Co. Kerry within the mouth of the Shannon Estuary (NPWS, 2012a), nearly 50 km from the proposed development site. Given the intervening distance between the proposal site and this marine/coastal habitat, it is considered that the proposed development does not have potential for significant effects on sandbanks. The Shannon Estuary is approximately 45 km long and is well-connected to the Atlantic Ocean, meaning that exchange rates of water within the estuary can be expected to be very high with an almost constant movement of water into and out of the estuary. Any change to the water quality of the watercourses draining into the estuary from the proposed development site would be considered imperceptible/undetectable given the volumes of fresh water entering the estuary (from Rivers Shannon, Maigue, Fergus, and Deel, amongst others) at each low tide, and the volume of saline/brackish water filling the estuary on each flooding tide. Thus, the proposed development will not affect the conservation objectives for 'Sandbanks which are slightly covered by sea water all the time' and the habitat is not considered further in the NIS.
Estuaries [1130]	**Yes**	The extent of the estuary has been mapped as occurring eastwards from Carrig Island on the southern shores of the Shannon Estuary to Aylevarroo Point on the northern shore (NPWS, 2012a). Distribution mapping for the SAC shows the closest estuarine habitat to the proposed development site is located approximately 8.7 river km downstream from the proposed new bridge crossing of the Ahacronane River, and approximately 7.4 river km downstream from where the proposed Option A grid route crosses the Knockardnacorlan River. Additionally, there is a tenuous hydrological connection between the proposed development and estuarine habitat via the proposed Option A grid crossing of Creeves Stream located approximately 7.8 river km upstream. Surface water drainage from all parts of the proposed wind farm site eventually drains into the Shannon Estuary. Although the very high exchange rates of water within the estuary are noted, and it is considered that any potential water quality impacts during the construction phase will be localised in view of the nature, extent and scale of the proposed works, a precautionary approach will be taken due to the hydrological links and relatively short distance between the proposal site and the QI downstream. Therefore, the potential for impacts to occur cannot be ruled out and 'Estuaries' are to be considered further in the NIS.

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Qualifying features	Potential for significant impacts	Rationale
Mudflats and sandflats not covered by seawater at low tide [1140]	**Yes**	Both the Fergus and inner Shannon Estuaries feature vast expanses of intertidal mudflats. Within the SAC, mudflats are mapped as occurring south of Ballybunion, at Bunaclugga Bay, Querrin Point and Poulnasherry Bay. Other areas of mudflats occur further east within the estuary channel at Limerick City (NPWS, 2012a). Distribution mapping for the SAC shows the closest area of mudflats to the proposed development site is approximately 8.7 river km downstream from the proposed new bridge crossing of the Ahacronane River, and approximately 7.4 river km downstream from where the proposed Option A grid route crosses the Knockardnacorlan River. Additionally, there is a tenuous hydrological connection between the proposed development and the estuarine habitat via the proposed Option A grid crossing of Creeves Stream located approximately 7.8 river km upstream. Surface water drainage from all parts of the proposed wind farm site eventually drains into the Shannon Estuary. While it is considered that any potential water quality impacts during the construction phase will be localised in view of the nature, extent and scale of the proposed works, there is the potential for impacts to occur, and as such, 'Mudflats and sandflats not covered by seawater at low tide' are to be considered further in the NIS.
Coastal lagoons [1150]	No	There are four coastal lagoons within the SAC, namely Quayfield and Poulaweala Loughs, Shannon Airport Lagoon, Scattery Lagoon, and Cloonconneen Pool (NPWS, 2012a). Coastal lagoons are areas of shallow, coastal salt water, wholly or partially separated from the sea by sandbanks, shingle or rocks. Given the intervening distance of almost 10 km between the proposed development site and the nearest area of this habitat at Quayfield and Poulaweala Loughs, and since this habitat type is confined to coastline above the high tide mark and is therefore outside the zone of influence of any potential impact arising from the proposed wind farm construction/operation, there will not be a significant impact to 'Coastal lagoons' and this habitat type is not considered further in the NIS.
Large shallow inlets and bays [1160]	No	The habitat 'large shallow inlets and bays' is a large physiographic feature that may wholly or partly incorporate other Annex I habitats including reefs, sandbanks and mudflats and sandflats within its area. In contrast to estuaries, large shallow inlets and bays have limited freshwater influence. The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and in areas extremely sheltered from wave action (NPWS, 2012a). The entire mouth of the Shannon Estuary extending eastwards as far as Carrig Island is mapped as large shallow inlets and bays. This habitat, with an estimated area of approximately 25,000 ha, is mapped as occurring west of the Shannon towards the mouth of the estuary more than 30 km west of the proposed development site. Given the intervening distance between the proposal and this habitat, in conjunction with very high exchange rates of water within Shannon Estuary, it is considered that the proposed development does not have potential for significant effects on this habitat. Thus, the proposed development will not affect the conservation objectives for 'Large shallow inlets and bays' and it is not considered further in the NIS.

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Qualifying features	Potential for significant impacts	Rationale
Reefs [1170]	**Yes**	The intertidal reefs within the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps, to ridged bedrock with gullies of sand between the ridges, to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. The communities found are tolerant to sand scour and tidal streams. 'Reefs' occur throughout the estuary, mainly as scattered and isolated pockets within the inner estuary and covering extensive areas at the mouth of the Shannon Estuary (NPWS, 2012a). A review of available mapping identified numerous small patches of reefs located to the eastern extent of the estuary towards Limerick City. Furthermore, the Annex I habitat 'Estuaries [1130]' 'may wholly or partly incorporate other Annex I habitats including reefs... within its area' (NPWS, 2012b). Consequently, since the potential for significant impacts to 'Estuaries' has already been established and because there is a hydrological link between the proposal site and the reefs downstream, the potential for impacts to occur cannot be ruled out at this stage and 'Reefs' will be considered further in the NIS.
Perennial vegetation of stony banks [1220]	No	This habitat type occurs along the coast where shingle (cobbles/pebbles) and gravel have accumulated to form elevated ridges or banks above the high tide mark and is mapped as occurring in nine locations along the Shannon River and Estuary scattered throughout the hard coastline of the River Shannon (NPWS, 2012a). The nearest area of this habitat to the proposal site occurs at Ballymacrinan Bay, more than 27 km to the west. Given the characteristics of the proposed development and the distance intervening, it is not considered that the proposal has any potential to significantly impact on this habitat type. Thus, the proposed development will not affect the conservation objectives for 'Perennial vegetation of stony banks' and the habitat is not considered further in the NIS.
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No	Vegetated sea cliffs are steep slopes fringing hard or soft coasts created by past or present marine erosion and support a wide diversity of vegetation types with variable maritime influence. Most of the SAC west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs, including Loop Head, Ballybunion and Kerry Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated (NPWS, 2012c). The closest area of this habitat to the proposed development site occurs at Burrane, more than 20 km to the west. Given the characteristics of the proposed development and the distance intervening, it is not considered that the proposal has any potential to significantly impact on this habitat-type. Thus, the proposed development will not affect the conservation objectives for 'Vegetated sea cliffs of the Atlantic and Baltic coasts' and the habitat is not considered further in the NIS.
Salicornia and other annuals colonising mud and sand [1310]	No	This is a coastal habitat where pioneer salt-marsh vegetation colonises intertidal mud and sandflats in areas protected from strong wave action. It is an important precursor to the development of more stable saltmarsh vegetation and develops at the lower reaches of saltmarshes where vegetation is frequently flooded by the tide. Within this SAC, areas of *Salicornia* habitat are limited (NPWS, 2012a).

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Qualifying features	Potential for significant impacts	Rationale
		A review of habitat mapping and documents available determined that of the ten sub-sites surveyed as part of the 2007-2008 Saltmarsh Monitoring Project (McCorry & Ryle, 2009), the closest occurring area of *Salicornia* habitat was located within the 'Barrigone/Aughinish' sub-site (SMP code: 0079), at a location approximately 8.3 river km downstream from the proposed Option A grid route crossing of Knockardnacorlan. Within the sub-site, *Salicornia* habitat consists of a 'single, almost negligible patch of glasswort (*Salicornia europaea* agg.) vegetation' occupying 0.001 ha on the northern side of Robertstown Creek (NPWS, 2012c). However, when the site was re-surveyed as part of the 2017-2018 Saltmarsh Monitoring Project (Brophy *et al*., 2019), it was found that this tiny patch within the sub-site had been 'lost due to natural processes'. The next nearest downstream subsite supporting *Salicornia* is 'Knock' (SMP code: 0085) located more than 20 km from the proposed development site. Given the characteristics of the proposed development, the natural loss of the habitat from the 'Barrigone/Aughinish' sub-site and the distance intervening to the 'Knock' sub-site, it is not considered that the proposal has any potential to significantly impact on this habitat-type. Thus, the proposed development will not affect the conservation objectives for '*Salicornia* and other annuals colonising mud and sand' and the habitat is not considered further in the NIS.
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	**Yes**	'Atlantic salt meadows' (ASM) generally occupy the widest part of a saltmarsh gradient and develop when halophytic vegetation colonises soft intertidal sediments of mud and sand in areas protected from strong wave action. The vegetation forms the middle and upper reaches of saltmarshes where tidal inundation still occurs but with decreasing frequency and duration. A review of habitat mapping and documents available determined that of the ten sub-sites surveyed for the Saltmarsh Monitoring Project (McCorry & Ryle, 2009), the closest mapped area of ASM is located within the 'Barrigone/Aughinish' sub-site (SMP code: 0079) (NPWS, 2012b) approximately 8.7 river km downstream from the proposed new bridge crossing of the Ahacronane River, and approximately 7.4 river km downstream from where the proposed Option A grid route crosses the Knockardnacorlan River. Surface water drainage from all parts of the proposed wind farm site eventually drains into the Shannon Estuary. ASM is the dominant saltmarsh habitat at the site with an area of approximately 10.2 ha, the majority of which occurs as pure marsh. Typically, within this sub-site it is mostly comprised of a narrow fringe with some discrete saltmarsh plains, particularly along the eastern half of the site. While it is considered that any potential water quality impacts during the construction phase will be localised in view of the nature, extent and scale of the proposed works, there is a tenuous hydrological link between this habitat type and the proposed development site thereby creating the potential, albeit slight, for impacts to occur, and as such, 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' are to be considered further in the NIS.
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	**Yes**	'Mediterranean salt meadows' (MSM) occupy the upper zone of salt marshes and usually occur adjacent to the boundary with terrestrial habitats. They are widespread on the Irish coastline but are less extensive as ASM. MSM habitat includes salt marshes in the Mediterranean basin dominated by *Juncus* (rushes), especially *J. maritimus* (sea rush) tolerant of saline soils. Although MSM are more restricted in their distribution and size, a review of habitat mapping and supporting documents available for the SAC determined that of the ten sub-sites surveyed, mapped and assessed as part of the Saltmarsh Monitoring Project (McCorry

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Qualifying features	Potential for significant impacts	Rationale
		& Ryle, 2009), the closest occurring area of MSM habitat is located within the 'Barrigone/Aughinish' sub-site (SMP code: 0079) (NPWS, 2012b), approximately 8.7 river km downstream from the proposed new bridge crossing of the Ahacronane River, and approximately 7.4 river km downstream from where the proposed Option A grid route crosses the Knockardnacorlan River. Surface water drainage from all parts of the proposed wind farm site eventually drains into the Shannon Estuary. The MSM at this site has a total area of 2.41 ha and is largely confined to the eastern inlet into which the Ahacronane River drains. While it is considered that any potential water quality impacts during the construction phase will be localised in view of the nature, extent and scale of the proposed works, there is a tenuous hydrological link between this habitat type and the proposed development site thereby creating the potential, albeit slight, for impacts to occur, and as such, 'Mediterranean salt meadows (*Juncetalia maritimi*)' are to be considered further in the NIS.
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	**Yes**	This annexed habitat has a broad definition, covering from upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. Floating river vegetation characterised by species of water-crowfoot (*Ranunculus* spp.), pondweeds (*Potamogeton* spp.) and the moss (*Fontinalius antipyretica*) are present throughout the major river systems within the site. In Ireland, this sub-type is associated with tidal reaches of rivers and other periodically disturbed watercourses (e.g. canals and drains) (NPWS, 2012a). Since the full distribution of this habitat and its sub-types within the SAC is currently unknown (NPWS, 2012d), a precautionary approach will be taken. The existing drainage network at the proposed development site drains into watercourses that ultimately merge with the SAC, thereby creating a hydrological connection between the proposal site and the SAC. This QI habitat may occur in the tidal reaches of the River Shannon within the potential ZOI of the proposed development. Therefore, the proposed development has potential to affect the conservation objectives for 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' and the habitat will be considered further in the NIS.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	No	*Molinia* meadows are found mainly on moist, moderately base-rich, peats and peaty gley soils, often with fluctuating water tables. They usually occur as components of wet pastures/fens, and often form mosaics with dry grassland, heath, mire and scrub communities. The current full extent of this habitat within the SAC is not mapped within the conservation objectives mapping; however, the site synopsis states that *Molinia* meadows occur in several parts of the site with an especially noteworthy example at World's End in Castleconnell on the River Shannon (NPWS, 2012a). As this habitat type is confined to terrestrial locations above the high tide mark and outside of the zone of influence of any potential impact arising from the construction/operation of the wind farm, there will not be a significant impact to *Molinia* meadows on calcareous, peaty or clavey-silt-laden soils and the habitat will not be considered further in the NIS.
Alluvial forests with *Alnus glutinosa* and *Fraxinus*	No	Alluvial woodland occurs on the banks of the Shannon, in the valley bottoms of the tributaries and on seepage zones on valley sides within the site (NPWS, 2012a). The most prominent woodland type is gallery woodland where white willow (*Salix alba*)

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Qualifying features	Potential for significant impacts	Rationale
excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]		dominates the tree layer with occasional alder (*Alnus glutinosa*). This habitat can occur on islands in river channels or low-lying wetlands alongside the channels and is characterised by periodic inundation of water. As there is no hydrological connection between areas of this habitat within the SAC and the proposed development site, and since the habitat type is confined to restricted terrestrial locations above the high tide mark, it is considered to be outside of the zone of influence of any potential impact arising from the proposed wind farm. Therefore, no significant impact to the conservation objectives for 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*', is anticipated and therefore, this habitat is not considered further in the NIS.
Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]	No	The freshwater pearl mussel (FPM) is a large, long-lived bivalve mollusc found in clean, fast-flowing, well-oxygenated rivers with unconsolidated substrates. Stable, clean gravel and sand with adequate availability of dissolved oxygen provides ideal habitat for juveniles. The pH and hardness of water is also important, and FPM distribution is mainly restricted to acidic, soft waters over-lying non-calcareous rock-types. Low nutrient status is also critical such that excess macrophyte and algal growth is prevented; therefore, oligotrophic waterbodies are required. Conservation objectives for this species within the SAC apply to the FPM population of the Cloon River in County Clare which is confined to the main channel and is distributed from Croany Bridge to upstream of Clonderalaw Bridge (NPWS, 2012a). The Cloon River enters the main Shannon Estuary at a point nearly 20 km northwest of the proposal site. Furthermore, it has already been established in **Sections 4.2.7.6** and **4.2.7.7**, above, that the watercourses surrounding the proposed development site drain over limestone formations and have relatively high levels of water hardness. Given the characteristics and location of the proposed development, and species' ecology, it is not considered that the proposal has any potential to significantly impact on FPM. Thus, the proposed development will not affect the conservation objectives for 'Freshwater pearl mussel' and the species is not considered further in the NIS.

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Qualifying features	Potential for significant impacts	Rationale
River Lamprey (*Lampetra fluviatilis*) [1099] Sea Lamprey (*Petromyzon marinus*) [1095]	Yes	The life cycles of sea lamprey and river lamprey contain both a marine phase and a freshwater phase. Both species spend their adult life in marine and estuarine waters, living as external parasites on other fish species before migrating up rivers in spring to spawn in areas of clean gravel, after which they die. Sea lamprey and river lamprey often spawn in the lower reaches of rivers but can also migrate up to 50 miles upstream (Kurz & Costello, 1999). Sea and river lampreys are poor swimmers (Reinhardt *et al*., 2009) and are generally considered unable to navigate past weirs and other barriers meaning that both lamprey species are restricted to the lower reaches of the SAC. Neither lamprey species occurred at any of the sites sampled (see **Figure 2**, above, for sampling locations) during aquatic ecology surveys and it is extremely unlikely that either are to be found within the study area. However, the existing drainage network at the proposed development site drains into watercourses that ultimately merge with the SAC, thereby creating a hydrological connection between the proposal site and the SAC through which there is potential for water quality impacts to occur, particularly during the construction phase of the proposed development. Therefore, based on this and the precautionary principle, it is deemed that there is potential for impacts to the conservation objectives for sea and/or river lamprey so both species will be considered further in the NIS.
Brook Lamprey (*Lampetra planeri*) [1096]	Yes	Brook lamprey is the smallest of the three lamprey species native to Ireland. Unlike sea and river lamprey, it is not parasitic and is non-migratory, spending its entire life in freshwater. Species distribution within river catchments is dependent on the availability of suitable habitat; adults require fine sand/gravel areas in which to spawn while the juvenile form needs clean, fine sediment into which to burrow (King *et al*., 2011). Brook lamprey did not occur at any of the sites sampled (see **Figure 2**, above, for sampling locations) during aquatic ecology surveys although it is possible that the watercourses draining the proposed development site do support brook lamprey. Furthermore, the existing drainage network at the site drains into watercourses that ultimately merge with the SAC, thereby creating a hydrological connection between the proposal site and the SAC through which there is potential for water quality impacts to occur, particularly during the construction phase of the proposed development. Based on this and the precautionary principle, it is deemed that there is potential for impacts to the conservation objectives for brook lamprey so the species will be considered further in the NIS.
Salmon (*Salmo salar*) [1106]	Yes	Salmon is an anadromous species, living in freshwater for at least the first two or three years of life before migrating to sea. Most Irish salmon spend one winter at sea before returning to their natal rivers. Salmon has been observed spawning in the lower Shannon and its tributaries. Adult salmon occur in the Shannon Estuary prior to returning to natal streams to spawn, and smolts occur in the estuary on their journey from influent rivers to the sea (NPWS, 2012a). No salmon was recorded at any of the sample sites (see **Figure 2**, above, for sampling locations) of the aquatic ecology surveys carried out – therefore,

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Qualifying features	Potential for significant impacts	Rationale
		watercourses are deemed sub-optimal due to siltation and water enrichment at higher reaches, and the morphologically degraded nature of watercourses in lower reaches. However, the existing surface drainage network of the proposal site drains into watercourses that ultimately merge with the SAC, thereby creating a hydrological connection between the proposal site and the SAC through which there is potential for water quality impacts to occur, particularly during the construction phase of the proposed development. Therefore, there is potential for impacts to the conservation objectives for salmon so the species will be considered further in the NIS.
Common Bottlenose Dolphin (*Tursiops truncatus*) [1349]	No	The only known resident population of bottlenose dolphin in Ireland are found in the Shannon Estuary. Most of the estuary is considered to comprise suitable habitat for this Annex II species, apart from the inter-tidal areas of the Fergus Estuary and the inner estuary channel near Shannon town stretching east towards Limerick - a review of on-line NBDC species records shows that sightings are concentrated in the outer channel and are extremely rare east of Foynes Island. Within the SAC, two 'critical areas' of habitat used preferentially by the species have been identified – one close to Tarbert/Killimer, and one further west towards the estuary's mouth at Ballybunion and Kilcredaun Point (NPWS, 2012a). Given the characteristics and location of the proposed development including the nature, extent and scale of the proposed works, the dilution potential of the River Shannon and Estuary, the distribution of bottlenose dolphin habitat and records within the estuary, it is not considered that the proposal has the potential to significantly impact on this species. Thus, the proposed development will not affect the conservation objectives for bottlenose dolphin, and the species is not considered further.
Otter (*Lutra lutra*) [1355]	**Yes**	Otter has a widespread distribution throughout Ireland and can be found in a wide variety of aquatic habitats such as lakes, rivers, streams, estuaries, canals and along the coast. They are highly territorial, mainly solitary animals that prey on a wide variety of vertebrate and invertebrate species, although their diet primarily comprises fish. The amount of time spent within different parts of an individual's home range is related to prey abundance. Safe refuges where they can rest are also essential. No evidence of otter was recorded during the ecological field surveys and there are no documented records of otter held by the NBDC for the proposed development site. However, the existing surface drainage network of the proposal site drains into watercourses that ultimately merge with the SAC, thereby creating an indirect hydrological connection between the proposal site and the SAC through which there is potential for water quality impacts to occur. This creates the potential for otter to be indirectly affected through a reduction in prey source and habitat availability. There is also the possibility of impacts to commuting/foraging otter resulting from increased noise/activity, particularly during the construction phase of the proposed development. Therefore, it is considered that there is potential for impacts to the conservation objectives for otter so the species will be considered further in the NIS.

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It has been determined in **Table 32**, above, that without appropriate mitigation measures, the proposed development has the potential, or potential cannot be ruled out at this stage, to result in significant effects to the conservation objectives of the following Qualifying Interests (QIs) of the Lower River Shannon SAC:

- Estuaries [1130];
- Mudflats and sandflats not covered by seawater at low tide [1140];
- Reefs [1170];
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330];
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410];
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260];
- River Lamprey (*Lampetra fluviatilis*) [1099];
- Sea Lamprey (*Petromyzon marinus*) [1095];
- Brook Lamprey (*Lampetra planeri*) [1096];
- Atlantic Salmon (*Salmo salar*) [1106]; and,
- Otter (*Lutra lutra*) [1355].

8.3 River Shannon and River Fergus Estuaries SPA (004077)

8.3.1 Description of the European Site

The following text summarises the Natura 2000 Standard Data Form for the site[47]. Refer to **Figure 21**, above.

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The SPA comprises the entire estuarine habitat from Limerick City and Ennis town westwards as far as Doonaha in County Clare and Dooneen Point in County Kerry. Also included are several areas in the outer Shannon Estuary, such as Clonderalaw Bay and Poulnasherry Bay. The site has vast expanses of intertidal flats containing a diverse macro-invertebrate community, e.g. *Macoma-Scrobicularia-Nereis*, which provides a rich food resource for wintering birds. Eelgrass (*Zostera* spp.) is also present in places. Salt marsh vegetation frequently fringes the mudflats, and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches. The tidal channels and creeks within the most inner parts of the estuaries are fringed with species such as common reed (*Phragmites australis*) and sedges (*Scirpus* spp.). Common cordgrass (*Spartina anglica*) is frequent in parts.

This is one of the most important coastal wetland sites in Ireland and regularly supports more than 50,000 wintering waterfowl including internationally important numbers of redshank, black-tailed godwit and dunlin, and nationally important numbers of 16 other species. The site is of particular importance for dunlin (11% of national total), grey plover (7.5% of national total), lapwing (6.5% of national total), redshank (6.1% of national total), and shelduck (6.0% of national total), with significant numbers of whooper swan, golden plover and bar-tailed godwit also occurring at the site. A population of Greenland white-fronted goose (*Anser albifrons flavirostris*) once frequented the site but have since abandoned the area. The site provides both feeding and roosting areas for the wintering birds while the quality of estuarine habitats at the site is generally good.

[47] N2K IE0004077 dataforms (europa.eu) Accessed: 6th July 2025

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The River Shannon and River Fergus Estuaries SPA is designated for the protection of the following qualifying features of conservation interest:

- Cormorant (*Phalacrocorax carbo*) [A017] Breeding & Wintering;
- Whooper Swan (*Cygnus cygnus*) [A038] Wintering;
- Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Wintering;
- Shelduck (*Tadorna tadorna*) [A048] Wintering;
- Wigeon (*Anas Penelope*) [A050] Wintering;
- Teal (*Anas crecca*) [A052] Wintering;
- Pintail (*Anas acuta*) [A054] Wintering;
- Shoveler (*Anas clypeata*) [A056] Wintering;
- Scaup (*Aythya marila*) [A062] Wintering;
- Ringed Plover (*Charadrius hiaticula*) [A137] Wintering;
- Golden Plover (*Pluvialis apricaria*) [A140] Wintering;
- Grey Plover (*Pluvialis squatarola*) [A141] Wintering;
- Lapwing (*Vanellus vanellus*) [A142] Wintering;
- Knot (*Calidris canutus*) [A143] Wintering;
- Dunlin (*Calidris alpine*) [A149] Wintering;
- Black-tailed Godwit (*Limosa limosa*) [A156] Wintering;
- Bar-tailed Godwit (*Limosa lapponica*) [A157] Wintering;
- Curlew (*Numenius arquata*) [A160] Wintering;
- Redshank (*Tringa tetanus*) [A162] Wintering;
- Greenshank (*Tringa nebularia*) [A164] Wintering;
- Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wintering; and,
- Wetlands [A999].

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8.3.2 Identification of Potentially Significant Impacts to Qualifying Features

Table 33, below, lists the qualifying features of the River Shannon and River Fergus Estuaries SPA and evaluates through a scientific examination of evidence and data whether these features should or should not be selected for further assessment in the NIS. When explaining the rationale behind each selection, results of the 2010/11 Waterbird Survey Programme are used and subsites are referenced – a map indicating the subsite locations is included in Figure 22, below, at the end of this section.

Table 33. Selection of qualifying features of the River Shannon and River Fergus Estuaries SPA (004077) for impact assessment

Qualifying Features	Potential for significant impacts	Rationale
Cormorant (*Phalacrocorax carbo*) [A017]	Yes	As outlined in Section 4.2.8.6, above, cormorant was seen on several occasions during the VP surveys and hinterland surveys, however, the species was not observed within the footprint of the proposed development site during any of the bird surveys carried out. A review of waterbird distribution for cormorant within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that subsite 0I439 at Foynes, approximately 6.5 km north of the proposed development site, recorded 'High' numbers of cormorant foraging sub-tidally during low tide surveys (see Figure 22, below, for subsite locations). The SPA also supports a nationally important breeding population of cormorant (93 pairs in 2010) (NPWS, 2012e). Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the cormorant population. There is also potential that once the turbines are built, they become a collision risk or possibly create a barrier to movement resulting in displacement of the species. Based on this and because of the information outlined in the previous paragraph, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Whooper Swan (*Cygnus cygnus*) [A038]	Yes	As outlined in Section 4.2.8.6, above, whooper swan was observed on one occasion during the 60 months of VP surveys. There were no other records of whooper swan reported during any of the other surveys described in Section 3.6.2, above. A review of waterbird distribution for whooper swan within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme (NPWS, 2012e), determined that subsite 0I439 at Foynes, approximately 6.5 km north of the proposed development site, was assessed as having 'High' numbers of whooper swan during low tide surveys across all behaviours and habitats (see Figure 22, below, for subsite locations). The SPA is designated for wintering whooper swan that forage on low-lying grasslands, estuaries (NPWS, 2012e) and improved pasture (Burke *et al*., 2021), and therefore, the improved agricultural grassland at the proposed development site may have some potential as foraging grounds for the species. Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the whooper swan population

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Qualifying Features	Potential for significant impacts	Rationale
		there. Additionally, there is potential that once the turbines are built, they become a collision risk or possibly create a barrier to movement resulting in species displacement. Based on this and on the information outlined in the previous paragraph, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]	No	The site is designated for wintering light-bellied brent goose. This species is amber-listed as the majority winter at less than ten sites and the Irish population is also internationally significant. It winters on coastal estuaries during the autumn and early winter as well as on grasslands from mid-winter before departing to breeding grounds in Canada in late April. Brent geese are grazers and are known for their preference for foraging in intertidal areas with the Eelgrass *Zostera* sp. (Robinson *et al*. 2004). Where this food source is absent the birds feed upon algae and saltmarsh plants and the species also grazes terrestrially. There were no records of light-bellied brent goose within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for light-bellied brent goose within the SPA carried out as part of the sub-site assessments for the 2010/11 Waterbird Survey Programme, determined that brent geese at the SPA had a relatively restricted distribution occurring in only seven sub-sites that were all located at the outer western section of the SPA and at least 30 km from the proposed development site (NPWS, 2012e). Based on this, this species is not considered to be within the zone of potential influence of the proposal and will not be considered further in the NIS.
Shelduck (*Tadorna tadorna*) [A048]	**Yes**	There were no records of shelduck within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for shelduck within the SPA as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that shelduck were recorded foraging and roosting intertidally at subsite 0I439 (see **Figure 22**, below, for subsite locations), approximately 6.5 km north of the proposed development site (NPWS, 2012e). Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the shelduck population there. Based on this and the precautionary principle, and because of the information outlined in the previous paragraph regarding shelduck distribution in the area, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.

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Qualifying Features	Potential for significant impacts	Rationale
Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052]	**Yes**	No wigeon were recorded during any of the ornithological surveys described in **Section 3.6.2**, above. As described in **Section 4.2.8.6**, above, during the hinterland surveys, two flocks of teal were observed at two ponds approximately 4 km east of the proposed development site (see **Figure 12**, above), however, no wigeon or teal were recorded within the footprint of the proposed development site during any of the bird surveys. A review of waterbird distribution for both species within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that they were relatively widespread over the SPA and were recorded foraging/roosting intertidally at subsite 0I439 and surrounding subsites (see **Figure 22**, below, for subsite locations), approximately 6.5 km north of the proposed development site (NPWS, 2012e). Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the wigeon and/or teal populations there. Based on this and the precautionary principle, and because of the information outlined in the previous paragraph regarding the distributions of wigeon and teal, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Pintail (*Anas acuta*) [A054]	No	Pintail is amber-listed due to a decline in its non-breeding (wintering) population. It is an extremely rare breeding species with records from the Midlands and north (Dempsey & O' Clery, 2002). Wintering takes places primarily within estuaries or coastal brackish lagoons. Pintail feed on a variety of plant and animal material obtained from shallow water although they can be observed foraging on land. No pintail were recorded during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for pintail within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme (NPWS, 2012e) determined that the species was recorded at two subsites only – 0H519 and 0K509 (see **Figure 22**, below, for subsite locations). Since both these sites are located at the western extreme of the SPA at least 30 km from the proposed development site and because there were no pintail observations made during the 60 months of ornithological surveys, this species is deemed to be outside the zone of potential influence of the proposal and will not be considered further in the NIS.
Shoveler (*Anas clypeata*) [A056]	**Yes**	Apart from two individuals observed in February 2023 at a pond approximately 4 km east of the proposed development site during hinterland surveys (see **Figure 12**, above), there were no shoveler recorded within or around the proposed development site during the ornithological surveys described in **Section 3.6.2**, above. However, a review of waterbird distribution for shoveler within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined there were several shoveler foraging within subsite 0I439 closest to the proposed development site (see **Figure 22**, below, for subsite locations), approximately 6.5 km north of the proposed development site (NPWS, 2012e). Additionally, an I-WeBS report by Fitzgerald *et al.* (2021) lists shoveler as a species occurring in numbers of national importance at the estuary based on counts from 2013/14 to 2017/18 (mean 2,311).

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Qualifying Features	Potential for significant impacts	Rationale
		Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the shoveler population there. Based on this and the precautionary principle, and the information outlined in the previous paragraph regarding shoveler distribution, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Scaup (*Aythya marila*) [A062]	No	Scaup are a winter visitor to Ireland, arriving from northern breeding sites between November and April to coastal areas, estuaries, brackish lagoons and freshwater lakes close to the coast. They forage in sub-tidal areas, diving to hunt for molluscs and crustaceans as well as feeding on marine plants in areas typically with a depth of less than 10 metres. Scaup is red-listed in Ireland for its small breeding population and its localised wintering range. There was no scaup recorded within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for scaup within the SPA carried out as part of the sub-site assessments for the 2010/11 Waterbird Survey Programme (NPWS, 2012e) determined that the species was recorded foraging at three subsites only - 0H519, 0H521 and 0H522 (see **Figure 22**, below, for subsite locations). Since all three sites are located at the western extreme of the SPA at least 20 km from the proposed development site and because no scaup were observed at the proposal site during the 60 months of bird surveys, this species is deemed to be outside the zone of potential influence of the proposal and will not be considered further in the NIS.
Ringed Plover (*Charadrius hiaticula*) [A137]	No	Ringed plovers are 'visual foragers' searching the sediment surface for signs of prey such as worms, crustaceans and insects. A substantial proportion of ringed plovers occur on non-estuarine coasts, exhibiting a degree of plasticity in habitat choice such as shingle shores, saltmarsh and short grassland as well as artificial habitats. Ringed plover is amber-listed as internationally important numbers overwinter in Ireland. They breed on shingle and sandy beaches (Dempsey & O'Clery, 2002) and on rough ground near the coast. There was no ringed plover recorded within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for ringed plover within the SPA carried out as part of the sub-site assessments for the 2010/11 Waterbird Survey Programme (NPWS, 2012e) determined that the species was found predominantly in areas towards the mouth of the estuary on intertidal mudflats and none were found at subsite 0I439 closest to the proposed development site. There were several roosting individuals counted within subsite 0I438 located nearly 9 km north of the proposed development site but the number of ringed plover at this subsite was categorised as 'Low' across all behaviours and habitats for low tide surveys (see **Figure 22**, below, for subsite locations). Since there were no ringed plover observed within or around the proposed development site during the 60 months of ornithological surveys and because none were recorded at the subsite nearest the proposal site during the 2010/11 Waterbird

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Qualifying Features	Potential for significant impacts	Rationale
		Survey Programme, namely subsite 0I439, ringed plover is deemed to be outside the zone of potential influence of the proposal and will not be considered further in the NIS.
Golden Plover (*Pluvialis apricaria*) [A140]	**Yes**	As described in **Section 4.2.8.6**, above, two flocks of golden plover were observed in flight during the winter 2023/24 VP surveys, while during the March 2023 transect surveys, a flock of 12 was observed flying west away from the proposed development site. A review of waterbird distribution for golden plover within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that the species are relatively widespread throughout the SPA. Subsite 0I439, located approximately 6.5 km north of the proposed development site, was one of twelve subsites where golden plover regularly occurred (see **Figure 22**, below, for subsite locations) (NPWS, 2012e). Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the golden plover population there. Based on this and the precautionary principle, and because of the information outlined in the previous paragraph regarding golden plover distribution in the area, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Grey Plover (*Pluvialis squatarola*) [A141]	No	Grey plover is a red-listed species in Ireland as the majority spend winter at less than ten sites. The SPA is designated for wintering grey plover. They feed on various marine molluscs, crustaceans and worms, foraging on intertidal mudflats within the estuary and on beaches. There were no records of grey plover within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for the species within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme (NPWS, 2012e) determined that there grey plover were recorded at only two subsites - 0I429 and 0I430 - both located more than 18 km northeast of the proposed development site (see **Figure 22**, below, for subsite locations). Given the intervening distance between the proposed development site and these two subsites and since there were no grey plover observed within or around the proposed development site during the 60 months of ornithological surveys, this species is deemed to be outside the zone of potential influence of the proposal and will not be considered further in the NIS.
Lapwing (*Vanellus vanellus*) [A142]	**Yes**	As described in **Section 4.2.8.6**, above, two lapwing flights (comprising two birds and twelve birds, respectively) were recorded at the proposed development site during the winter 2024/25 VP surveys. There were no other lapwing recorded within or around the proposed development site during the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for lapwing within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that the species are widespread throughout the SPA and were recorded in relatively high numbers at subsite 0I439, approximately 6.5 km north of the proposed development site (see **Figure 22**, below, for subsite locations) (NPWS, 2012e).

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Qualifying Features	Potential for significant impacts	Rationale
		Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the lapwing population there. Based on this and the precautionary principle, and because of the information outlined in the previous paragraph regarding lapwing distribution in the area, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Knot (*Calidris canutus*) [A143]	No	Knot are a winter visitor to Ireland, arriving from northern Greenland and Arctic Canada between October and February to coastal areas and estuarine sites with extensive muddy sand. They are specialist intertidal foragers and use sensors on their bill to detect buried prey. Preferred prey includes different species of bivalve molluscs and crustaceans. Knot is red-listed in Ireland due to falling numbers and its relatively localised wintering range. Knot was not recorded within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for SCI species within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme found knot to have a relatively restricted foraging/roosting distribution within the site and were not recorded at any subsites nearest the proposed development site (see **Figure 22**, below, for subsite locations) (NPWS, 2012e). Based on these reasons, this species is not considered to be within the zone of potential influence of the proposal and will not be considered further in the NIS.
Dunlin (*Calidris alpina*) [A149]	**Yes**	Dunlin were not recorded within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for dunlin within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that the species are widespread within the SPA. They were recorded foraging and roosting intertidally at subsite 0I439 and adjacent subsites (see **Figure 22**, below, for subsite locations), approximately 6.5 km north of the proposed development site (NPWS, 2012e). Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the dunlin population there. Based on this, and because of the information outlined in the previous paragraph regarding dunlin distribution in the area, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Black-tailed Godwit (*Limosa limosa*) [A156]	No	There were no black-tailed godwit recorded within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for black-tailed godwit within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that black-tailed godwit activity was predominantly concentrated in an area between the Deel and Maigue Estuaries (see **Figure 22**, below) within eastern reaches of the Shannon Estuary and up-stream of the proposed development (NPWS, 2012e).

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Qualifying Features	Potential for significant impacts	Rationale
		Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the black-tailed godwit population there. Based on this and the precautionary principle, and because of the information outlined in the previous paragraph regarding black-tailed godwit distribution in the area, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Bar-tailed Godwit (*Limosa lapponica*) [A157]	No	Bar-tailed godwit forage by probing intertidal sediment for invertebrate species at the tide's edge with their heads in water, feeding predominantly on large polychaete worms such as *Arenicola marina* and *Nepthys* species. The species is characteristic of sites with sandy substrates (Hill *et al*., 1993) or sections of a site with sandy (as opposed to muddy) sediment. The dominant intertidal benthic community type across the site is 'intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans' (NPWS, 2012e). This broad community has a wide variability in sediment type from gravel to fine sand to muds. Of note are high abundances of *Nephtys hombergii* occurring from lower Fergus Estuary westwards, this polychaete is a known prey species of bar-tailed godwit. The bar-tailed godwit is amber-listed in Ireland as the majority winter at less than ten sites. There were no bar-tailed godwit recorded within or around the proposed development site during any of the ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for SCI species within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme found bar-tailed godwits to have a relatively restricted distribution within the site and were not recorded in any significant numbers in any of the subsites nearest the proposal site (see **Figure 22**, below, for subsite locations) (NPWS, 2012e). Based on this and the results of the bird surveys, the species is deemed to be outside the zone of potential influence of the proposal and will not be considered further in the NIS.
Curlew (*Numenius arquata*) [A160]	**Yes**	As described in **Section 4.2.8.6**, above, two individual curlew flights were recorded during VP surveys in July 2021 and February 2024. During the wildfowl distribution surveys undertaken in 2022/ 2023 non-breeding season at Lough Doohyle, approximately 6.4 km east of the proposed development, a flock of 17 curlew were recorded in December 2022. There were no other records of curlew reported during any of the other ornithological surveys described in **Section 3.6.2**, above. A review of waterbird distribution for curlew within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that the species is widespread throughout the SPA. They were recorded foraging and roosting intertidally at subsite 0I439 (see **Figure 22**, below, for subsite locations), approximately 6.5km north of the proposed development site (NPWS, 2012e). Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the curlew population there. Based on this, and because of the information outlined in the previous paragraph regarding curlew distribution in the area, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.

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Qualifying Features	Potential for significant impacts	Rationale
Redshank (*Tringa totanus*) [A162] Greenshank (*Tringa nebularia*) [A164]	**No**	No redshank or greenshank were observed during any of the ornithological surveys. A review of waterbird distribution for redshank and greenshank within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that both species are widespread throughout the SPA. They were both recorded foraging and roosting intertidally at the subsite closest to the proposed development site, 0I439, (see **Figure 22**, below, for subsite locations), approximately 6.5km to the north (NPWS, 2012e). Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the water quality of the SPA and thus, potentially to the habitat, distribution and feeding opportunities of the redshank and greenshank populations there. Based on this, and because of the information outlined in the previous paragraph regarding redshank and greenshank distribution in the area, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Black-headed Gull (*Chroicocephalus ridibundus*) [A179]	**Yes**	As set out in **Section 4.2.8.6**, above, black-headed gull was frequently observed flying over the proposed development site and surrounding areas during VP surveys, often in large flocks and on several occasions feeding in agricultural fields. Black-headed gull was also frequently recorded during hinterland surveys (see **Figure 12**, above). A review of waterbird distribution for SCI species within the SPA carried out as part of the subsite assessments for the 2010/11 Waterbird Survey Programme determined that foraging and roosting black-headed gull had a relatively widespread distribution throughout the estuary. At the subsite 0I439, located approximately 6.5 km north of the proposed development site, foraging black-headed gulls were recorded during all four low tide surveys. Significant numbers of roosting birds were also counted at subsite 0I439 in November 2010 (see **Figure 22**, below, for subsite locations) (NPWS, 2012e). Since the proposed development site is hydrologically linked to the SPA, there is potential for significant impacts to the SPA's water quality and thus, potentially to the habitat, distribution and feeding opportunities of the black-headed gull population. There is also potential that once the turbines are built, they become a collision risk or possibly create a barrier to movement resulting in species displacement. Based on this and because of the information outlined in the previous paragraphs, the species is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.
Wetlands [A999]	**Yes**	There is a hydrological connection between the SPA and the proposal site via the various watercourses that drain the site and ultimately merge with the River Shannon and the SPA, located approximately 7.3 river km downstream from the proposed Option A grid route crossing of the Knockardnacorlan River, or 8.7 river km downstream from where the proposed new bridge will be constructed across the Ahacronane River. Based on this and the precautionary principle, the habitat 'Wetlands' is deemed to be within the zone of potential influence of the proposal and will be considered further in the NIS.

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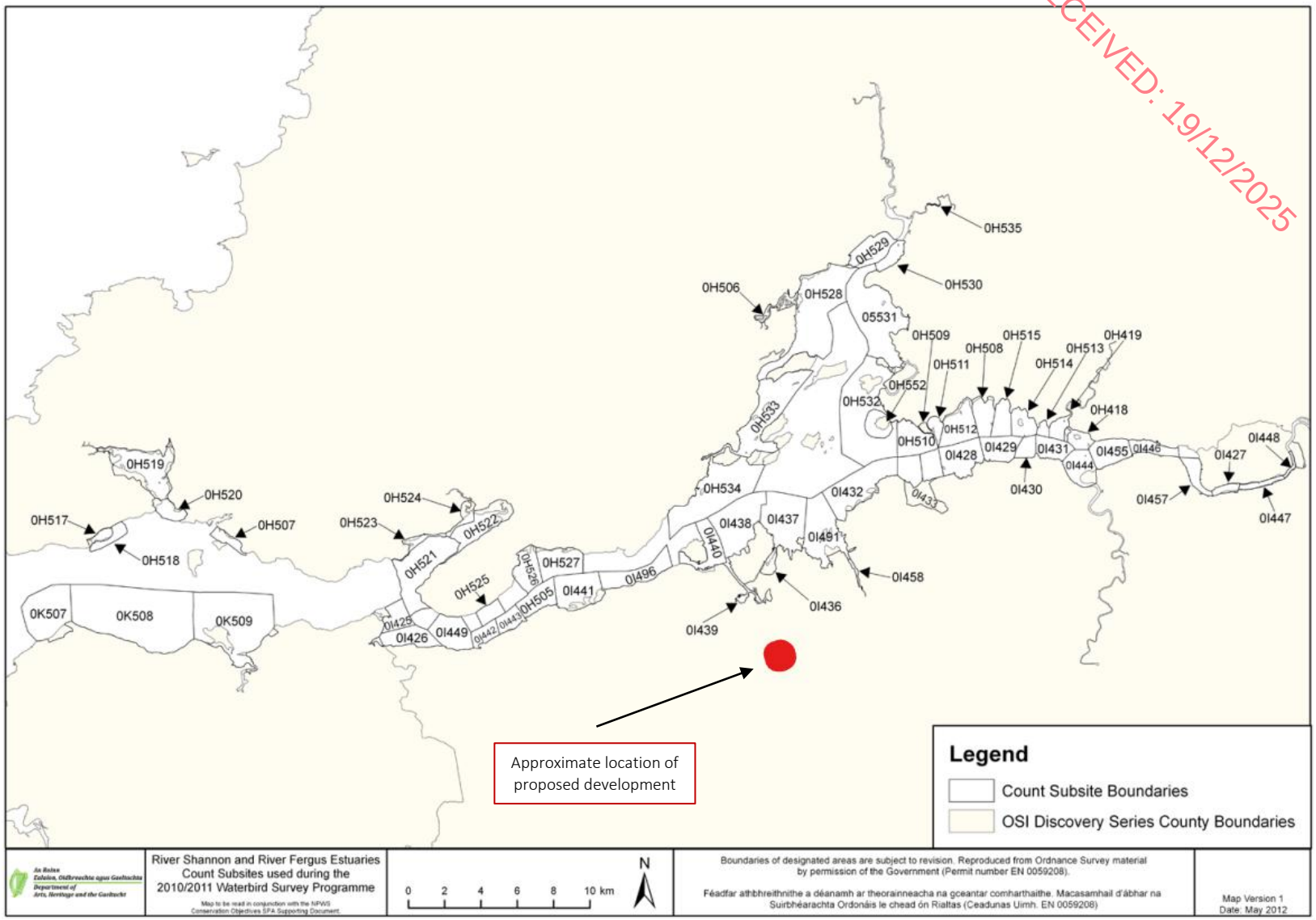

Figure 22: Locations of subsites used in 2010/11 Waterbird Survey Programme within River Shannon and River Fergus Estuaries SPA [adapted from NPWS, 2012e]

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It has been determined in **Table 33**, above, that without appropriate mitigation measures, the proposed development has the potential, or potential cannot be ruled out at this stage, to result in significant effects to the conservation objectives of the following Special Conservation Interest (SCI) bird species and wetland habitat of the River Shannon and River Fergus Estuaries SPA:

- Cormorant (*Phalacrocorax carbo*) [A017];
- Whooper Swan (*Cygnus cygnus*) [A038];
- Shelduck (*Tadorna tadorna*) [A048];
- Wigeon (*Anas penelope*) [A050];
- Teal (*Anas crecca*) [A052];
- Shoveler (*Anas clypeata*) [A056];
- Golden Plover (*Pluvialis apricaria*) [A140];
- Lapwing (*Vanellus vanellus*) [A142];
- Dunlin (*Calidris alpina*) [A149];
- Curlew (*Numenius arquata*) [A160];
- Redshank (*Tringa totanus*) [A162];
- Black-headed Gull (*Chroicocephalus ridibundus*) [A179];
- Wetlands [A999].

8.4 Assessment of Potentially Significant Effects

There follows an evaluation of potentially significant effects which may arise because of the proposed development on the qualifying features that have been selected for impact assessment in **Sections 8.1.2**, **8.2.2**, and **8.3.2**, above, together with the potential effects identified in **Section 7**, above. Following this, a determination is made as to whether the proposal is likely to have adverse effects on the integrity of the European sites selected for assessment.

The likelihood of adverse effects to a European site from the proposed development has been determined based on the following indicators:

- Water quality;
- Habitat loss or alteration;
- Disturbance and/or displacement of species; and
- Habitat or species fragmentation.

The likelihood of significant cumulative/in-combination effects is assessed in **Section 8.8**, below.

8.4.1 Water Quality

8.4.1.1 Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA

As discussed in **Section 4.2.2** and illustrated in **Figure 10**, above, there are several watercourses draining the proposed development site and the surrounding area that ultimately drain into two European sites downstream

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– the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA, both located approximately 7.3 river kilometres downstream from the proposed Option A grid route crossing of the Knockardnacorlan River (WC3), and approximately 8.7 river kilometres downstream from where the proposed new bridge will be constructed across the Ahacronane River (WC1). The existing drainage network within the development site, together with the network of drains in the surrounding area, create the potential for a hydrological link between the proposed wind farm site and the SAC and/or the SPA downstream.

During a wind farm's construction phase, and in the absence of any pollution prevention controls, earthworks have the potential to adversely impact water quality due to soil erosion. The subsequent suspension of soil sediment particles in site run-off and overland flow can eventually reach the natural watercourses draining the site. Nutrients such as phosphorous can be bound to soil from past fertilisation of grassland crops and can become transported in overland flow. Potential also exists for accidental ingress of fuel and oils, concrete and cementitious material and other such substances considered harmful to the aquatic environment that could enter the streams draining the proposed development site - including the Ahacronane River, the Creeves Stream, the Knockardnacorlan River, and the Lissatotan Stream - via run-off, overland flow or the existing drainage network and tributary streams.

Water quality is a key environmental factor underpinning the conservation condition of the complex of wetland habitats and species that the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA are both selected for. Several watercourses drain the study area and their proximity to the proposed development site boundary provides a hydrological pathway between the proposed development site and the two European sites located downstream. Given the pollution risk associated with the construction phase of the works and the identified hydrological pathways, it is considered that without appropriate mitigation measures, there is potential for some localised reduction in water quality of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.

Potential sedimentation, nutrient-enrichment, or other aquatic pollution, which could arise in the absence of effective water quality protection measures, would impact on freshwater ecology of watercourses within the vicinity of the works. There is also potential for significant water quality impacts within the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA in the absence of appropriate mitigation measures as these sites include waterbodies that are downstream receptors with respect to the streams draining the site. Based on the characteristics and scale of the proposed development, no significant impacts to water quality are foreseen during the operational phase; however, based on the precautionary principle, mitigation measures will be implemented.

In conclusion, there is a risk that without a programme of mitigation measures, the proposed development may potentially result in adverse water quality impacts within the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA during construction, with the potential for operational impacts also possible, though highly unlikely. Adverse water quality impacts, should they arise, could then exert indirect impacts on aquatic/water-dependant habitats and species protected within the SAC and SPA, which could adversely affect the integrity of these sites.

Section 9, below, outlines a programme of mitigation measures designed to control and eliminate the point and diffuse pollution sources identified and to ameliorate the potential adverse water quality impacts that might ensue because of the proposed development. Mitigation measures for the decommissioning phase will be similar to those of the construction phase but will be of a considerably lesser scale since excavations will not be required. Residual impacts are assessed in Section 11, below.

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8.4.2 Habitat Loss/Alteration

8.4.2.1 Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA

There is no spatial overlap between the proposed development and the SPA so there will be no direct loss/alteration of hen harrier habitat from within the SPA. The proposed development site contains large areas of agricultural grassland that are of little ecological value to hen harrier, but the relatively numerous hedgerows and other linear features within the site may have some potential to be utilised by hen harrier as foraging habitat (Irwin *et al.*, 2012). Furthermore, the entire proposed wind farm site is located within ten kilometres of the SPA which is the expected maximum foraging range of hen harrier during the breeding season SNH (2016).

However, as discussed in **Section 4.2.8.6**, above, hen harrier was recorded only once during the Vantage Point (VP) surveys carried out on-site over ten seasons from April 2020 to March 2025, inclusive, when an adult was observed flying in a northwestwards direction over a field to the north of T1 outside the proposed development boundary. Additionally, during dedicated hen harrier surveys, activity was recorded over spruce plantation and areas of Carrigkerry Bog located between five and seven kilometres southwest of the proposed development site boundary at T3. Indeed, when Irwin *et al.* (2012) analysed the foraging and nesting behaviour of hen harrier in Ireland, it was found that the species actively avoided improved agricultural grassland in favour of more forested areas or less intensively managed land.

Therefore, in the context of the greater landscape and more suitable areas within the SPA west of the proposed development site, this minimal loss of potential hen harrier foraging habitat compared to the available optimal habitats in the wider hinterland to facilitate construction and operation of the wind farm is not considered to have the potential to significantly affect the conservation objectives of the SPA.

8.4.2.2 Lower River Shannon SAC

There is no spatial overlap between the proposed development and the SAC so there will be no direct habitat loss/alteration from within the SAC. However, as already stated in **Section 8.4.1**, above, without mitigation measures there is potential for significant water quality effects to the SAC during the construction phase of the proposed development via the hydrological links provided by watercourses draining the area. This creates potential for significant indirect alteration/loss of the aquatic habitats within the SAC in the absence of mitigation.

Contaminated water entering the SAC creates potential for habitat alteration (or indirect habitat loss) of riverbeds downstream due to sediments suspended in overland flows that may clog up gravels suitable for spawning salmon or lamprey because of the unmitigated proposal. Otter habitat may be indirectly affected by a reduction in water quality which can significantly alter the suitability of a site for otters and their requirements. Furthermore, the construction works may temporarily displace commuting or foraging otters. However, this impact is deemed to be limited given the localised and temporary nature of the works and the wide availability of similar suitable habitat in the vicinity of the works and the fact that the site is of relatively little ecological value to otter.

Six habitats within the SAC - 'Estuaries', 'Mudflats and sandflats not covered by seawater at low tide', 'Reefs', 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)', 'Mediterranean salt meadows (*Juncetalia maritimi*)' and 'Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' - also have the potential to be indirectly affected by a decrease in water quality. The habitats of the subtidal and intertidal animal communities living within the different regions of sediment, silt, mud and rock of estuaries, mudflats and reefs have the potential to be altered or lost should there be a reduction in the quality of water. Similarly, the halophytic vegetation of the soft intertidal salt marshes also has the potential to be detrimentally affected by any reduction in the water quality of the SAC.

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In conclusion, there is a risk that without a programme of mitigation measures, the proposed development may potentially result in indirect alteration of the habitats Estuaries [1130]', 'Mudflats and sandflats not covered by seawater at low tide [1140]', 'Reefs [1170]', 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]', 'Mediterranean salt meadows (*Juncetalia maritimi*) [1410]', and 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]' within the Lower River Shannon SAC during construction, with the potential for operational impacts also possible, though highly unlikely. This could adversely affect the integrity of the Lower River Shannon SAC, and thus mitigation measures in relation to protection of water quality are discussed in **Section 9**, below.

8.4.2.3 River Shannon and River Fergus Estuaries SPA

There is no spatial overlap between the proposed development and the SPA so there will be no direct habitat loss/alteration within the SPA. The proposal site contains large areas of agricultural grassland and smaller areas of wet grassland and scrub (see **Section 4.2.3**, above, and Habitat Map in **Appendix 2** of this report) which may have potential to be utilised as foraging habitat by SCI bird species such as curlew, lapwing or black-headed gull.

The following nine SCI bird species for which the SPA is designated were observed within five kilometres of the proposed development site during the suite of ornithological surveys carried out at the site over ten seasons from April 2020 to March 2025, inclusive, (see **Section 3.6.2**, above, for survey details and **Section 4.2.8**, above, for survey results summaries):

- Black-headed Gull (*Chroicocephalus ridibundus*);
- Cormorant (*Phalacrocorax carbo*);
- Curlew (*Numenius arquata*);
- Golden Plover (*Pluvialis apricaria*);
- Lapwing (*Vanellus Vanellus*);
- Shoveler (*Anas clypeata*);
- Teal (*Anas crecca*); and
- Whooper Swan (*Cygnus cygnus*).

None of the SPA's designated SCI bird species listed in **Table 33**, above, were observed on the ground within the footprint of the proposed development and any species' flights that traversed the airspace of the site were completed without the birds grounding. Furthermore, apart from black-headed gull, each species was usually recorded only once or twice in-flight per season and, in the case of teal and shoveler, at a distance of at least four kilometres from the proposed development site. The VP observations of cormorant, curlew, lapwing, and whooper swan all consisted of flights where the bird(s) flew over agricultural fields located outside the proposed development site boundary and continued their flight path without landing.

As outlined in **Section 4.2.8.6**, above, only two flocks of golden plover – 36 birds in December 2023, and 24 birds in January 2024 – were observed flying through the proposed wind farm site during the 60 months of VP surveys carried out at the site. It is acknowledged that golden plover feed primarily within agricultural grassland and arable land during the winter months, however, neither of the observed flocks, nor any individual golden plover from within those flocks, landed within the proposed development site or within the surrounding area. Additionally, there were no other sightings of golden plover reported during the entire 60-month suite of ornithological surveys.

For these reasons and given the intervening distance of six kilometres between the proposed development site and the closest point of the SPA and because of the many other foraging/roosting areas of equal or greater

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suitability provided within the surrounding landscape, the habitat at the proposed Ballynisky Wind Farm site is not considered to be of significant value to the SPA's populations of cormorant, curlew, golden plover, lapwing, shoveler, teal and whooper swan.

Black-headed Gull

During the December 2020 VP surveys, several groups of black-headed gull were observed feeding in agricultural fields to the south and southeast of VP2 along the Lissatotan Road approximately 400 metres northwest of VP2 – refer to **Figure 23**, below. The flocks ranged in size from 4 to 120 individuals and moved back and forth between the fields feeding and foraging among cattle but without ever entering the footprint of the proposed development site. There were two additional VP survey records of black-headed gull feeding on the ground occurring on 23rd October 2022 and 24th November 2022 involving flocks of 55 gulls and 25 gulls, respectively, in grassland to the east of the site outside the footprint of the proposed development - refer to **Figure 23**, below. Black-headed gull was not recorded on the ground during any other VP survey over the 60-month survey period from October 2020 to March 2025, inclusive.

The black-headed gull diet consists mainly of animal matter such as insects, earthworms, and crustaceans but can also include plant material such as fruit and berries where available, and although they feed by direct predation, they can also be rapacious and opportunistic scavengers. Accordingly, individuals can be found foraging on freshwaters, marine, estuaries and terrestrial areas including farmland (Crowe, 2005) where they are attracted to muddy fields (Vernon, 1970) and will often follow a plough as the mud is churned.

The agricultural fields adjacent to the proposed development site, particularly around VP2, are evidently suitable foraging grounds for black-headed gull and are utilised as such. However, since no grounded black-headed gull was observed anywhere within the actual footprint of the proposed development and given the intervening distance of at least six kilometres between the proposed wind farm site and the closest point of the SPA, it is deemed unlikely that the agricultural fields at the proposed development site are of a significant value as feeding grounds to the black-headed gull population of the SPA.

In conclusion, while there will be some loss and/or alteration of feeding habitat potentially suitable for the black-headed gull population of the River Shannon and River Fergus Estuaries SPA, in the context of other large suitable agricultural fields within the surrounding landscape, the nearby estuarine and coastal locations, together with more urban areas where scavenging opportunities are plentiful, the loss and/or alteration of habitat to facilitate construction and operation of the proposed Ballynisky Wind Farm is not considered to have the potential to significantly affect the conservation objectives for the black-headed gull population of the SPA.

Figure 23: Three agricultural field locations where black-headed gull were observed feeding on the ground during Vantage Point (VP) surveys.

Wetlands

As discussed in **Section 8.4.1.1**, above, during the construction phase of the proposed development, there is the potential for the water quality within the River Shannon and River Fergus Estuaries SPA to be indirectly affected via contamination of the watercourses draining the proposed development site which then ultimately drain into the SPA downstream. This creates potential for significant indirect alteration of the wetland habitat for which the SPA is designated. This wetland habitat is a critical resource for the regularly occurring migratory waterbirds that use it and of particular importance to many of the SPA's designated SCI bird species listed in **Table 33**, above.

To conclude, there is potential for the loss/alteration of the 'Wetlands' [A999] habitat for which the River Shannon and River Fergus Estuaries is designated during the construction phase via a reduction in water quality which in turn can then adversely affect the SCI species of the SPA as listed in **Table 33**, above. The risk of occurrence however can be adequately prevented by the implementation of standard best management practices and controls. Therefore, certain mitigation measures will be implemented with regards to protection of water quality. **Section 9**, below, outlines a programme of mitigation measures designed to ameliorate potential adverse water quality impacts from the proposed development and the indirect habitat impacts that might ensue.

8.4.3 Disturbance and/or Displacement of Species

8.4.3.1 Lower River Shannon SAC

The Lower River Shannon SAC is designated for the protection of several aquatic species, and the semi-aquatic species, otter. **Table 34**, below, outlines the SAC's QI species which have been selected for impact assessment.

Table 34. Qualifying Interest (QI) species for the Lower River Shannon SAC selected for impact assessment.

Qualifying Interest (QI) Species	Distribution within the SAC
Sea lamprey (*Petromyzon marinus*) [1095]	Freshwater aquatic
Brook lamprey (*Lampetra planeri*) [1096]	Freshwater aquatic
River lamprey (*Lampetra fluviatilis*) [1099]	Freshwater aquatic
Atlantic salmon (*Salmo salar*) [1106]	Freshwater aquatic
Otter (*Lutra lutra*) [1355]	Freshwater/coastal/terrestrial [semi aquatic]

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There is potential for indirect disturbance or displacement of salmon and lamprey arising from potential pollutants entering watercourses during the construction phase of the proposed development. Spawning salmon and lamprey, in this case confined to brook lamprey, require a clean, well-aerated riverbed substrate to survive. Siltation of the substrate and eutrophication leading to increased biomass of filamentous algae could reduce the availability of suitable habitat. A reduction of water quality within the water column can reduce the suitability of the river for adult salmon and lamprey resulting in disturbance/displacement of the species. There is potential for significant indirect effects to salmon and lamprey due to a reduction in water quality.

Regarding otter and the potential for disturbance or displacement impacts because of noise and/or human activity associated with construction of the development, it is noted that the drains in the vicinity of the proposed development site are considered to comprise marginal/sub-optimal foraging habitat for otter. No evidence of otter was recorded during the ecological site surveys. Although there is some potential for otter to occur, any disturbance or displacement impacts that arise due to fugitive noise from machinery and/or human activity during site preparation and construction will be temporary and will be restricted to the immediate vicinity of the proposed development site. Furthermore, otter is unlikely to use the 1st Order and 2nd Order watercourses within the surrounding area given the small size and relatively low biomass of suitable prey species within the watercourses. However, larger watercourses downstream from the proposed development site can provide otter with a potential food source due to the wide variety of aquatic species present as described in Section 4.2.7, above. Therefore, while the proposed development is unlikely to result in any direct displacement of otter, there is potential for indirect displacement of the species through a reduction in water quality and suitability of the main channel for aquatic fauna and, consequently, reducing the available prey biomass for otter.

It has been determined in Section 8.4.1, above, that there is a risk, without a programme of mitigation measures to control any potential emissions from site preparation works and construction activity, that the point/diffuse sources of pollution that could ensue from the proposed development may exert an impact on water quality. Section 9, below, outlines a programme of mitigation measures designed to ameliorate potential adverse water quality impacts and thus indirect disturbance or displacement of aquatic species that might ensue because of the proposed development. Residual impacts are assessed in Section 11, below.

8.4.3.2 River Shannon and River Fergus Estuaries SPA, and Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA

Wind farms have the potential to adversely affect SCI bird species in the three main following ways (SNH, 2017; Drewitt & Langston 2006, 2008; Band *et al*., 2007; Desholm, 2006):

- Direct habitat loss through construction of wind farm infrastructure.
- Indirect effects such as displacement (sometimes called indirect habitat loss) if birds avoid the wind farm and its surrounding area due to turbine construction and operation. Displacement due to disturbance during the construction and operational phase may occur. Displacement may also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds.
- Direct effect of mortality caused by collisions with turbine blades and other infrastructure.

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8.4.3.2.1 *Direct Habitat Loss*

There will be no direct loss of habitat within either SPA because of the proposed development. Furthermore, as has been discussed in Sections 8.4.2.1 and 8.4.2.3, above, it is considered that any loss of habitats from within the footprint of the proposed turbine area will not significantly affect the conservation objectives for the SCI bird species of either SPA when other habitats of greater suitability are located within the surrounding areas are considered.

8.4.3.2.2 *Displacement Effects (Indirect Habitat Loss)*

There is potential for disturbance and displacement effects due to fugitive noise emissions generated during the construction phase of the proposal. It is considered that groundworks to prepare the wind farm site prior to installation of turbines and associated infrastructure will comprise the main activities with the potential to generate noise emissions greatly over and above ambient noise levels. However, such activities will be restricted to within the main footprint of the wind farm.

Similarly, in terms of visual intrusion, the proposed development's human resource requirement of work crews and other personnel will be located within the main wind farm site for the duration of the works. Similarly, installation of the proposed Option A grid connection cable is not expected to create excessive noise levels over and above existing background levels by virtue of the installation methodology and because the route will mainly follow a public road before connecting with Carrons substation, itself located in a modified and disturbed area within Carrons Wind Farm.

It has already been noted in Section 8.4.1, above, that adverse water quality effects have the potential to arise during the construction phase of the proposed development due to run-off from materials or through the accidental release of pollutants such as fuels, oils, silt, chemicals or hydrocarbons associated with construction activities. Siltation of the substrate and eutrophication leading to increased biomass of filamentous algae would reduce the available suitable habitat.

Since Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA is located up-gradient of the proposed development site, there is no potential pollution pathway that could result in a deterioration of water quality within the SPA. However, the River Shannon and River Fergus Estuaries SPA is hydrologically connected to the proposed development site via three watercourse crossings (WC) as illustrated in Figure 10, above, the closest of which is WC3 located approximately 7.4 river kilometres upstream from the SPA. Therefore, without mitigation, poor water quality brought about by the proposed works has the potential to significantly impact the River Shannon and River Fergus Estuaries SPA and the SCI bird species for which it is designated.

8.4.3.2.2.1 Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA

As the proposed development site is located less than ten kilometres from the SPA, it is within the expected maximum foraging range for hen harrier during the breeding season (SNH, 2016). This creates the potential for indirect displacement effects on the SPA's hen harrier population should they use habitats outside the SPA boundary. However, VP surveys carried out over 60 months at the proposed wind farm site recorded hen harrier on only one occasion when an individual was observed flying from southeast to northwest outside the proposed development site's northern border in March 2023 from VP1 (see Figure 24, below, and Section 4.2.8.6, above).

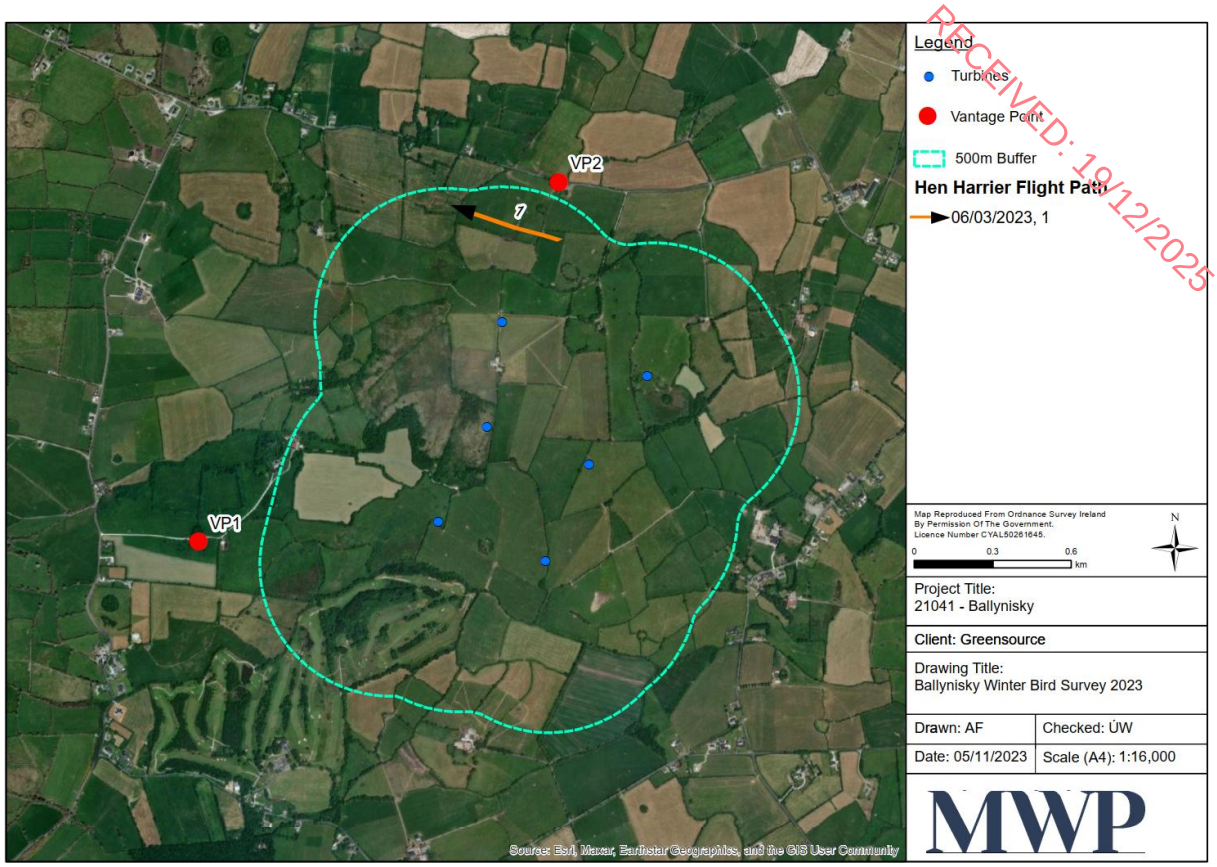

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Figure 24: Sole hen harrier flight recorded over 60-month VP survey period at the proposed development site (flight recorded on 6th March 2023 from VP2).

Furthermore, as has been discussed in Section 8.4.2.1, above, hen harrier is deemed unlikely to occur within the proposed wind farm site due to the presence of large areas of intensively managed agricultural grassland generally considered unsuitable for use as hen harrier roosting or foraging habitat. For this reason and because of the lack of hen harrier activity recorded at the site during the 60-month survey period from October 2020 to March 2025, inclusive, it is considered that the wind farm construction will not significantly disturb or displace the hen harrier population for which the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA is designated and will not significantly affect the conservation objectives of the SPA.

8.4.3.2.2.2 River Shannon and River Fergus Estuaries SPA

While the SPA is at least six kilometres north of the proposed wind farm site, there is potential for indirect displacement effects on the SCI species that may use habitats outside the SPA boundary. However, monthly VP surveys carried out over 60 months at the proposed wind farm site did not record any of the SPA's designated SCI species foraging or roosting within the footprint of the proposed development.

Furthermore, most of the SPA's SCI species prefer large bodies of water such as the extensive estuarine regions of the Shannon, Fergus and Maigue Rivers located further west towards the Atlantic. The terrestrial habitats available at the development site are not similar or ecologically analogous to the habitats preferred by almost all these species and therefore, the site does not have the ecological resources required to attract nor support these SCI species. While most of the species are generalists that can exploit alternative habitats, all are expected to, and based on the survey data appear to, preferentially select the range of coastal and estuarine habitats of higher ecological value abundantly available within the SPA site.

Some areas of agricultural grassland and wet grassland within the proposed development site have potential to be utilised as foraging habitat by SCI bird species such as curlew, lapwing or black-headed gull. Indeed, several

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flocks of black-headed gull were observed foraging within agricultural fields at VP2 in December 2020, and in fields east of the site in October and November 2022 (see **Figure 23**, above). However, as outlined in **Section 8.4.2.3**, above, the fields at the proposed development site are unlikely to be feeding grounds of significant value to the SCI bird species populations of the SPA due to the intervening distance of at least six kilometres between the SPA and the proposed development site, and because of the many other large foraging areas of equal or greater suitability provided within the surrounding landscape.

There is potential for disturbance and displacement effects due to fugitive noise emissions generated during the construction phase of the proposal. It is considered that groundworks to prepare the wind farm site prior to installation of turbines and associated infrastructure will comprise the main activities with the potential to generate noise emissions greatly over and above ambient noise levels. However, such activities will be restricted to within the main footprint of the wind farm and at least 6 kilometres from the SPA. Similarly, in terms of visual intrusion, the proposed development's human resource requirement of work crews and other personnel will be located within the main wind farm site for the duration of the works.

It has already been noted in **Section 8.4.1.1**, above, that adverse water quality effects have the potential to arise during the construction phase of the proposed development due to run-off from materials or through the accidental release of pollutants such as fuels, oils, silt, chemicals or hydrocarbons associated with construction activities. Siltation of the substrate and eutrophication leading to increased biomass of filamentous algae would reduce the available suitable habitat. Therefore, without mitigation, poor water quality brought about by the proposed works has the potential to significantly impact the River Shannon and River Fergus Estuaries SPA and the SCI bird species for which it is designated.

8.4.3.2.3 *Collision Risk*

Wind farms create the potential for direct effects on avian species via mortality or injury through collision of the birds with wind turbine structures and the rotating blades. The risk of collision is dependent on a wide range of factors including bird species, number of birds, weather conditions, topography and the character of the wind farm itself (Drewitt & Langston, 2006), and collision rates can vary greatly between different wind farms. Raptors have been reported as being more susceptible to turbine collision than many other species due to their morphology and flight behaviour (Gove *et al.*, 2013) while, conversely, the risk of collision for waders is generally considered to be low 'due to a relatively low cursory flight path, coupled with high flight manoeuvrability' (McGuinness *et al.*, 2015).

8.4.3.2.3.1 Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA

During the VP surveys at the proposed development site, only one hen harrier flight was recorded involving a single bird travelling westwards over agricultural grassland approximately 300 metres north of T1 in March 2023 (see **Figure 24**, above). Apart from the dedicated hen harrier roost surveys conducted at Carrigkerry Bog more than five kilometres southwest of T3 (see **Section 4.2.8.2**, above), there were no other sightings of hen harrier within or around the proposed development site during any other ornithological survey carried out over the 60-month survey period.

Hen harrier are generally deemed to be less vulnerable to collision with wind turbines than other raptor species mainly due to the species' foraging technique whereby they hunt for prey close to the ground at low heights within ground vegetation (Whitfield & Madders, 2006; Haworth & Fielding, 2014; Gove *et al.*, 2013; Wilson *et al.*, 2015). The main turbine collision risk for hen harrier usually occurs during aerial display flights or 'sky dancing', an activity that occurs within 500 metres of the nest but can also occur up to a maximum of one kilometre from the nest site (Bright *et al.*, 2009). However, sky dancing or display flights are highly unlikely to occur at the proposed development site since the optimal hen harrier nesting habitats (and aerial display habitat) are open moorland and young forestry plantations, both of which are absent from within and around the proposed

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development site. Additionally, a collision risk modelling assessment (see **Appendix 7-B** of **Volume III** of the EIAR) was carried out for several target species using flight data collected during the VP surveys. However, since there was only one hen harrier flight recorded over the entire 60-month VP survey period, there was insufficient data to complete a collision risk model for hen harrier.

Bearing in mind the information in the preceding paragraphs, coupled with the paucity of hen harrier activity recorded at the proposed development site indicates that the site does not constitute an important ecological resource for the SPA's hen harrier population.

Based on the findings of the ornithology study conducted for the proposed development, it is reasonable to conclude that hen harrier does not regularly use the airspace over the proposed development site and, therefore, the likelihood of the SPA's hen harrier population being significantly affected via mortality or injury due to collision is considered negligible.

8.4.3.2.3.2 River Shannon and River Fergus Estuaries SPA

During the monthly VP surveys carried out at the proposed development site over the 60-month survey period, five SCI species for which the River Shannon and River Fergus Estuaries SPA is designated were observed in flight, namely black-headed gull, cormorant, curlew, golden plover, lapwing and whooper swan (see **Section 4.2.8.6**, above). Cormorant was observed in-flight six times during the VP surveys, curlew and lapwing were each observed twice, while whooper swan was only seen once in-flight. All four species' flights occurred outside the airspace of the proposed development. Golden plover was also observed only twice in-flight during the 60 months of VP surveys, however, both flights occurred over the proposed development's redline boundary. Black-headed gull flights were frequently recorded within and around the airspace of the proposed development during winter VP surveys.

For flightpath maps of SCI species observed during VP surveys, refer to the **Appendix 7-A** Baseline Ornithology Report, Annex D- Figures, Volume III of the EIAR)

Cormorant, lapwing, whooper swan, golden plover and curlew

Although larger bird species such as cormorant, geese and swans have reduced manoeuvrability when compared with smaller birds (McGuinness *et al*., 2015; Drewitt & Langston, 2006), the observed collision rate for these species has appeared to remain low. A review by Hötker *et al*., (2006) of the number of bird collision victims at fourteen wind farms in Germany since 1989 found only two cormorant among the fatalities while a review of data from wind farms in seven other European countries did not find any cormorant collision victims (Hötker *et al*, 2006). At offshore wind turbines near Blyth in northeast England, 'no collision mortality was witnessed during 352 hours of daytime watches post-construction' (Rothery *et al*., 2009) and 'cormorants did not appear to be at risk and were observed to avoid flying critically close to the turbines' (Lowther, 2000).

There is very limited published information on the collision risk posed by turbines to non-breeding curlew and lapwing. A review of data collected at twenty wind farms across South Africa (totalling 825 turbines) between 2014 and 2018 found not one collision fatality involved any of the sixteen local Scolopacidae bird species, the family of birds to which curlew also belongs (Perold *et al*., 2020). In relation to lapwing and collision risk, several studies have found no obvious impacts on breeding lapwing populations from wind farm infrastructure via turbine collision (McGuinness *et al*., 2015), however, there are no discernible robust studies on the collision risk to non-breeding populations. However, given that over the course of the 60-month VP survey period lapwing was only seen in-flight on two occasions, it is reasonable to conclude that lapwing do not regularly use the airspace over the proposed development site and, therefore, the likelihood of the SPA's non-breeding lapwing population being significantly affected because of turbine strikes is considered negligible.

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With regards whooper swan and risk of turbine collision, data on bird carcasses found at wind farms in Germany revealed that duck, geese and swans made up only 5% of fatalities, or 65 birds, from 1989 to 2010 (Rydell *et al*., 2017). Furthermore, species such as geese and swans react to wind turbines at greater distances than most birds due to their heavier bodies and slower flight speed. This quicker reaction time coupled with the 'good eyesight' of geese and swans (Rees, 2012) means that the species have extremely high levels of avoidance rates for wind turbines – 99.5% for swans and 99.8% for geese (SNH, 2018). The risk of collision for waders (including golden plover) is generally deemed to be low because of their high flight manoeuvrability coupled with a relatively low, cursory flight path (McGuinness *et al*., 2015). Carcass searches carried out from February 2010 to December 2011 found that only 3.8% of the total carcasses encountered were golden plover (nearly 70% of carcasses comprised a species of ground-dwelling Arctic grouse unused to flying) (Rydell *et al*., 2017).

It is concluded, therefore, for the reasons outlined in the preceding paragraphs and because during 60 months of VP surveys at the proposed development site whooper swan, golden plover, lapwing, curlew, and cormorant were all seen in-flight only occasionally and/or outside the 500-metre buffer around the proposed development site, there is no potential for likely significant effects from the operational phase of the proposed wind farm to these five species and, therefore, there is no potential for likely significant effects on whooper swan, golden plover, lapwing, curlew, or cormorant populations for which River Shannon and River Fergus Estuaries SPA is designated.

Black-headed Gull

The only gull species designated as an SCI species for the River Shannon and River Fergus Estuaries SPA is the black-headed gull which, as previously noted, was frequently recorded within and around the airspace of the proposed development during the VP surveys. In general, gull species are reportedly killed by turbine strikes more frequently than would initially be expected based on their abundance (Rydell *et al.*, 2017; Hötker *et al*., 2006; Everaert *et al*., 2002). However, Rothery *et al*. (2009) did not observe any turbine collisions at Blyth in the UK and reported that only 4% of black-headed gull flights at the site were within the height band of the rotor blades (above 26.4 metres). In a separate study at Blyth, 'observations suggested that gulls flew between the turbines, especially in good weather' and that black-headed gulls appeared less vulnerable to turbine collisions when compared with larger gull species due to their tendency to fly at heights of less than 15 metres (Still *et al*., 1996; Langston & Pullan, 2003; Furness *et al*., 2013).

It is the wintering population of black-headed gull that the River Shannon and River Fergus Estuaries SPA is designated. A baseline wintering population of 2,681 individuals is stated on the Standard Data Form (updated 2005-10), whilst an average wintering population of 1,303 individuals was reported for the SPA in 2006-2011 following a review undertaken by NPWS (2012e).

Black-headed gull were frequently recorded during the non-breeding seasons of the ornithological surveys completed at the proposed development site, with annual peak counts of 60 to 372 birds recorded over the five seasons surveyed (60 months in total). Activity largely comprised birds in flight and only three flocks were recorded using land within the study area (e.g., for foraging and loafing) with no black-headed gull at all recorded using any land within the redline boundary – see **Figure 23**, above. The proposed development is not considered to comprise Functionally Linked Land to the SPA in relation to the wintering population of black-headed gull.

However, frequent flights northwards to the River Shannon and River Fergus Estuaries SPA and (particularly) southwards from the SPA were recorded. Whilst detailed guidance on black-headed gull movement patterns in relation to connectivity with inland SPAs is not available, based on the known general movement patterns of this species when commuting and while migrating, and considering the intervening distance between the proposed development site and the SPA (approximately 6.8 kilometres), those birds observed flying northwards and southwards may potentially belong to the wintering population for which the River Shannon and River Fergus Estuaries SPA is designated. The peak count for a black-headed gull flock flying within the proposed development site towards/from the direction of the SPA was 102 birds (equating to 3.8% of the baseline citation population for

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the SPA, and 7.8% of the 2006-2011 population estimate for the SPA). Therefore, the black-headed gull flight route recorded over or within proximity to the proposed development was considered to be potentially of significance in the context of River Shannon and River Fergus Estuaries SPA.

To establish whether there is any potential for significant impacts on the SPA black-headed gull population through collision fatalities due to the introduction of turbines into the landscape, collision risk modelling was undertaken. An additional modelling scenario utilising the migration tab was adopted, incorporating all observations at the collision risk height (between 20 and 180 metres) of black-headed gulls flying northwards or southwards through the airspace within the VP viewsheds. (for full details, refer to Section 4.2.5 of the **Collision Risk Modelling Report** in **Appendix 7-B** of Volume III of the EIAR). Black-headed gull was included in the modelling study since the species was regularly recorded in-flight throughout the VP surveys. Results of the model predict a rate of 0.014 black-headed gull collision fatalities per year, equating to 0.472 birds over the expected operational lifespan of the development (35 years).

This estimated number of collision fatalities of 0.472 birds over the lifespan of the project is less than 1% of the citation population for the SPA (1% threshold = 26.81) and is less than 1% of the estimated 2012 wintering black-headed gull population for the SPA (1% threshold = 13.03).

In addition, the following factors should be taken into consideration:

- Collision Risk Modelling represents a precautionary assessment of likely collisions (see Section 3.6 of **Appendix 7-B Collision Risk Modelling Report**).
- This modelling assumes that all birds flying in a northwards or southwards direction over the project site belong to the wintering population of the SPA. Given the distance between the proposed project site and the SPA (c. 6.8 km), and the widespread nature of this species (i.e., over-wintering in a range of coastal and inland habitats), it is considered unlikely that all black-headed gulls observed flying northwards or southwards over the project site are part of the SPA's population.
- Whilst gull fatalities due to wind farms can be relatively high, black-headed gulls typically display lower susceptibility to turbine collisions than many other gull species. For example, Rothery *et al*. (2009) did not observe any black-headed gull turbine collisions at a wind farm at Blyth in southeast England and reported that only 4% of black-headed gull flights at the site were at collision risk height.

Based on the results of the comprehensive suite of ornithological surveys carried out at the proposed development site over five consecutive years, the findings of the collision risk model and assessment, and the factors described in the preceding paragraphs, the operational phase of the proposed development will not significantly effect the black-headed gull population of the River Shannon and River Fergus Estuaries SPA through collision fatalities.

It is concluded, therefore, for the reasons outlined in the preceding paragraphs, including assessment of collision risk, that there will be no significant black-headed gull population effects via collision risk because of the proposed development. Consequently, there is no potential for adverse effects to the integrity of River Shannon and River Fergus Estuaries SPA, in light of SPA's conservation objectives, as a result of the proposed development.

8.4.3.2.4 *Barrier Effects*

Wind energy developments have the potential to create 'barrier effects' where a barrier to movement is created that can disturb or displace a species from an area. This effect is of particular concern due to the possibility of increasing a bird's energy expenditure should they be required to fly further distances than they would otherwise need so as to avoid turbines and enable them to access feeding, roosting and/or breeding areas. As is the case with collision risk, barrier effects are dependent on many different factors such as, amongst others, species type,

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flight height, wind force/direction, and time of day (Drewitt & Langston, 2006). Indeed, the actual barrier effect itself can vary hugely, ranging from a slight change in flight direction, height or speed to a considerable diversion that may significantly affect an individual's energy budget (Gove *et al*., 2013).

Hen harrier, cormorant, whooper swan, lapwing, golden plover and curlew

A review of publications and reports on the issue of barrier effects carried out by Hötker *et al*. (2006) determined a barrier effect for 104 out of 168 daytime observations (81 species), indicating that it is a relatively common occurrence but does not seem to affect all species equally. The review also established that geese, kites, cranes and small passerines exhibited a particularly high level of sensitivity to barrier effects while birds such as cormorants, ducks, gulls, terns and some raptors 'were all less sensitive or less willing to change their original migration direction when approaching wind farms….and their local populations were less influenced by wind farms'. At Blyth in Northumberland in northwest England, for globally significant numbers of overwintering purple sandpipers (*Calidris maritima*) (part of the Scolopacidae family of birds which also includes curlew) the wind turbines did not appear to act as a barrier to movement, and the species displayed an apparently high level of tolerance to the turbines (Lowther, 2000).

Post wind farm construction monitoring schemes at two wind farms in Scotland, namely Ben Aketil and Edinbane, did not find any 'apparent landscape level impacts on hen harrier flights' and concluded that neither wind farm appeared to act as a barrier to flights (Haworth & Fielding, 2014). Also in the UK, when bird distribution data collected from regular breeding season surveys at twelve upland wind farms containing ten or more turbines was assessed, it was reported that hen harrier showed reduced flight activity around turbines but did not 'appear to alter flight height in response to turbine proximity' (Pearce-Higgins *et al*., 2009) and as discussed in **Section 8.4.3.2.3.1**, above, hen harrier mainly fly at very low elevations as they quarter the ground for prey at slow speed.

It is concluded, therefore, based on the ornithology study conducted for the proposed development, the reasons outlined in the preceding paragraphs and because during 60 months of VP surveys at the proposed development site cormorant was observed in-flight only six times, curlew, lapwing and golden plover observed each in-flight twice, and hen harrier and whooper swan were both seen only once in-flight, there is no potential for likely significant effects from the operational phase of the proposed wind farm to create a barrier to movement for these six species. Therefore, there is no potential for likely significant effects on the population of hen harrier for which Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA is designated, nor the populations of whooper swan, cormorant, golden plover, lapwing and curlew for which River Shannon and River Fergus Estuaries SPA is designated.

Black-headed Gull

As previously discussed in **Section 4.2.8**, above, and in other preceding sections, black-headed gull was recorded flying over the proposed development site and surrounding areas on numerous occasions during the VP surveys carried out over the 60-month survey period. Much of this flight activity included flights towards/from the direction of the SPA raising the possibility that the species uses the airspace of the proposed development as an ecological link between the SPA and other habitats. The risk of collision with turbine infrastructure, as detailed in **Section 8.4.3.2.3.2**, above, has been deemed low but there is potential for the black-headed gull population of the SPA to produce an 'active in-flight response to wind turbines intercepting their route' (May, 2015) as they fly towards/from the SPA.

In the Netherlands, at the East dam in the port of Zeebrugge in Belgium and at Maasvlakte in the port of Rotterdam, daytime observations found that wind turbines did not act as a barrier for the daily migration routes of local breeding gull and tern colonies as the birds flew between turbines unmolested as they moved to and from their marine feeding areas (Everaert *et al*., 2002; Langston & Pullan, 2003). Similarly, studies of bird behaviour at

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offshore wind farms in Denmark observed some species such as gannet (*Morus bassanus*) and scoter (*Melanitta nigra*) rarely or never flying between turbines despite their abundance at the site, whereas gulls 'showed no sign of avoidance at all' (Petersen *et al*., 2006). Additionally, there is some evidence to suggest that swans, geese, and gulls may develop a certain degree of behavioural plasticity in adapting to the presence of turbines (Therkildsen *et al*., 2021), further reducing the potential for barrier effects to occur.

During the VP surveys at Ballynisky, most black-headed gull flights occurred outside the proposed development's airspace with many flights moving towards/from the SPA. It is noted, however, that given their relatively widespread distribution and proclivity for over-wintering in a range of habitats varying from coastal to inland, and the intervening distance of more than six kilometres between the SPA and the proposed development site, it is highly unlikely that all black-headed gull observed moving towards/from the SPA within the airspace of the proposed development are part of the SPA's black-headed gull population. While there is potential for some displacement or barrier effects to arise during the operational phase of the proposed development, it is anticipated that any diversion distances involved will be minimal since there is an abundance of available suitable airspace within surrounding areas.

It is concluded, therefore, for the reasons outlined in the preceding paragraphs and because of the nature and location of the black-headed gull flights observed during 60 months of VP surveys, the operational phase of the proposed wind farm is unlikely to create a barrier to movement for black-headed gull and is, therefore, not likely to significantly disturb or displace the population of black-headed gull for which the River Shannon and River Fergus Estuaries SPA is designated to such an extent that would adversely affect the integrity of the SPA.

8.4.4 Habitat or Species Fragmentation

Habitat fragmentation has been defined as 'reduction and isolation of patches of natural environment' (Franklin *et al*., 2002; Morrison *et al*., 2012) usually due to an external disturbance that alters the habitat and 'create[s] isolated or tenuously connected patches of the original habitat' (Wiens, 1989). This results in spatial separation of habitat units that had previously been in a state of greater continuity. Negative effects of habitat fragmentation on species or populations can include increased isolation of populations/species which can detrimentally impact on the resilience or robustness of populations reducing overall species diversity and altering species abundance.

The proposed development will not result in any habitat loss within either of the relevant European sites - Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA, Lower River Shannon SAC, and River Shannon and River Fergus Estuaries SPA – and significant habitat or species fragmentation impacts are not envisaged. However, a programme of mitigation measures pertaining to protection of water quality will be implemented (see **Section 9**, below). Residual impacts are assessed in **Section 11**, below.

8.5 Assessment of Effects on the Conservation Objectives of Stack's to Mullaghareirk Mountains: West Limerick Hills & Mount Eagle SPA [004161]

An evaluation was undertaken to identify if the Special Conservation Interest (SCI) bird species of the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA, namely hen harrier, (see **Section 8.1.2**, above) potentially lies within the zone of influence of the proposed development and requires further assessment in the NIS. This was done through a scientific examination of ecological evidence and data listed in **Section 3**, above, or referenced, as well as the results of the ecological field surveys (**Section 4.2**, above). In this case, hen harrier was selected for further assessment in the NIS.

Following this, an assessment of the potentially significant effects that may arise due to the proposed development was carried out in **Section 8.4**, above, and a determination was made as to whether the integrity of the SPA is likely to be adversely effected by the proposal. Displacement of the SCI species due to risk of collision

(Section 8.4.3.2.3) and/or the potential barriers to movement (Section 8.4.3.2.4) was assessed and based on the findings of the ornithology study conducted for the proposed development, it is reasonable to conclude that hen harrier do not regularly use the airspace over the proposed development site and, therefore, the likelihood of the SPA's hen harrier population being significantly affected via mortality or injury due to collision is considered negligible.

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8.5.1 Hen Harrier [A082]

Hen harrier is a ground-nesting raptor and an amber-listed species that was once considered to be relatively widespread in Ireland with its traditional breeding grounds being on upland open heather moorland and scrub. However, a combination of agricultural intensification, increased peat extraction, and extensive afforestation have resulted in a decline in the abundance of breeding birds in hen harrier strongholds (NPWS, 2022a).

The conservation objective for hen harrier is to restore the favourable conservation condition of this species in the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA. The specific species Attributes and Targets for hen harrier defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 35**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 35. Assessment of effects on conservation objectives of 'Hen harrier [A082]' (NPWS, 2022b)

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population size/ Number of confirmed breeding pairs	Restore the numbers of confirmed breeding pairs to at least 38–39 confirmed breeding pairs.	The nearest proposed turbine location (T1) is approximately 3.7 km from the SPA's easternmost extent and therefore, no potential for significant disturbance/displacement effects of nesting sites or breeding pairs within the SPA due to the proposed development. Additionally, hen harrier activity within and around the proposed development site was almost non-existent with only one hen harrier flight recorded in 60 months of VP surveys (see **Figure 24**, above). Consequently, the risk of collision with turbine infrastructure, which can also affect the species' productivity rate, has been deemed negligible and is not anticipated to significantly affect the hen harrier population via mortality/injury due to collision – see **Section 8.4.3.2.3.1**, above**.** Therefore, no impact to these attributes and no significant effects to these measures are expected.	No
Productivity rate/ Number of fledged young per confirmed pair	Maintain at least 1.0–1.4 fledged young per confirmed pair.		
Spatial utilisation by breeding pairs/ Percentage	Restore the spatial utilisation of the SPA by breeding pairs to at least 97 – 98%.	The main development site including all six turbines are located outside the 2 km core foraging range for hen harrier but are within the maximum foraging distance of 10 km (SNH, 2016). There will be no decrease to the SPA's area, and loss of habitat within the development site will be confined mostly to intensively managed grassland which is of limited value to hen harrier. There are some areas of hedgerow within and around the development site that may be of some foraging value to the SPA's hen harrier population, however this loss is considered negligible in the context of the greater landscape and nearby more suitable western areas within the SPA itself.	No
Extent and condition of heath and bog and associated habitats/	Restore the extent and quality of this resource to support the targets relating to population size,	There are no heath, bog or associated habitats located within the footprint of the development or adjacent areas, therefore there will be no impact to this attribute and no significant effects to this measure are expected. Refer to the Habitat Map in **Appendix 2** of this report.	No

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Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Hectares; condition assessment	productivity rate and spatial utilisation.		
Extent and condition of low intensity managed grasslands and associated habitats/ Hectares; condition assessment	Restore the extent and quality of this to support the targets relating to population size, productivity rate and spatial utilisation.	Since, the nearest proposed turbine location (T1) is approximately 3.7 km from the easternmost extent of the SPA, the development will not impede the restoration of this attribute within the SPA. The proposed development site is predominantly made up of species-poor intensively managed agricultural grassland with only very limited areas of low intensity managed grasslands and associated habitats within the development's footprint. Refer to Habitat Map in **Appendix 2** of this report. Therefore, it is not expected that this attribute will be impacted and no significant effects to this measure are envisaged.	No
Extent and condition of hedgerows/ Kilometres; condition assessment	Maintain at least the length and quality of this resource to support the targets relating to population size, productivity rate and spatial utilisation.	Since, the nearest proposed turbine location (T1) is approximately 3.7 km from the easternmost extent of the SPA, the proposed development will not impede the maintenance of the length and quality of this attribute within the SPA. All turbines of the proposed development will be located outside the hen harrier core foraging range of 2 km (SNH, 2016) on habitat that is considered generally sub-optimal as foraging habitat for the species (see **Section 8.4.2.1**, above). Furthermore, the suite of ornithological surveys undertaken have indicated that the habitat at the proposed development site is not of sufficient importance for foraging/roosting hen harrier to significantly effect this attribute and, therefore, impacts on population size, productivity rate and spatial utilisation are not anticipated.	No
Age structure of forest estate/ Percentage	Achieve an even and consistent distribution of age-classes across the forest estate.	There are no areas of forest estate located within the footprint of the development or adjacent areas, therefore there will be no impact to this attribute and no significant effects to this measure are expected. Refer to the Habitat Map in **Appendix 2** of this report.	No
Disturbance to breeding sites/ Level of impact	Disturbance occurs at levels that does not significantly impact upon breeding hen harrier.	The nearest proposed turbine location (T1) is approximately 3.7 km from the easternmost extent of the SPA. Therefore, there is no potential for disturbance of any hen harrier breeding sites within the SPA due to the proposed development.	No

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8.6 Assessment of Effects on the Conservation Objectives of the Lower River Shannon SAC [002165]

An evaluation was undertaken to determine which of the Qualifying Interests (QIs) of the Lower River Shannon SAC (see **Section 8.2.2**, above) potentially lie within the zone of influence of the proposed development and require further assessment in the NIS. This was done through a scientific examination of ecological evidence and data listed above in **Section 3** or referenced, as well as the results of the ecological field surveys (**Section 4.2**, above). Following this, an assessment of the potentially significant effects that may arise due to the proposed development was carried out in **Section 8.4**, above, and a determination was made as to whether the integrity of the SAC is likely to be adversely affected by the proposal.

In this case, certain qualifying aquatic habitats and certain qualifying aquatic/water-dependant species were selected for further assessment. The remaining QI habitats and species were deemed to be outside of the zone of influence of the proposed development and were not selected for further assessment in the NIS. The effects of the proposed development on the qualifying interests potentially within the zone of influence of the proposed development have been assessed against the measures designed to achieve the conservation objectives of the site. The outcome of the assessment has been presented in the following sections.

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8.6.1 Estuaries [1130]

The conservation objective for 'Estuaries' is to maintain the favourable conservation condition of this habitat in the Lower River Shannon SAC. The specific habitat Attributes and Targets for this QI defined in relation to the achievement of the Conservation Objectives for the SAC are presented in **Table 36**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 36. Attributes and targets for 'Estuaries [1130]' within the Lower Shannon SAC (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Habitat area/Hectares	The permanent habitat area is stable or increasing, subject to natural processes. Habitat area estimated as 24,273 ha.	There will be no overlap of the proposed development and this habitat. However, it is possible that sediment-laden run-off or uncontrolled emissions/spills enter watercourses draining to the SAC and reduce water quality which can negatively affect this attribute and reduce the area/quality of the habitat.	Yes Refer to **Section 9**
Community distribution/ Hectares	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community.	Sediment-laden run-off may arise from exposed areas during groundworks or from construction vehicles/plant. These are potential sources of nutrients to watercourses. Accidental fuel/oil spills or uncontrolled emissions of cementitious material/wastewater or other harmful substances also pose a risk to water quality, conservation of communities and habitat distribution.	Yes Refer to **Section 9**

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8.6.2 Mudflats and sandflats not covered by seawater at low tide [1140]

The conservation objective for 'Mudflats and sandflats not covered by seawater at low tide' is to maintain the favourable conservation condition of this habitat in the Lower River Shannon SAC. The specific habitat Attributes and Targets for this QI defined in relation to the achievement of the Conservation Objectives for the SAC are presented in **Table 37**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 37. Attributes and targets for 'Mudflats and sand flats not covered by sea water at low tide' within the Lower River Shannon SAC (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Habitat area/Hectares	The permanent habitat area is stable or increasing, subject to natural processes. Habitat area estimated using OSI data as 8,808 ha.	There will be no overlap of the proposed development and this habitat. However, it is possible that sediment-laden run-off or uncontrolled emissions/spills enter watercourses draining to the SAC leading to a reduction in water quality which can negatively affect this attribute and reduce the area/quality of the habitat.	Yes Refer to **Section 9**
Community distribution/ Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustacean community complex.	Sediment-laden run-off may arise from exposed areas during groundworks or from construction vehicles/plant. These are potential sources of nutrients to watercourses. Accidental fuel/oil spills or uncontrolled emissions of cementitious material/wastewater or other harmful substances also pose a risk to water quality, conservation of communities and habitat distribution.	Yes Refer to **Section 9**

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8.6.3 Reefs [1170]

The conservation objective for 'Reefs' is to maintain the favourable conservation condition of this habitat in the Lower River Shannon SAC. The specific habitat Attributes and Targets for this QI defined in relation to the achievement of the Conservation Objectives for the SAC are presented in **Table 38**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 38. Assessment of effects on conservation objectives of 'Reefs [1170]' (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Habitat distribution/ Occurrence	The distribution of Reefs is stable, subject to natural processes.	There will be no decline in habitat distribution within the SAC. Thus, this attribute will not be negatively affected by the proposed development.	No
Habitat area/ Hectares	The permanent habitat area is stable, subject to natural processes.	There will be no overlap of the proposed development and this habitat. However, it is possible that sediment-laden run-off or uncontrolled emissions/spills enter watercourses draining to the SAC leading to a reduction in water quality which can negatively affect this attribute and reduce the area/quality of the habitat.	Yes Refer to **Section 9**
Community distribution/ Hectares	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and Laminaria-dominated community complex.	Sediment-laden run-off may arise from exposed areas during groundworks or from construction vehicles/plant. These are potential sources of nutrients to watercourses. Accidental fuel/oil spills or uncontrolled emissions of cementitious material/wastewater or other harmful substances also pose a risk to water quality, conservation of communities and habitat distribution.	Yes Refer to **Section 9**

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8.6.4 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]

The conservation objective for 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' is to restore the favourable conservation condition of this habitat in the Lower River Shannon SAC. The specific habitat Attributes and Targets for this QI defined in relation to the achievement of the Conservation Objectives for the SAC are presented in Table 39, below. An assessment of the effects of the proposed development against these measures is also included.

Table 39. Assessment of effects on conservation objectives of 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]' (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Habitat area/ Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For subsites mapped: Carrigafoyle - 6.774 ha; Barrigone, Aughinish - 10.288 ha; Beagh - 0.517 ha; Bunratty-26.939 ha; Shepperton, Fergus Estuary - 37.925 ha; Inishdea, Owenshere - 18.127 ha; Killadysert, Inishcorker - 2.604 ha; Knock - 0.576 ha; Querin - 3.726 ha; Rinevilla Bay - 11.883 ha.	There will be no overlap of the proposed development and this habitat. However, it is possible that sediment-laden run-off or uncontrolled emissions/spills enter watercourses draining to the SAC leading to a reduction in water quality which can negatively affect this attribute and reduce the area/quality of the habitat.	Yes Refer to **Section 9**
Habitat distribution/ Occurrence	No decline in habitat distribution, subject to natural processes.	There will be no decline in habitat distribution within the SAC. Thus, this attribute will not be negatively affected by the proposed development.	No
Physical structure: sediment supply Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions.	A natural flow regime is required for plant communities and channel geomorphology to be in favourable condition. There will be no additional barriers to circulation other than those that have always been in existence. Thus, this attribute will not be negatively affected by the proposed development.	No
Physical structure: creeks and pans/ Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession.	The proposed development footprint will not incur any significant physical change to the foreshore in the environs of this habitat. Thus, this attribute will not be negatively affected by the proposed development.	No

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Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Physical structure: flooding regime/ Hectares flooded, frequency	Maintain natural tidal regime	There will be no alteration of the tidal regime of the habitat within the SAC and no impact to the area of the habitat. Thus, this attribute will not be negatively affected by the proposed development.	No
Vegetation structure: zonation/ Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.	The proposed development footprint will not incur any significant physical change to the foreshore in the environs of this habitat, so no change to this attribute is expected.	No
Vegetation structure: vegetation height/ Centimetres	Maintain structural variation within sward.	The proposal will not change access to the foreshore and to the areas of salt marsh, so no change to this attribute is expected.	No
Vegetation structure: vegetation cover/ Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of the saltmarsh area vegetated.	The proposal will not change access to the foreshore and to the areas of salt marsh, so no change to this attribute is expected.	No
Vegetation composition: typical species and sub-communities/ Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).	The proposed development footprint will not incur any significant physical changes to the foreshore in the environs of this habitat, so no change to this attribute is expected.	No
Vegetation structure: negative indicator species - *Spartina anglica*/ Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with annual spread of less than 1%.	The proposed development will not physically interfere with this habitat through excavation or otherwise which could spread this non-native invasive species. Thus, this attribute will not be negatively affected by the proposed development.	No

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8.6.5 Mediterranean salt meadows (*Juncetalia maritimi*) [1410]

The conservation objective for 'Mediterranean salt meadows (*Juncetalia maritimi*)' is to restore the favourable conservation condition of this habitat in the Lower River Shannon SAC. The specific habitat Attributes and Targets for this QI defined in relation to the achievement of the Conservation Objectives for the SAC are presented in Table 40, below. An assessment of the effects of the proposed development against these measures is also included.

Table 40. Assessment of effects on conservation objectives of 'Mediterranean salt meadows (*Juncetalia maritimi*) [1410]' (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Habitat area/ Hectares	Area increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 4.193 ha; Barrigone, Aughinish - 2.407 ha; Bunratty - 0.865 ha; Inishdea, Owenshere - 11.609 ha; Killadysert, Inishcorker - 0.705 ha; Knock - 0.143 ha, Querin - 0.008 ha; Rinevilla Bay - 2.449ha.	There will be no overlap of the proposed development and this habitat. However, it is possible that sediment-laden run-off or uncontrolled emissions/spills enter watercourses draining to the SAC leading to a reduction in water quality which can negatively affect this attribute and reduce the area/quality of the habitat.	Yes Refer to Section 9
Habitat distribution/ Occurrence	No decline in habitat distribution, subject to natural processes.	There will be no decline in habitat distribution within the SAC. Thus, this attribute will not be negatively affected by the proposed development.	No
Physical structure: sediment supply Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions.	A natural flow regime is required for plant communities and channel geomorphology to be in favourable condition. There will be no additional barriers to circulation other than those that have always been in existence. Thus, this attribute will not be negatively affected by the proposed development.	No
Physical structure: creeks and pans/ Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession.	The proposed development footprint will not incur any significant physical change to the foreshore in the environs of this habitat. Thus, this attribute will not be negatively affected by the proposed development.	No
Physical structure: flooding regime/ Hectares flooded, frequency	Maintain natural tidal regime.	There will be no alteration of the tidal regime of the habitat within the SAC and no impact to the area of the habitat. Thus, this attribute will not be negatively affected by the proposed development.	No

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Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Vegetation structure: zonation/ Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.	The proposed development footprint will not incur any significant physical change to the foreshore in the environs of this habitat, so no change to this attribute is expected.	No
Vegetation structure: vegetation height/ Centimetres	Maintain structural variation within sward.	The proposal will not change access to the foreshore and to the areas of salt marsh, so no change to this attribute is expected.	No
Vegetation structure: vegetation cover/ Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated.	The proposal will not change access to the foreshore and to the areas of salt marsh, so no change to this attribute is expected.	No
Vegetation composition: typical species/ Percentage cover	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).	The proposed development footprint will not incur any significant physical changes to the foreshore in the environs of this habitat, so no change to this attribute is expected.	No
Vegetation structure: negative indicator species - *Spartina anglica*/ Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with annual spread of less than 1%.	The proposed development will not physically interfere with this habitat through excavation or otherwise which could spread this non-native invasive species. Thus, this attribute will not be negatively affected by the proposed development.	No

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8.6.6 Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]

The conservation objective for 'Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' is to maintain the favourable conservation condition of this habitat in the Lower River Shannon SAC. The specific habitat Attributes and Targets for this QI defined in relation to the achievement of the Conservation Objectives for the SAC are presented in **Table 41**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 41. Assessment of effects on conservation objectives of 'Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]' (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Habitat area/Kilometres	Area stable or increasing, subject to natural processes. Three sub-types of high conservation value are known to occur in the SAC.	The full extent of this habitat is unknown. The construction phase of the proposed development could potentially result in sediment release from excavations and deposit silt in the channel, possibly affecting the area of the habitat suitable for colonisation. Therefore, there is potential for this conservation objective to be negatively affected.	Yes Refer to **Section 9**
Habitat distribution/ Occurrence	No decline, subject to natural processes.	There will be no decline in habitat distribution within the SAC. Thus, this attribute will not be negatively affected by the proposed development.	No
Hydrological regime: river flow/ metres per second	Maintain appropriate hydrological regimes	A natural flow regime is required for both plant communities and channel geomorphology to be in favourable condition. There will be no alteration of hydrological regime within the habitat within the SAC. Thus, this attribute will not be negatively affected by the proposed development.	No
Hydrological regime: tidal influence/ Daily water level fluctuations - metres	Maintain natural tidal regime	There will be no alteration of hydrological regime or natural tidal influence within the habitat within the SAC. Thus, this attribute will not be negatively affected by the proposed development.	No
Hydrological regime: freshwater seepages/ metres per second	Maintain appropriate freshwater seepage regimes	There will be no alteration of hydrological regime or the freshwater seepages regime of the habitat within the SAC. Thus, this attribute will not be negatively affected by the proposed development.	No
Substratum composition: particle size range/ Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)	Sediment laden run-off may arise from disturbed areas during groundworks or from construction vehicles/plant. When combined with heavy rainfall these activities pose a risk of silt runoff into waterways, including the Ahacronane River and the Knockardnacorlan River downslope of the site and within the SAC. Such impacts may occur via the existing drainage network in the absence of appropriate controls.	Yes Refer to **Section 9**

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Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Water quality: nutrients/ Milligrams per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition. The specific targets may vary among sub- types	Nutrient enrichment typically leads to increased filamentous algal biomass and consequent changes in algae, bryophyte and macrophyte species composition and abundance. Excess algal growth can lead to oxygen depletion in aquatic environments. Sediment-laden run-off may arise from exposed areas during groundworks or from construction vehicles/plant. These are potential sources of nutrients to watercourses. Accidental fuel/oil spills or uncontrolled emissions of cementitious material/wastewater or other harmful substances also pose a risk to water quality and habitat condition.	Yes Refer to **Section 9**
Vegetation composition: typical species/ Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	The sub-types of this habitat include higher plants, bryophytes and microalgae. Site preparation and construction activity could adversely affect water quality and in turn habitat condition and typical vegetation composition. Therefore, there is potential for this conservation objective to be negatively affected.	Yes Refer to **Section 9**
Floodplain connectivity/ Area	The area of active floodplain at and upstream of the habitat should be maintained	River connectivity with the floodplain is essential for the functioning of this habitat and is particularly important in terms of sediment sorting and nutrient deposition. The proposed development will not affect floodplain connectivity within the catchment. Thus, this attribute will not be negatively affected by the proposed development.	No
Riparian habitat/ Area	The area of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained	The proposed development will not result in any loss in area of riparian woodland. Thus, this attribute will not be negatively affected by the proposed development.	No

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8.6.7 Sea Lamprey [1095]

The conservation objective for sea lamprey is to restore the favourable conservation condition of this QI species in the Lower River Shannon SAC. The specific species Attributes and Targets for sea lamprey defined in relation to the achievement of the Conservation Objectives for the SAC are presented in **Table 42**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 42. Assessment of effects on conservation objectives of 'Sea lamprey [1095]' (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Distribution: extent of anadromy/ % of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	The proposed development will not result in any change in distribution or accessibility of rivers from the estuary for sea lamprey. Thus, this attribute will not be negatively affected by the proposed development.	No
Population structure of juveniles/ Number of age/size groups	At least three age/size groups present	Potential adverse water quality effects which may arise because of the proposed development could impact on the population structure of juveniles within the SAC.	Yes Refer to **Section 9**
Juvenile density in fine sediment/ Juveniles/m^2	Juvenile density at least 1/m^2	Potential adverse water quality effects which may arise because of the proposed development could impact on juvenile sea lamprey habitat condition and juvenile population structure within the SAC.	Yes Refer to **Section 9**
Extent and distribution of spawning habitat/ m^2 and occurrence	No decline in extent and distribution of spawning beds	Lampreys require areas of clean gravels to spawn. Potential adverse water quality effects which may arise because of the proposed development could impact on spawning habitat potentially located downstream of the site and could result in a decline in spawning habitat extent within the SAC.	Yes Refer to **Section 9**
Availability of juvenile habitat/ Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Juvenile lampreys require areas of clean sand and silt in which to develop and mature. Potential adverse water quality effects which may arise because of the proposed development could impact on juvenile lamprey habitat condition and availability in watercourses downstream of the site within the SAC.	Yes Refer to **Section 9**

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8.6.8 River Lamprey [1099] and Brook Lamprey [1096]

The conservation objective for river and brook lamprey is to maintain the favourable conservation condition of these species in the Lower River Shannon SAC. The specific species Attributes and Targets for river and brook lamprey defined in relation to the achievement of the Conservation Objectives for the SAC are presented in **Table 43**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 43. Assessment of effects on conservation objectives of 'River lamprey [1099]' and 'Brook lamprey [1096]' (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Distribution/ % of river accessible	Access to all watercourses down to 1st Order streams	Potential adverse water quality effects to the 1st and 2nd Order streams at the site which may arise because of the proposed development have the potential to reduce the accessibility and availability of watercourses for river/brook lamprey and, therefore, negatively affect the species' distribution within the SAC further downstream.	Yes Refer to **Section 9**
Population structure of juveniles/ Number of age/size groups	At least three age/size groups of brook/river lamprey present	Potential adverse water quality effects which may arise because of the proposed development could impact on the population structure of juvenile river or brook lamprey within the SAC.	Yes Refer to **Section 9**
Juvenile density in fine sediment/ Juveniles/m^2	Mean catchment juvenile density of river/brook lamprey at least $2m^2$	Potential adverse water quality effects which may arise because of the proposed development could impact on juvenile lamprey habitat condition and mean catchment juvenile density within the SAC.	Yes Refer to **Section 9**
Extent and distribution of spawning habitat/ m^2 and occurrence	No decline in extent and distribution of spawning beds	Lampreys require areas of clean gravels to spawn. Potential adverse water quality effects which may arise because of the proposed development could impact on spawning habitat potentially located downstream of the site and could result in a decline in spawning habitat extent within the SAC.	Yes Refer to **Section 9**
Availability of juvenile habitat/ Number of positive sites in 2nd order channels (and greater) downstream of spawning areas	More than 50% of sample sites positive	Juvenile lampreys require areas of clean sand and silt in which to develop and mature. Potential adverse water quality effects which may arise because of the proposed development could impact on juvenile lamprey habitat condition and availability in watercourses downstream of the site within the SAC.	Yes Refer to **Section 9**

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8.6.9 Atlantic Salmon [1106]

The conservation objective for Atlantic salmon is to restore the favourable conservation condition of this species in the Lower River Shannon SAC. The specific species Attributes and Targets for Atlantic salmon defined in relation to the achievement of the Conservation Objectives for the SAC are presented in **Table 44**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 44. Assessment of effects on conservation objectives of 'Atlantic salmon [1106]' (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Distribution: extent of anadromy/ % of river accessible	100% of river channels down to 2nd order streams accessible from estuary	Potential adverse water quality effects to the 1st and 2nd Order streams which may arise because of the proposed development have the potential to reduce the accessibility and availability of watercourses for salmon further downstream within larger watercourses and, therefore, negatively affect the species' distribution within the SAC.	Yes Refer to **Section 9**
Adult spawning fish/ Number	Conservation Limits (CL) for each system consistently exceeded	Potential adverse water quality effects which may arise because of the proposed development could impact adult salmon, fry, or smolts.	Yes Refer to **Section 9**
Salmon fry abundance/ Number of fry/ 5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling		
Out-migrating smolt abundance/ Number	No significant decline		
Number and distribution of redds/ Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon require areas of clean gravel and cobble to spawn. Potential adverse water quality effects which may arise because of the proposed development could impact on spawning habitat potentially located downstream of the site and could result in a decline in spawning habitat within the SAC.	Yes Refer to **Section 9**
Water quality/ EPA Q value	At least Q4 at all sites sampled by EPA	Potential adverse water quality effects which may arise because of the proposed development could impact on river water quality as measured by the Q-value.	Yes Refer to **Section 9**

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8.6.10 Otter [1355]

The conservation objective for otter is to restore the favourable conservation condition of this species in the Lower River Shannon SAC. The specific species Attributes and Targets for otter defined in relation to the achievement of the Conservation Objectives for the SAC are presented in **Table 45**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 45. Assessment of effects on conservation objectives of 'Otter [1355]' (NPWS, 2012b).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Distribution/ percentage positive survey sites	No significant decline	The proposed development site features some small streams which are evaluated as marginal/sub-optimal potential foraging habitats for otter. Due to the nature, location and scale of the proposed development, a significant decline in distribution of otter is not likely. Thus, this attribute will not be negatively affected by the proposed development.	No
Extent of terrestrial habitat/ hectares	No significant decline. Area mapped as 596.8 ha above high-water mark, 958.9 ha along riverbanks/around ponds	The proposed development will not result in any significant decline in the extent of terrestrial/ marine/freshwater (river) or freshwater (lake/lagoon) habitat for otter. Thus, this attribute will not be negatively affected.	No
Extent of marine habitat/ hectares	No significant decline. Area mapped as 4,461.6 ha		
Extent of freshwater (river) habitat/ kilometres	No significant decline. Length mapped as 500.1 km		
Extent of freshwater (lake/lagoon) habitat/ hectares	No significant decline. Area mapped as 125.6 ha		
Couching sites and holts/ number	No significant decline	Field surveys did not identify any suitable couching sites or breeding habitat. The proposed development will not result in any decline in the number of couching sites and holts for otter. Any otter using the proposed development site are considered transient i.e. only passing through from one catchment to another. Thus, this attribute will not be negatively affected.	No
Fish biomass available/ kilograms	No significant decline	Potential adverse water quality effects may arise as the proposed development could impact on water quality within downstream watercourses and therefore the fish biomass available to otter.	Yes Refer to **Section 9**
Barriers to connectivity/ number	No significant increase.	The proposed development will not increase the number of barriers to connectivity for otter. Thus, this attribute will not be negatively affected.	No

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8.7 Assessment of Effects on the Conservation Objectives of the River Shannon and River Fergus Estuaries SPA [004077]

An evaluation was undertaken to identify which of the Special Conservation Interest (SCI) bird species of the River Shannon and River Fergus Estuaries SPA (see **Section 8.3.2**, above) potentially lie within the zone of influence of the proposed development and require further assessment in the NIS. This was done through a scientific examination of ecological evidence and data listed above in **Section 3** or referenced, as well as the results of the ecological field surveys (**Section 4.2**, above). In this case, certain qualifying SCI species were selected for further assessment. The remaining species were deemed to be outside of the zone of influence of the proposed development and were not selected for further assessment in the NIS.

Following this, an assessment of the potentially significant effects that may arise due to the proposed development was carried out in **Section 8.4**, above, and a determination was made as to whether the integrity of the SPA is likely to be adversely affected by the proposal. Potential indirect effects to the water quality of the SPA were identified along with the possible indirect ramifications this may have on the wetland habitat and species within the SPA. Displacement of the SCI species due to risk of collision (**Section 8.4.3.2.3**) and/or the potential barriers to movement (**Section 8.4.3.2.4**) the proposed turbines may create was identified and addressed and the potential for both was considered low.

The effects of the proposed development on the qualifying interests potentially within the zone of influence of the proposed development have been assessed against the measures designed to achieve the conservation objectives of the site and the outcome of the assessment has been presented in the following sections. Surveys undertaken at the proposed development site and surrounding areas, as described in **Section 3.6.2**, above, are referred to throughout the following assessments. Bird surveys carried out for the 2010/11 Waterbird Survey Programme (NPWS, 2012e) at the subsites illustrated in **Figure 22**, above, are also referred to throughout since the dataset is used within the SPA's current Conservation Objectives document, and are most recent publicly available bird data for all the subsites. Given that habitats within the SPA have not undergone significant change in the intervening years, the current distribution of SCI species within the SPA can be expected to correlate to distributions recorded in 2010/11.

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8.7.1 Cormorant [A017]

Cormorant is a resident species in Ireland occurring along the coast and breeding in colonies mainly on offshore islands and rocky coastlines although there are some inland breeding populations. This diving species feeds on fish, foraging mainly in shallow waters (<30m depth) and may roost in intertidal or supratidal areas. The species is amber-listed in Ireland due to a localised breeding population. Cormorant is the only qualifying species with a breeding population within the River Shannon and River Fergus Estuaries SPA (NPWS, 2012e).

The conservation objective for cormorant is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for cormorant defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 46**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 46. Assessment of effects on conservation objectives of 'Cormorant [A017]' (NPWS, 2012f).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Breeding population abundance: apparently occupied nests (AONs)/ Number	No significant decline	Cormorant usually breed in colonies on rocky coastlines found to the outer extent of the SPA and at a significant distance from the proposed development site. There is ample suitable breeding habitat along the Shannon Estuary and further west towards the Atlantic for this species. The proposed development is not expected to cause a significant decline in the breeding population of cormorant, but water quality impacts and/or disturbance of this species is possible which could potentially affect the breeding population and range. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Productivity rate/ Mean number	No significant decline	The proposed development is not expected to cause a significant decline on the productivity of this species. Therefore, no significant effects to this measure are expected.	No
Distribution: breeding colonies/ Number; location; area (hectares)	No significant decline	The proposed development does not affect the habitat types for which cormorant most commonly nest upon, namely rocky islets, sea stack tops and cliffs (Walsh *et al.*, 1995). However, since the only cormorant observations reported during the VP surveys at Ballynisky were three flights that involved one or two birds and occurred outside the proposed development site boundary, the species is not considered to use the area within or around the proposed development site for the purposes of a breeding colony. Therefore, no significant effects to this measure are expected.	No
Prey biomass available/ Kilogrammes	No significant decline	Cormorant are piscivorous and use 0I439 and adjacent subsites for foraging (see **Figure 22**, above, for subsite locations). Reduced water quality could impact prey items of this specialist species. Mitigation with regard to water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Barriers to connectivity/ Number; location; shape; area (hectares)	No significant increase	Applies to breeding colonies of cormorant - the species often utilise extensive areas of marine waters for foraging. Since only six cormorant flights were recorded during the VP surveys and all occurred outside the proposed development site boundary, and because the nearest proposed turbine location (T1) is at least 7 km south of the	No

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Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
		SPA, the species is not considered to use the proposed development area as a connecting corridor to foraging grounds. Therefore, no significant barrier effects to connectivity are expected and the proposed development is unlikely to impact this measure.	
Disturbance at breeding site/ Level of impact	Human activities should occur at levels that do not adversely affect the breeding cormorant population	Key habitats include sandy areas, rocky and vegetated substrate. As construction of the proposed development will occur at least 6 km south of the SPA in an area dominated by intensively managed agricultural grassland unsuitable for breeding cormorant, disturbance due to increased noise levels and/or air emissions is not considered likely.	No
Population trend/ Percentage change	Long term population trend stable or increasing	The most recent cormorant population status assessment for the SPA reports a species decline within the 'Intermediate' range (1.0% - 24.9% decline). This range allows for natural fluctuations and represents a range within which population declines are relatively small and potentially reversible and are less likely to influence the species' long-term conservation status. An all-Ireland trend for the period 1994/95 to 2008/09 is an increase of 31.5% (NPWS, 2012e). This attribute applies to non-breeding cormorant only and while the proposed development is not expected to cause a significant decline in the cormorant population, water quality impacts and/or disturbance of this species is possible which could potentially affect population trend. While no significant effects to this measure are expected, mitigation with regard to water quality will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by cormorant other than that occurring from natural patterns of variation	Only six cormorant flights were recorded during the VP surveys and all occurred outside the proposed development site boundary but during the 2010/11 Waterbird Survey Programme, cormorant were recorded relatively frequently at the subsites nearest the proposed development site (see **Figure 22**, above, for subsite locations). A single cormorant was reported during the hinterland surveys at a pond 4 km east of the proposed development site, and a flock of 12 was recorded during transect surveys (see **Section 4.2.8.6**, above). This attribute applies to non-breeding cormorant only and while the proposed development is not expected to cause significant decline in the distribution of the cormorant population, water quality impacts and/or disturbance is possible which may potentially affect population distribution. While no significant effects to this measure are expected, mitigation with regard to water quality will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.2 Whooper Swan [A038]

Whooper swan is an Annex I species and is amber-listed in Ireland as the country hosts more than 20% of the European wintering population with birds usually arriving in late autumn and departing by mid-April. Flood plains and grassland areas adjacent to rivers provide optimal foraging/roosting habitat for whooper swan during the winter months when they can be seen in estuaries and other wetland habitats as well as lowland agricultural areas. Flooded areas of cutaway bog are also regularly utilised by whooper swans as foraging grounds. They forage diurnally, primarily on agricultural grasses and grains although aquatic plants in inter-tidal areas are also taken. This is a highly mobile species whose movement is dependent upon the degree of flooding in suitable foraging habitats; they also exhibit a high level of site fidelity to wintering areas (Wilson *et al.*, 1991; Warren *et al.*, 1992; Stroud *et al.*, 2012).

The conservation objective for whooper swan is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for whooper swan defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 47**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 47. Assessment of effects on conservation objectives of 'Whooper Swan [A038]' (NPWS, 2012f)

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Results of the 2020 International Swan Census (Burke *et al.*, 2021) showed a 'substantial increase' in numbers of whooper swan on the island of Ireland up 26.5% since the 2015 Census with the entire Shannon & Fergus Estuary area supporting internationally important numbers of the species (NPWS, 2012e). The proposed development is not expected to cause a significant decline in the whooper swan population, but water quality impacts and/or disturbance of this species is possible which could potentially affect population trend. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by whooper swan other than that occurring from natural patterns of variation	During the 2010/11 Waterbird Survey Programme, subsite 0I439 was assessed as having 'High' numbers of whooper swan during low tide surveys across all behaviours and habitats (see **Figure 22**, above, for subsite locations), and during the VP surveys at the proposed development site, there was a record of one whooper swan flying west in an area outside the proposed development's airspace. Although the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via the watercourses draining the development site. This in turn has the potential to cause significant adverse effects to the range of whooper swan foraging and roosting habitats within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.3 Shelduck [A048]

Shelduck is amber-listed in Ireland as the majority of the wintering population occurs at less than ten sites. Shelduck nest in sand dune systems, and on islands and grassy parts of estuaries, and they forage in a variety of ways from scything their bill through wet mud on exposed tidal flats, to dabbling and scything in shallow water and up-ending in deeper waters. They can therefore forage throughout the tidal cycle. Shelduck is mainly confined to the intertidal area and coastlands of the SPA and feeds on mudflats.

The conservation objective for shelduck is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for shelduck defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 48**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 48. Assessment of effects on conservation objectives of 'Shelduck [A048]' (NPWS, 2012f).

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as declining by more than 50% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e). Burke *et al*. (2018) estimated a 14% decrease in all-Ireland shelduck numbers when 2015/16 core counts were compared with the 2006/07 to 2010/11 population estimates. The proposed development is not expected to cause a significant decline in the shelduck population, however there is potential for adverse water quality impacts and/or disturbance of this species which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shelduck other than that occurring from natural patterns of variation	During the 2010/11 waterbird survey programme, shelduck were recorded within 41 sub sites overall, and within 38 during low tide surveys, with highest densities occurring north of the proposal site, on the River Fergus near Breckinish (see **Figure 22**, above, for subsite locations) (NPWS, 2012e). Although the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via watercourses draining the development site. This in turn has potential to cause significant adverse effects to the range of shelduck foraging/roosting habitat within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.4 Wigeon [A050]

Wigeon is amber-listed due to a decline in its non-breeding (wintering) population. Wigeon are highly migratory, arriving to Ireland in August/September and wintering in ponds and flooded fields around the SPA. Their diet is almost entirely vegetarian, and a major part of the diet comprises seagrass and algae species which are taken by grazing or dabbling in shallow water. Wigeon also forage within grasslands and agricultural crops for seeds, stems and rhizomes. A gregarious bird, they are rarely seen far from water.

The conservation objective for wigeon is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for wigeon defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 49**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 49. Assessment of effects on conservation objectives of 'Wigeon [A050]' (NPWS, 2012f).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of wigeon at the SPA was assessed as declining by more than 50% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e). Burke *et al*. (2018) estimated a 14% decrease in all-Ireland numbers when 2015/16 core counts were compared with the 2006/07 to 2010/11 population estimates. Although the proposed development is not expected to cause a significant decline in the wigeon population, there is potential for adverse water quality impacts and/or disturbance of this species which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by wigeon other than that occurring from natural patterns of variation	During the 2010/11 Waterbird Survey Programme, wigeon was recorded foraging and roosting in relatively high numbers at 0I439 and adjacent subsites (see **Figure 22**, above, for subsite locations) (NPWS, 2012e). While the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via the watercourses draining the development site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for wigeon within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.5 Teal [A052]

Teal is largely migratory, moving south of their breeding range during winter. Being highly responsive to cold spells they can show rapid and extensive movement during these periods. Teal is amber-listed due to a decline in the breeding population. Teal is a very common winter visitor to the Shannon and Fergus estuaries area. They are omnivorous and have a variety of foraging methods (e.g. dabbling and up-ending) within differing habitats. Areas of shallow water are favoured including shallow estuaries, tidal creeks and the edges of salt and freshwater marsh (NPWS, 2012e).

The conservation objective for teal is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for teal defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 50**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 50. Assessment of effects on conservation objectives of 'Teal [A052]' (NPWS, 2012f).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as declining by more than 50% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e), while Burke *et al*. (2018) estimated a 6% increase in All-Ireland teal numbers when the 2015/16 core counts were compared with the 2006/07 to 2010/11 population estimates. Although the proposed development is not expected to cause a significant decline in the teal population, there is potential for adverse water quality impacts and/or disturbance of this species which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by teal other than that occurring from natural patterns of variation	During the 2010/11 Waterbird Survey Programme, teal was widespread and recorded within 53 subsites overall with relatively high numbers recorded within subsite 0I439 and adjacent subsites (see **Figure 22**, above, for subsite locations) (NPWS, 2012e). While the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via watercourses draining the development site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for teal within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.6 Shoveler [A056]

The small numbers of shoveler breeding in Ireland are largely sedentary or dispersive and are supplemented during winter by migratory birds from other locations within northwest and central Europe. Shovelers are omnivorous, and feed on a range of items from planktonic crustaceans and small molluscs to insects, larvae, plant material and seeds. A true dabbling duck, shovelers feed by surface-feeding, swimming with head and neck immersed, up-ending, and less often, by shallow dives. Shoveler is red-listed due to a decline in its non-breeding (wintering) population.

The conservation objective for shoveler is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for shoveler defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 51**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 51. Assessment of effects on conservation objectives of 'Shoveler [A056]' (NPWS, 2012f)

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as 'undetermined' but with an all-Ireland trend of a 21.3% increase for the period 1994/95 to 2008/09 (NPWS, 2012e). However, Burke *et al*. (2018) estimated a 30.6% decrease in all-Ireland shoveler numbers when the 2015/16 core counts were compared with the 2006/07 to 2010/11 population estimates. Although the proposed development is not expected to cause a significant decline in the SPA's shoveler population, there is potential for indirect adverse water quality impacts and/or disturbance during construction phase which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shoveler other than that occurring from natural patterns of variation.	The 2010/11 Waterbird Survey Programme recorded several shoveler foraging within subsite 0I439 closest to the proposal site (see **Figure 22**, above, for subsite locations) (NPWS, 2012e). Additionally, an I-WeBS report by Fitzgerald *et al.* (2021) lists shoveler as a species occurring in numbers of national importance at the estuary based on counts from 2013/14 to 2017/18 (mean 2,311). While the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via watercourses draining the development site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for shoveler within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.7 Golden Plover [A140]

During winter, golden plover feed primarily within agricultural grassland and arable land. Tidal flats are used more as a roosting/resting habitat and the birds tend to favour large, open tidal flats. Consequently, golden plover tends to occur in large aggregations when observed upon tidal flats. Intertidal feeding is observed to a greater degree during cold weather periods when grassland feeding areas are frozen over. Golden plover is red-listed as a breeding species due to a decline in the breeding and non-breeding (wintering) population.

The conservation objective for golden plover is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for golden plover defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 52**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 52. Assessment of effects on conservation objectives of 'Golden Plover [A140]' (NPWS, 2012f)

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as declining by more than 50% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e), while Burke *et al*. (2018) estimated a 23.5% decrease in all-Ireland golden plover numbers when the 2015/16 core counts were compared with 2006/07 to 2010/11 population estimates. Although the proposed development is not expected to cause a significant decline in the golden plover population, there is potential for adverse water quality impacts and/or disturbance which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by golden plover other than that occurring from natural patterns of variation	Golden plover were recorded in-flight twice during VP surveys and once during transect surveys – see **Section 4.2.8.6**, above, for further details. The subsite 0I439 was one of twelve subsites where golden plover regularly occurred during the 2010/11 Waterbird Survey Programme (see **Figure 22**, above, for subsite locations) (NPWS, 2012e). While the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via watercourses draining the development site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for golden plover within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.8 Lapwing [A142]

Lapwing are traditionally 'inland' waders. During winter they can be observed across a wide variety of habitats, principally using lowland farmland and freshwater wetlands (e.g. turloughs and callows) but also coastal wetlands where they feed on a variety of soil and surface-living invertebrates. They are opportunistic and mobile birds and will readily exploit temporary food sources such as recently ploughed fields. Estuaries are typically used as roosting areas where large flocks may be observed upon the tidal flats. Coastal habitats tend to be used more during cold weather events when farmland and freshwater habitats freeze over. Lapwing is red-listed in Ireland due to a decline in the breeding and non-breeding population.

The conservation objective for lapwing is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for lapwing defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 53**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 53. Assessment of effects on conservation objectives of 'Lapwing [A142]' (NPWS, 2012f)

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as declining by more than 50% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e), while Burke *et al*. (2018) estimated a 16.4% decrease in all-Ireland lapwing numbers when the 2015/16 core counts were compared with 2006/07 to 2010/11 population estimates. Although the proposed development is not expected to cause a significant decline in the lapwing population, there is potential for adverse water quality impacts and/or disturbance which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by lapwing other than that occurring from natural patterns of variation	Lapwing was recorded twice in-flight during VP surveys - see **Section 4.2.8.6**, above, for further details. The species was also recorded throughout the estuary and within subsite 0I439 during the 2010/11 Waterbird Survey Programme (see **Figure 22**, above, for subsite locations) (NPWS, 2012e). While the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via the watercourses draining the development site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for lapwing within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.9 Dunlin [A149]

Dunlin is a common wader along Irish coasts. Wintering populations favour coastal areas such as estuaries and mudflats with the population peaking in mid-winter. They tend to feed in groups on mudflats, often at the water's edge, taking a variety of prey including molluscs, crustaceans and worms. Dunlin is widespread within the site favouring inter-tidal foraging areas. Dunlin is red-listed in Ireland as the majority of the Irish population winters at less than ten sites.

The conservation objective for dunlin is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for dunlin defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 54**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 54. Assessment of effects on conservation objectives of 'Dunlin [A149]' (NPWS, 2012f).

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as declining by more than 50% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e), while Burke *et al*. (2018) estimated a 23.2% decrease in all-Ireland dunlin numbers when the 2015/16 core counts were compared with 2006/07 to 2010/11 population estimates. Although the proposed development is not expected to cause a significant decline in the dunlin population, there is potential for adverse water quality impacts and/or disturbance which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by dunlin other than that occurring from natural patterns of variation	Dunlin was recorded foraging and roosting intertidally at subsite 0I439 and adjacent subsites (see **Figure 22**, above, for subsite locations) during the 2010/11 Waterbird Survey Programme (NPWS, 2012e). While the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via the watercourses draining the development site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for dunlin within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.10 Curlew [A160]

Curlews are the largest wader to spend the non-breeding season in Ireland. Within intertidal areas they seek out larger prey items such as crabs, large worms and bivalves with their decurved bill ideally suited to extracting deep-living worms such as lugworms (*Arenicola marina*). They also take terrestrial worms in damp grasslands. Ireland supports a small and declining population of breeding curlew that are thought to make only short migrations. Many are resident during winter with their numbers enhanced by birds moving in from breeding grounds. Curlew is a red-listed species in Ireland due to a long-term decline in the breeding and wintering population and a contraction of its breeding range. Curlew spend winters in the Shannon and Fergus Estuaries and surrounding coastal grasslands feeding on intertidal mudflats.

The conservation objective for curlew is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for curlew defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 55**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 55. Assessment of effects on conservation objectives of 'Curlew [A160]' (NPWS, 2012f).

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as declining by more than 50% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e), while Burke *et al*. (2018) estimated a 13.4% decrease in all-Ireland curlew numbers when the 2015/16 core counts were compared with 2006/07 to 2010/11 population estimates. Although the proposed development is not expected to cause a significant decline in the curlew population, there is potential for adverse water quality impacts and/or disturbance which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by curlew other than that occurring from natural patterns of variation	Two curlew flights were recorded during the VP surveys - see **Section 4.2.8.6**, above, for further details. The species was also recorded foraging and roosting intertidally at subsite 0I439 and adjacent subsites (see **Figure 22,** above, for subsite locations) during the 2010/11 Waterbird Survey Programme (NPWS, 2012e). While the proposed development will not directly affect the SPA's water quality, there is potential for construction phase activities to indirectly affect water quality via watercourses draining the proposal site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for curlew within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.11 Redshank [A162]

Redshank feed along the upper shore of estuaries and along muddy river channels. They forage mainly by pecking at the surface or probing within intertidal mudflats, often favouring the muddier sections of sites where they prey upon species such as ragworm (*Hediste diversicolor)* and mud snail (*Hydrobia ulvae)*. A particularly favoured prey is the burrowing amphipod *Corophium volutator*, and the redshank will alter its distribution in response to depletion/changes in distribution of these mobile amphipods. Redshank is a red-listed species in Ireland due to a long-term decline in its breeding population.

The conservation objective for redshank is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for redshank defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 56**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 56. Assessment of effects on conservation objectives of 'Redshank [A162]' (NPWS, 2012f).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as declining by more than 50% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e), while Burke *et al*. (2018) estimated a 23.6% decrease in all-Ireland redshank numbers when the 2015/16 core counts were compared with 2006/07 to 2010/11 population estimates. Although the proposed development is not expected to cause a significant decline in redshank population, there is potential for adverse water quality impacts and/or disturbance which could potentially affect population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by redshank other than that occurring from natural patterns of variation	Redshank was recorded foraging and roosting intertidally at subsite 0I439 and adjacent subsites (see **Figure 22,** above, for subsite locations) during the 2010/11 Waterbird Survey Programme (NPWS, 2012e). While the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via watercourses draining the proposal site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for redshank within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.7.12 Black-headed Gull [A179]

Black-headed gull is resident in Ireland throughout the year with numbers boosted by wintering individuals arriving from mainland Europe. The species over-winters and breeds in both coastal and inland locations, nesting in colonies, in sand dunes, coastal islands, moorland polls, bogs and on freshwater lake islands. They are opportunistic feeders and take a wide variety of food items including fish, worms, molluscs, insects and plant material, taking advantage of any available food-source including domestic/fishing waste. They have a wide distribution within the SPA, favouring inter-tidal foraging areas. Black-headed gull is amber-listed due to a long-term decline in its breeding population and distribution.

The conservation objective for black-headed gull is to maintain the favourable conservation condition of this species in the River Shannon and River Fergus Estuaries SPA. The specific species Attributes and Targets for black-headed gull defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 57**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 57. Assessment of effects on conservation objectives of 'Black-headed Gull [A179]' (NPWS, 2012f).

Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Population trend/ Percentage change	Long term population trend stable or increasing	Population status of the species at the SPA was assessed as declining by 25% to 49% when the baseline data for the period 1995/96 to 1999/00 was compared with data from the period 2006/07 to 2010/11 (NPWS, 2012e). Although the proposed development is not expected to cause a significant decline in the black-headed gull population, there is potential for adverse water quality impacts and/or disturbance which could potentially affect the population trends. While no significant effects to this measure are expected, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**
Distribution/ Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-headed gull other than that occurring from natural patterns of variation	Black-headed gull was the most frequently recorded SCI species throughout the bird surveys. During VP surveys, numerous black-headed gull flights were observed within and around the airspace of the proposed development, and on several occasions, groups were seen feeding within agricultural fields north of the site (see **Figure 23**, above). The species was also recorded foraging and roosting at subsite 0I439 and adjacent subsites (see **Figure 22**, above, for subsite locations) during the 2010/11 Waterbird Survey Programme (NPWS, 2012e). While the proposed development will not directly affect the water quality of the SPA, there is potential for construction phase activities to indirectly affect water quality via watercourses draining the	Yes Refer to **Section 9**

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Attribute/Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
		development site. This in turn has the potential to cause significant adverse effects to the range of foraging and roosting habitats for black-headed gull within the SPA, and therefore, mitigation regarding water quality protection will be applied as a precaution.	

8.7.13 Wetlands [A999]

The conservation objective for 'Wetlands' is to maintain the favourable conservation condition of this habitat within the River Shannon and River Fergus Estuaries SPA as a resource for the regularly occurring migratory waterbirds that utilise it. The specific Attributes and Targets for the habitat defined in relation to the achievement of the Conservation Objectives for the SPA are presented in **Table 58**, below. An assessment of the effects of the proposed development against these measures is also included.

Table 58. Assessment of effects on conservation objectives of 'Wetlands [A999]' (NPWS, 2012f).

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Mitigation Required
Wetland habitat area/ Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261 ha, other than that occurring from natural patterns of variation.	The wetland habitats contained within the River Shannon and River Fergus Estuaries SPA are identified as being of conservation importance for non-breeding (wintering) migratory waterbirds. Therefore, the wetland habitats are deemed to be an additional Special Conservation Interest. The wetland habitats of the SPA are categorised into five types – subtidal; intertidal; supratidal; lagoon and associated; and freshwater and associated (NPWS, 2012e). There is no overlap of the proposal site with the SPA so there will be no direct loss of this habitat because of the proposed development. However, there is a hydrological connection between the SPA and the proposed development site via various watercourses that drain into the River Shannon and ultimately the SPA. While the proposed development is not expected to cause a significant decline in the permanent area of wetland habitat, there is potential for water quality of the habitat to be adversely affected which may result in habitat loss, therefore, mitigation regarding water quality protection will be applied as a precaution.	Yes Refer to **Section 9**

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8.8 Assessment of Potentially Significant Cumulative Effects

When in-combination impacts are assessed, it is necessary to identify the types of impacts that may ensue from the project under consideration and from other sources in the existing environment that cumulatively are likely to affect aspects of the structure and function of the relevant European sites (EC, 2021).

The European Commission (EC) (2019) guidelines on the provision of Article 6 of the Habitats' Directive state that the phrase 'in combination with other plans or projects' in Article 3(3) of the Habitats Directive refers to the cumulative effects due to plans or projects 'that are currently under consideration together with the effects of any existing or proposed projects or plans'. Relevant plans and projects have been identified in **Section 6**, above.

8.8.1 Ongoing Activities

8.8.1.1 Introduction

Irish waterbodies are frequently subjected to various anthropogenic activities and pressures that can adversely impact upon water quality. Indeed, more than half of affected waterbodies are impacted upon by more than one pressure type. Agriculture is the dominant pressure source in the country, effecting 53% of Irish waterbodies from 2013 to 2018 (O'Boyle *et al.*, 2019), mainly through nutrient pollution (nitrogen and phosphorus) which can cause excessive plant growth and increase the likelihood of harmful algal blooms.

Significant issues in waterbodies classified as 'At Risk' of not meeting surface waterbody environmental objectives within the Shannon Estuary South Catchment (24) by 2027 are identified in EPA (2021). The most significant pressure on waterbodies within the catchment is agricultural pressure due mainly to the release of excess nutrients (elevated phosphate and ammonia). Other pressures include hydromorphological impacts, domestic and urban wastewater, urban run-off, industry, peat extraction, forestry, mines and quarries, and other impacts[48].

Many watercourses in the catchment are also subject to significantly increased levels of sediment-loading due to forestry activities, mineral/peat harvesting and bank erosion. Forestry and peat extraction can cause ecological problems through increased erosion rates, siltation and nutrient loss. Phosphorus losses come primarily from wastewater discharges, and runoff losses from agriculture on poorly draining soils (O'Boyle *et al.*, 2019). Habitat condition in the catchment is compromised due to hydrological and morphological modifications to the waterbodies particularly in areas where barriers, locks or weirs may be in use. The primary pressures in the sub-catchments containing the proposed development, namely the Shanagolden[Stream]_SC_010 and the Deel[Newcastlewest]_SC_040, are considered to result from agriculture, wastewater, and industrial activities.

As defined in the Natura 2000 Data Form[49] and listed in **Table 59**, below, forestry and peat extraction have been identified as high and medium impact pressures, respectively, on the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA.

[48] 'Abstractions, aquaculture, atmospheric, anthropogenic pressures, historically polluted sites, wastewater treatment and invasive species' (EPA, 2021)
[49] N2K IE0004161 dataforms (europa.eu) Accessed: 19th June 2025

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Table 59. Most important impacts and activities with high effect on the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA as defined in the associated Natura 2000 Data Form.

Threat Level	Threats and Pressures Code	Reference
Low	D01.01	Paths, tracks, cycling tracks
Low	A09	Irrigation
Low	D01.02	Roads, motorways
High	B	Sylviculture, forestry
Low	E01.03	Dispersed habitation
Medium	C01.03	Peat extraction

As defined in the Natura 2000 Data Form[50], the Lower River Shannon SAC, anthropogenic activities and agricultural intensification have been identified as medium impact pressures, while forestry and peat-harvesting have been classed as low-level pressures, as listed in Table 60, below.

Table 60. Most important impacts and activities with high effect on the Lower River Shannon SAC as defined in the associated Natura 2000 Data Form.

Threat Level	Threats and Pressures Code	Reference
Medium	E01	Urbanised areas, human habitation
Medium	K02.03	Eutrophication (natural)
Medium	J02.01.02	Reclamation of land from sea, estuary or marsh
Low	C01.01.02	Removal of beach materials
Low	F01	Marine and freshwater Aquaculture
Medium	E03	Discharges
Low	J02.10	Management of aquatic and bank vegetation for drainage purposes
Medium	A08	Fertilisation
Medium	H04	Air pollution, air-borne pollutants
Medium	A08	Fertilisation
Low	F03.01	Hunting
Medium	A04	Grazing
Low	B	Sylviculture, forestry
Low	J02.12.01	Sea defence or coast protection works, tidal barrages
Low	G01.01	Nautical sports
Medium	J02.01.01	Polderisation
Low	D01.01	Paths, tracks, cycling tracks
Low	C01.03.01	Hand cutting of peat
Low	I01	Invasive non-native species

[50] N2K IE0002165 dataforms (europa.eu) Accessed: 20th June 2025

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As listed within the Natura 2000 Data Form[51], within the River Shannon and River Fergus Estuaries SPA, high impact pressures include fertilisation and urbanisation, while medium impact pressures include recreation, shipping lanes and discharges as listed in **Table 61**.

Table 61. Most important impacts and activities with high effect on the River Shannon and River Fergus Estuaries SPA as defined in the associated Natura 2000 Data Form.

Threat Level	Threats and Pressures Code	Reference
Medium	G01.01	Nautical sports
Medium	D03.02	Shipping lanes
High	E03	Discharges
High	E01	Urbanised areas, human habitation
High	A08	Fertilisation
High	E02	Industrial or commercial areas
Medium	E03	Discharges

8.8.1.2 Agriculture

The main impacts of farming are the loss of excess nutrients, sediment and pesticides to water. Excess ammonium may also be a problem in some waterbodies. These losses arise from point sources such as farmyards or from diffuse sources such as spreading of fertilisers and manures. Excess phosphorus and sediment are typical issues for rivers and lakes, and too much nitrogen is the main issue for estuaries and coastal waters (O'Boyle *et al*., 2019).

In the 3rd Cycle Draft Shannon Estuary South Catchment Report (HA 24) (EPA, 2021), agriculture was identified as a significant pressure in 62 waterbodies within the catchment (including three transitional waterbodies – Deel Estuary, Maigue Estuary, Upper Shannon Estuary). When this figure is compared to the 52 waterbodies in the catchment affected by agriculture during the 2nd Cycle monitoring period, the continued and increasing pressure on waterbodies exerted by agriculture is evident. Farming-related impacts within the catchment mainly involve the loss of phosphorus to surface waters from, for example, direct discharges, or runoff from yards, roadways or other compacted surfaces, or runoff from poorly draining soils. It takes only very small amounts of phosphorus to be lost, relative to the amounts used in agriculture, to cause a water quality problem. Sediment from land drainage works and bank erosion because of animal access also impact upon water quality. In the 2016-2021 EPA Water Quality Report, Trodd *et al.*, (2021) reported the Shannon Estuary South Catchment (24) as being one of five catchments whose river waterbodies had highest phosphate concentrations, 'primarily from run-off from agriculture on poorly draining soils and from wastewater discharges'.

Within the Shanagolden[Stream]_SC_010 and the Deel [Newcastlewest]_SC_040 sub-catchments that drain the proposed development site, agriculture is the principal land use. The water quality effects of the proposed development during the construction phase, together with the previously discussed effects of agricultural practices, could exacerbate potential impacts associated with the proposed development within the catchment and undermine the conservation objectives for the qualifying features of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA as discussed in **Sections 8.2** and **8.3**, above, respectively.

8.8.1.3 Hydromorphology and Drainage

Hydromorphology is the study of the physical character and processes that occur within a waterbody. Hydromorphological modification is a physical alteration to the conditions of a habitat or to the natural

[51] N2K IE0004077 dataforms (europa.eu) Accessed: 20th June 2025

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functioning of a waterbody that can change flow patterns and have an ecological impact. Changes may be caused by various activities such as the dredging and straightening of rivers (channelisation), land drainage, or hard infrastructure such as dams, weirs, culverts, or other obstructions (O'Boyle *et al*., 2019).

According to EPA (2021), hydromorphological modification is a significant pressure in six river waterbodies and one lake waterbody within the Shannon Estuary South (24) Catchment due mainly to the presence of drainage schemes and the resulting increased levels of siltation. Land drainage was responsible for detrimental impacts to three river waterbodies while channelisation was identified as an impact in two river waterbodies and one lake waterbody. Bank erosion and siltation are ongoing issues impacting the Ahacronane_020 Waterbody which drains the proposed development site and ultimately drains to the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.

The water quality effects of the proposed development during the construction phase together with the effects of hydromorphological modifications could exacerbate potential impacts associated with the proposed development within the Shannon Estuary South Catchment (24) and undermine the conservation objectives for the qualifying features of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA as discussed in Sections 8.2 and 8.3, above, respectively.

8.8.1.4 Domestic Wastewater and Diffuse Urban Run-off

Domestic wastewater discharged by households predominantly originates from human metabolism or from day-to-day human activities within single houses that are not connected to sewers and usually in rural settings and is treated on-site in septic tank systems or in individual wastewater treatment systems. If not correctly located, designed, installed and well-maintained, untreated effluent can leak into surrounding waters resulting in elevated nutrient concentrations and posing a significant ecological threat (EPA, 2013).

Within the Shannon Estuary South Catchment (24) domestic wastewater has been identified as a significant pressure in six river waterbodies due to inadequate domestic wastewater systems, many of which are located near to those waterbodies on poorly draining soil or in areas of high pollution impact potential, causing enrichment and microbial/organic contamination of local surface waters and decreased water quality as a result. Additionally, septic tanks are highly susceptible to the transfer of phosphorus via surface pathways and are identified as exerting pressure on five waterbodies within the catchment.

Pollution from diffuse urban run-off can also exert significant pressure on the integrity of waterbodies. Sources include run-off from paved/unpaved areas, domestic plumbing misconnections and leaking sewers which can result in the release of untreated effluent into receiving waterbodies causing elevated nutrient levels and ecological deterioration (O'Boyle *et al*., 2019). There are five river waterbodies within the Shannon Estuary South Catchment (24) that have been identified as being under significant pressure due to diffuse urban run-off, with elevated concentrations of nutrients and organics being the significant issue (EPA, 2021). None of the identified river waterbodies from the catchment are located in either the Shanagolden[Stream]_SC_010 sub-catchment or the Deel[Newcastlewest]_SC_040 sub-catchment.

Without mitigation, the water quality effects of the wind farm during the construction and early operational phases, together with the previously discussed effects of domestic wastewater and diffuse urban run-off, could exacerbate potential impacts associated with the proposed development within the Shannon Estuary South Catchment (24) and undermine the conservation objectives for the qualifying features of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA as discussed in Sections 8.2 and 8.3, above, respectively.

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8.8.1.5 Urban Wastewater

Since 2013, the national population has increased by almost a quarter of a million people with a resultant increase in the amount of wastewater requiring treatment. Works are ongoing by Uisce Éireann (formerly Irish Water) to improve the level of wastewater treatment nationally; however, the level of treatment is still inadequate at 120 locations around the country and raw sewage from 36 towns and villages is being released into rivers at five locations and into coastal waters at 31 locations (O'Boyle *et al*., 2019). As detailed in **Section 6.6**, there are twenty urban wastewater treatment plants (UWWTP) located within the Shannon Estuary South (24) Catchment with **Table 26**, above, providing details on the ten closest to the proposed development site. Of these twenty treatment plants, six have been identified as exerting significant pressure on 'At Risk' waterbodies in the catchment (EPA, 2021) and presented in **Table 62**, below.

Table 62. Details of urban wastewater treatment plants identified as being a significant pressure in 'At Risk' waterbodies within the Shannon Estuary South Catchment (24) as listed in EPA (2021).

Facility name	Facility type[52]	Active license no.	Waterbody impacted	2013-18 ecological status	Expected completion[53]
Dromcollagher Town and Environs	1,001 to 2,000 p.e.	D0316	Ahavarraga Stream_010	Bad	N/A
Charleville and Environs	2,001 to 10,000 p.e.	D0204	Charleville Stream_020	Poor	N/A
Ballingarry	500 to 1,000 p.e.	D0507	Clonshire_010	Poor	N/A
Askeaton Housing Estate (Lismakeera)	< 500 p.e.	A0503	Deel (Newcastlewest)_140	Unassigned	N/A
Hospital Town and Environs	1,001 to 2,000 p.e.	D0314	Mahore_020	Moderate	N/A
Shanagolden	< 500 p.e.	A0219	Shanagolden Stream_010	Poor	N/A

Without mitigation, the water quality effects of the proposed wind farm during the construction and early operational phases, together with the previously discussed effects of urban wastewater, could exacerbate potential impacts associated with the proposed development within the Shannon Estuary South Catchment (24) and undermine the conservation objectives for the qualifying features of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA as discussed in **Sections 8.2** and **8.3**, above, respectively.

8.8.1.6 Forestry

Poorly managed and inappropriately sited forestry operations can adversely affect water quality and aquatic habitats and species. The release of sediment and nutrients and the impacts of acidification are the most common water quality issues arising from forestry. Forestry may also bring about changes in stream flow regimes caused by associated land drainage (O'Boyle *et al*., 2019). Forestry has been identified as a significant pressure in three river waterbodies within the Shannon Estuary South (24) Catchment (EPA, 2021) - none of the identified river waterbodies from the catchment are located in either the Shanagolden[Stream]_SC_010 sub-catchment or the Deel[Newcastlewest]_SC_040 sub-catchment. The significant issues are a combination of the general forestry pressures of clear-felling and associated operations, and an increased sediment/nutrient loading that affects habitats. The proposed development will involve the construction of new tracks, turbines and other infrastructure, which give rise to earthworks that can mobilise silt and nutrients, however none of the proposed development occurs in or adjacent to conifer plantation.

[52] Defined using population equivalent value (p.e.)
[53] Expected completion date for upgrades scheduled under Uisce Éireann's Capital Investment Programme (CIP) (2020-2024) as of February 2021.

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During the construction phase of the proposed wind farm development, there is potential for negative water quality impacts on downstream waterbodies due mainly to earthworks and the release of sediment. There is potential for the proposed development to contribute to a cumulative impact on water quality in local watercourses, within and downstream of the site, by way of sediments and other pollutants potentially entering the watercourses. These water quality effects, coupled with the abovementioned forestry effects, could exacerbate potential impacts associated with the proposed development within the Shannon Estuary South Catchment (24) and undermine the conservation objectives for the qualifying features of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA as discussed in **Sections 8.2** and **8.3**, above, respectively.

8.8.1.7 Industry, Mines and Quarries

Industry has been identified as a significant pressure for one river waterbody and one groundwater body within the Shannon Estuary South (24) Catchment. Significant pressures exerted on watercourses because of industrial practices include impacts brought about by discharges, and emissions from industrial and commercial facilities leading to nutrient and organic problems and a diminution of water quality (O'Boyle *et al.*, 2019).

The Maigue_040 Waterbody[54] within the Shannon Estuary South (24) Catchment is affected by nutrient and organic issues due to Section 4-licensed[55] emissions from an unidentified industrial facility. Within the same catchment, the 'Industrial Facility (P0035-04)' ground waterbody[56] is significantly impacted by an EPA licenced facility, Aughinish Alumina Limited, through excess chemicals and the associated reduction of surface water quality (EPA, 2021).

Within the wider area of the River Shannon and River Fergus estuaries, larger industrial operations exert pressure on local watercourses and on the estuarine waterbodies themselves, indeed, the Rusal Aughinish Alumina Plant itself is one such industrial operation. It is the largest bauxite refinery in Europe, producing two million tons of alumina per year for shipment to smelting plants throughout Europe. The plant has an on-site bauxite residue disposal area (BRDA) that stores millions of tons of the 'red mud' bauxite residue left over after production of alumina[57]. Point source industrial discharges from the plant causing nutrient and organic issues have been identified as a significant pressure to watercourses within the Shannon Estuary South (24) Catchment (EPA, 2021).

The water quality of various river habitats and waterbodies can be adversely affected by quarrying via the generation of elevated levels of silt and dust which can eventually accumulate within watercourses resulting in excessive sedimentation of river channels followed by ecological deterioration. Mining operations mainly impact on the quality of water through the dewatering process used for mineral extraction. This drainage and extraction of minerals can lead to a release of ammonia and fine-grained suspended sediments and can bring about changes to the hydromorphological condition of rivers[58]. Ecological problems caused by quarrying and mining include increased erosion rates, siltation and nutrient loss (O'Boyle *et al.*, 2019).

Quarries have been identified as exerting a significant pressure in two river waterbodies within the Shannon Estuary South (24) Catchment, namely Ahacronane_020, and Deel(Newcastle)_030 (EPA, 2021). The issues arising from this pressure relate to sediment release, nutrient pollution, and morphological impacts.

Without mitigation, the water quality effects of the proposed wind farm during the construction and early operational phases, together with the previously discussed effects of industry, mining and quarrying, could exacerbate potential impacts associated with the proposed development within the Shannon Estuary South

[54] Waterbody Code: IE_SH_24M010400
[55] Discharge licences issued under Section 4 of the Local Government (Water Pollution) Act 1977-1990, for the discharge of trade effluent to surface water or groundwater. Licences set conditions so discharge is treated and controlled in a way that protects the receiving environment.
[56] Ground Waterbody Code: IE_SH_G_252
[57] Aughinish plant gets €2m IDA grant to treat 'red mud' dump | Business Post Accessed: 25th June 2025
[58] *River Basin Management Plan for Ireland 2022–2027* River Basin Management Plan 2022 - 2027 Accessed: 20th June 2025

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Catchment (24) and undermine the conservation objectives for the qualifying features of the Lower River Shannon SAC, and the River Shannon and River Fergus Estuaries SPA as discussed in **Sections 8.2** and **8.3**, above, respectively.

8.8.2 Other Wind Energy Developments

The potential in-combination effects of the proposed wind farm with other wind farms are those that could affect the SCI species of the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA and the River Shannon and River Fergus Estuaries SPA. Potential in-combination effects comprise barrier effects that can be caused when several wind farms are situated in such proximity that they disrupt the movements of birds through an area and create a possible increase in collision mortality. While both potential effects depend on the scale and distance between wind farms and on the bird species that occur in an area, mortality from collision is associated with very high numbers of turbines and densities of birds.

The two-turbine Carrons Wind Farm is located approximately 2.5 kilometres west of the nearest proposed Ballynisky turbine (T1) while the six-turbine Grouse Lodge Wind Farm is situated approximately 4.5 kilometres southwest of the nearest proposed Ballynisky turbine (T3) (refer to **Table 22** and **Figure 17**, above). There are no other wind energy developments in the surrounding landscape for at least 13 kilometres.

The intervening distances between the proposed Ballynisky Wind Farm site and other operational wind farms in the area as shown in **Figure 17**, above, are considered significant and widely dispersed. Accordingly, there is no clustering of turbines at Ballynisky or within the surrounding area and therefore no plausible potential for synergistic interaction between the proposed Ballynisky Wind Farm and other wind farms that could result in significant cumulative effects.

It is, therefore, concluded that there is no potential for synergistic interaction between the proposed Ballynisky Wind Farm and the wind farms shown in **Figure 17**, above, that could cause in-combination barrier, disturbance or mortality effects to the SCI species for which the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA and the River Shannon and River Fergus Estuaries SPA are designated.

8.8.3 Solar Energy Developments

8.8.3.1 Ballinknockane Solar Farm

Should construction of the permitted Ballinknockane Solar Farm (Planning Application Reference: 171220) occur concurrently with the construction phase of the proposed Ballynisky Wind Farm, there is potential for in-combination effects to occur via the Ahacronane River that could affect the qualifying species of the Lower River Shannon SAC and/or the River Shannon and River Fergus Estuaries SPA. The proposed development site for the Ballinknockane Solar Farm lies adjacent to the Ahacronane River and is approximately 5.3 and 6.1 river kilometres downstream from WC2 and WC1, respectively, of the Option A grid route (see **Figure 2**, above, for watercourse crossing locations), therefore, the proposed Ballynisky Wind Farm site is also hydrologically connected, albeit tenuously, to the proposed Ballinknockane Solar Farm site.

However, construction began on the Ballinknockane Solar Farm in 2024, and it is expected to be energised in mid-2026 and fully operational by early 2027. Therefore, as outlined in **Section 5.4.10**, above, the construction phase of the proposed Ballynisky Wind Farm is not expected to begin until after the Ballinknockane Solar Farm construction phase has been completed, and given the significant period of time between the expected energisation of the Solar Farm and the likely timeline to commence the construction phase of the Ballynisky Wind Farm, no adverse in-combination effects will occur as a result of the construction phase of both developments.

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8.8.3.2 Ardgoulbeg Solar Farm

Permission (valid for a 10-year period) was granted in March 2025 to Harmony Solar Rathkeale Ltd for the development of Ardgoulbeg Solar Farm on a 63.4-hectare site near Rathkeale, located approximately 3.5 kilometres east of the proposed Ballynisky Wind Farm site. The Solar Farm site is situated adjacent to the River Deel and is hydrologically connected to the proposed Ballynisky Wind Farm site via the Riddlestown Stream which merges with the River Deel at a point located approximately 8 river kilometres downstream from where the stream passes T3. There is, therefore, potential for cumulative water quality impacts to occur via the Riddlestown Stream that could affect the qualifying species/habitats of the Lower River Shannon SAC and/or the River Shannon and River Fergus Estuaries SPA should the construction phases of the permitted Ardgoulbeg Solar Farm and the proposed Ballynisky Wind Farm occur concurrently.

However, as discussed in **Section 5.4**, above, no in-stream works will be required during construction of Ballynisky Wind Farm and the nearest point of Riddlestown Stream to the development boundary is more than fifty metres. Considering this and the intervening distances of 8 river kilometres to the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA, the potential for significant in-combination water quality impacts effecting the QIs of the SAC and the SCI species of the SPA is low. However, due to the tenuous hydrological link between the proposed Ballynisky Wind Farm site and permitted Ardgoulbeg Solar Farm site via the Riddlestown Stream and the River Deel, a precautionary approach will be taken and a programme of mitigation measures pertaining to protection of water quality is recommended (see **Sections 9.1.2** and **9.2.6**, below).

It is, therefore, concluded that should the construction phases of Ballynisky Wind Farm and Ardgoulbeg Solar Farm occur concurrently, there is no potential for synergistic interaction between the developments that could result in significant cumulative effects that would undermine the conservation objectives for the qualifying features of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.

8.8.4 Climate Change

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2023) published in 2023, states that anthropogenic activities have 'unequivocally caused global warming' and altered global climactic patterns due to the continued increase in global greenhouse gas (particularly carbon) emissions arising from 'unsustainable energy use, land-use and land-use changes, lifestyles and patterns of consumption and production'. Changing of climates is an important environmental influence on ecosystems and can affect them in a variety of ways. For instance, warming may force species to migrate to higher latitudes or higher elevations where temperatures are more conducive to their survival.

As the frequency of events such as wildfires, flooding, and drought become more common, the ability of an ecosystem to temper the impacts of these extreme conditions may become restricted. Moreover, climate change not only affects ecosystems and species directly, but it also interacts with other human stressors such as development which could cumulatively lead to dramatic ecological changes (Settele *et al.*, 2015). Since species differ in their ability to adjust, asynchronies can develop that reduce survival rates of species and the health of ecosystems due to mismatches in the timing of migration, breeding, pest avoidance, and/or food availability (Horton *et al.* 2014).

In Ireland, shifting climactic systems have resulted in higher temperatures and rainstorms of increased intensity and frequency which can have a range of ecological effects. For example, the riverbanks of watercourses draining the proposed development site (see **Figure 2**, above) can be left more vulnerable to erosion in times of heavy rainfall which can then be exacerbated by land 'improvement' measures and hydromorphological changes associated with agricultural activities. The resulting uncontrolled erosion of riverbanks and riparian areas, acting in combination with soil loss and run-off from fields, has the potential to result in unnatural sediment loads and

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siltation of rivers. The construction phase of the proposed development has the potential to impact downstream water quality which, when combined with the aforementioned effects of climate change, may increase the impacts' intensity while also undermining the conservation objectives for the QI species and habitats of the Lower River Shannon SAC (as discussed in **Section 8.6**, above) and the SCI bird species of the River Shannon and River Fergus Estuaries SPA (as discussed in **Section 8.7**, above) located downstream.

To limit the consequences of human-caused global climate change, the achievement of net zero CO^2 (carbon dioxide) emissions via a transition from fossil fuels to low- or zero-carbon energy sources such as wind-generated energy is required (IPCC, 2023). A Renewable Energy Statistics 2023 Report produced by the International Renewable Energy Agency[59] (IRENA, 2023) puts the global total amount of electricity generated from renewable sources in 2021 at 7,858 TWh (terawatt-hour), and of this, 1,838 TWh (23%) was generated by wind energy, representing a 16% increase in global wind power generation when compared to 2020.

Wind-generated electricity in Ireland has increased hugely in recent years, going from an output of 1,923 MW (megawatts) in 2013 to an output of 4,619 MW in 2022 (IPCC, 2023). As detailed in the Renewable Energy in Ireland 2020 Report (SEAI, 2020), 28% of Ireland's electricity in 2018 was wind-generated and the country is now 'a world leader at incorporating large amounts of wind-generated electricity onto the network'. Once operational, Ballynisky Wind Farm will be part of Ireland's expanding renewable energy network - a network that will be pivotal in ensuring the country meets its future carbon emissions reduction targets and, ultimately, in reducing the effects of climate change on the Qualifying Interests of Ireland's European sites.

9. Mitigation

Construction of the proposed six-turbine Ballynisky Wind Farm may potentially cause temporary indirect and significant impacts to the QI species and habitats for which two European sites are classified, namely the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA, as outlined in the impact assessment in the preceding sections. Several planned mitigation measures detailed below will reduce the significance of these impacts.

Refer to **Sections 5.3** and **5.4**, above, for a summary of the proposed development's characteristics and construction phase details, and to **Chapter 03 Description of the Proposed Development** and **Chapter 08 Water** in Volume II of the EIAR for further details.

9.1 Mitigation by Design

9.1.1 Introduction

To ensure the creation of an optimised wind farm layout design, baseline studies were undertaken by the environmental, planning and engineering professionals of the Project Design team (outlined in **Chapter 01 Introduction** in Volume II of the EIAR) to ascertain the site-specific physical and environmental constraints to be considered during the design process. Following the good practice of mitigation by design, the identification of buildable areas suitable for turbines, tracks and infrastructure has been carefully considered and designed to minimise potential environmental impacts while maximising wind potential.

[59] IRENA is a 'lead global intergovernmental agency for energy transformation that serves as the principal platform for international cooperation, supports countries in their energy transitions, and provides state of the art data and analyses on technology, innovation, policy, finance and investment'. About (irena.org) Accessed: 18th June 2025.

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Hydrology was one of the most important environmental constraints considered during the design stage of the proposed development. As discussed in **Section 8.4.1**, above, the existing drainage network within and around the proposed development site creates the potential for a tangible impact pathway between the proposed development site and the two European sites downstream, namely, the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA, both located approximately 7.4 river kilometres downstream from WC3 on the Option A grid route. There is, therefore, a risk of potentially significant impacts to the QI species and habitats of both these European sites should contaminated surface water run-off enter the watercourses draining the proposed development site.

While the NIS has been conducted in the absence of water quality control measures, all measures outlined in **Section 9.2.6**, below, are included in the design of the proposed development to avoid or minimise water quality impacts arising during the construction phase of the proposed development. Refer to **Chapter 03 Description of Proposed Development** and **Chapter 08 Water**, in Volume II of the EIAR for full details.

9.1.2 Surface Water Drainage and Treatment System Design

The site drainage system for the proposed Ballynisky Wind Farm has been designed integrally with the wind farm infrastructure layout to ensure that the proposed development will not change the existing flow regime across the site, will not reduce water quality, and will safeguard the current water quality status of the Shannon Estuary South (24) catchment (and associated sub-catchments) from any potential wind farm-related sediment run-off. Design of the site-specific drainage system considered existing ground conditions and hydrological regime of the site, technical guidance, best management practice manuals and the knowledge gleaned by the MWP design team through work on previous wind farm developments.

Additionally, a site-specific Surface Water Management Plan (SWMP) has been designed for the proposed Ballynisky Wind Farm to prevent or reduce impacts to water quality within the site. Refer to Section 3.4.7 in **Chapter 03 Description of Proposed Development**, in Volume II of the EIAR and the CEMP in **Appendix 3B** of Volume III of the EIAR for further details. The main elements of the plan are summarised below.

Fundamental to any drainage system design is the basic tenet of ensuring that clean water flowing in the upstream catchment, including overland flow and flow in existing drains, is allowed to bypass the works areas without being contaminated by silt generated during on-site works such as from excavations for turbine infrastructure or from movement of delivery vehicles and on-site traffic. Dirty water drains will be provided on one or both sides of the access tracks and along the periphery of the turbines, crane hardstands, substation compound, met mast, and the temporary site construction compound. A drainage system designed to separate the clean and dirty water will ensure a minimal volume of water ultimately requiring treatment. See **Plate 13**, below, for a good example of separate clean water and dirty water drainage channels on a wind farm site.

The clean water will be intercepted and conveyed to the downstream side of the works areas either by piping it or diverting it by means of new drains or earth mounds that are all positioned upslope to prevent any mixing of the clean and dirty water. The outflow from these drains is then piped under the track at suitable intervals and at low points depending on the site topography. However, this may cause an abnormal concentration of flow at specific discharge points downstream of the works and to counter this, each clean water drain will be designed to terminate in a discharge channel running parallel to the ground contours that will function as a weir to ensure dispersal of the flow over a wider area of vegetation. An alternative design method is to allow clean water to discharge through perforated pipes running parallel to the ground contours. Both methods will prevent erosion of the ground surface and will attenuate the flow rate to the downstream receiving waters.

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Plate 13. Separation of clean water and dirty water drainage channels on a wind farm site.

Construction site run-off (dirty water) will be directed via drains to settlement ponds that reduce flow velocities and allow for silt settlement and removal before eventual discharge of treated water via overland dispersal across a wide area of vegetation at a location down-gradient of the proposed construction site. Each settlement pond unit has been micro-sited using contour maps and aerial photos to avail of any level areas and to ensure the outflow is spread over as much vegetation as possible before entering an aquatic buffer zone.

A modular approach has been adopted for the design of the settlement ponds which have been sized to cater for a 1,200 metres^2 works area equivalent to an access track length of 240 metres or the area of a typical turbine base and crane hardstand. Each settlement pond has been designed as a three-stage tiered system with a total surface area of 24 metres^2 (12 metres x 2 metres) and a depth of 1 metre that is divided into three chambers of equal length. In practice, it has been found that most of the settlement occurs in the first chamber with very low turbidity levels being achieved in the final effluent. This tiered system design facilitates the effective cleaning of water with minimal contamination of outflow and has been proven to work effectively on other wind farm construction sites.

See **Plate 14**, below, for an example of a well-constructed and well-maintained multi-tiered settlement pond.

Plate 14. Multi-tiered settlement pond with stone filter.

Each drain is designed to incorporate a series of check dams placed at intervals along the drainage channel to allow for excess run-off to be temporarily stored in an exceptional rainfall event in addition to providing flow attenuation, promoting settlement and reducing scour and ditch erosion. The check dams will be constructed with gravel or other suitable material and will be of a sufficient length and height to ensure their ability to retain water and release it slowly as run-off from the works area subsides. The number of dams required will vary depending on the gradient of the drainage channel with higher gradients requiring a greater number of dams with larger dimensions. Where required, silt fences will be incorporated into the drainage system design and placed at the end of any locally steep section of drain to further reduce the volume of suspended sediment.

During the construction phase of the proposed development, the entire drainage system will be managed and always monitored, particularly after heavy rainfall events. A programme of regular inspections and maintenance will be designed and carried out by dedicated construction personnel. Refer to Section 9.2.6.1, below, for further details of drainage system inspections and surface water monitoring.

9.1.3 Mitigation by Design and Avoidance

As already mentioned in Section 9.1.1, above, the hydrological regime of the proposed development site was a major consideration when the detailed design of the wind farm was being developed, and with regards watercourses within and around the site, the design was driven by a process of mitigation by avoidance. Indeed,

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with information derived from relevant guidance documents, buffers and setback distances are often the main mechanism by which wind farm designers incorporate mitigation by avoidance into the design of a project.

Since three EPA classified watercourses traverse the footprint of the proposed development (refer to **Figure 10**, above), all aspects of the proposed wind farm's internal layout was designed with reference to the best practise guidelines and recommendations outlined in the following documents:

- *Draft Revised Wind Energy Development Guidelines* (DoHLGH, 2019).
- *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016).
- *Best Practice Guidelines for the Irish Wind Energy Association* (IWEA, 2012).
- *Control of water pollution from linear construction projects* (Murnane *et al.,* 2006).
- *Guidelines for the crossing of Watercourses during Construction of National Road Schemes* (NRA[60], 2008).

Consequently, apart from the three watercourse crossings (see **Figure 10**, above) and some other minor works, a 50-metre buffer zone was applied to all watercourses in which no construction works will be permitted. This constraint ensured that mitigation by avoidance was incorporated into the layout design of the proposed development in practically all respects. An example of such design of mitigation by avoidance is presented in **Figure 25**, below, where the southern limit of the material storage area at T3 is governed by the 50-metre setback distance from the 'RATHNAGORE 24' Stream (EPA Code: 24R22).

[60] National Roads Authority, now known as Transport Infrastructure Ireland (TII)

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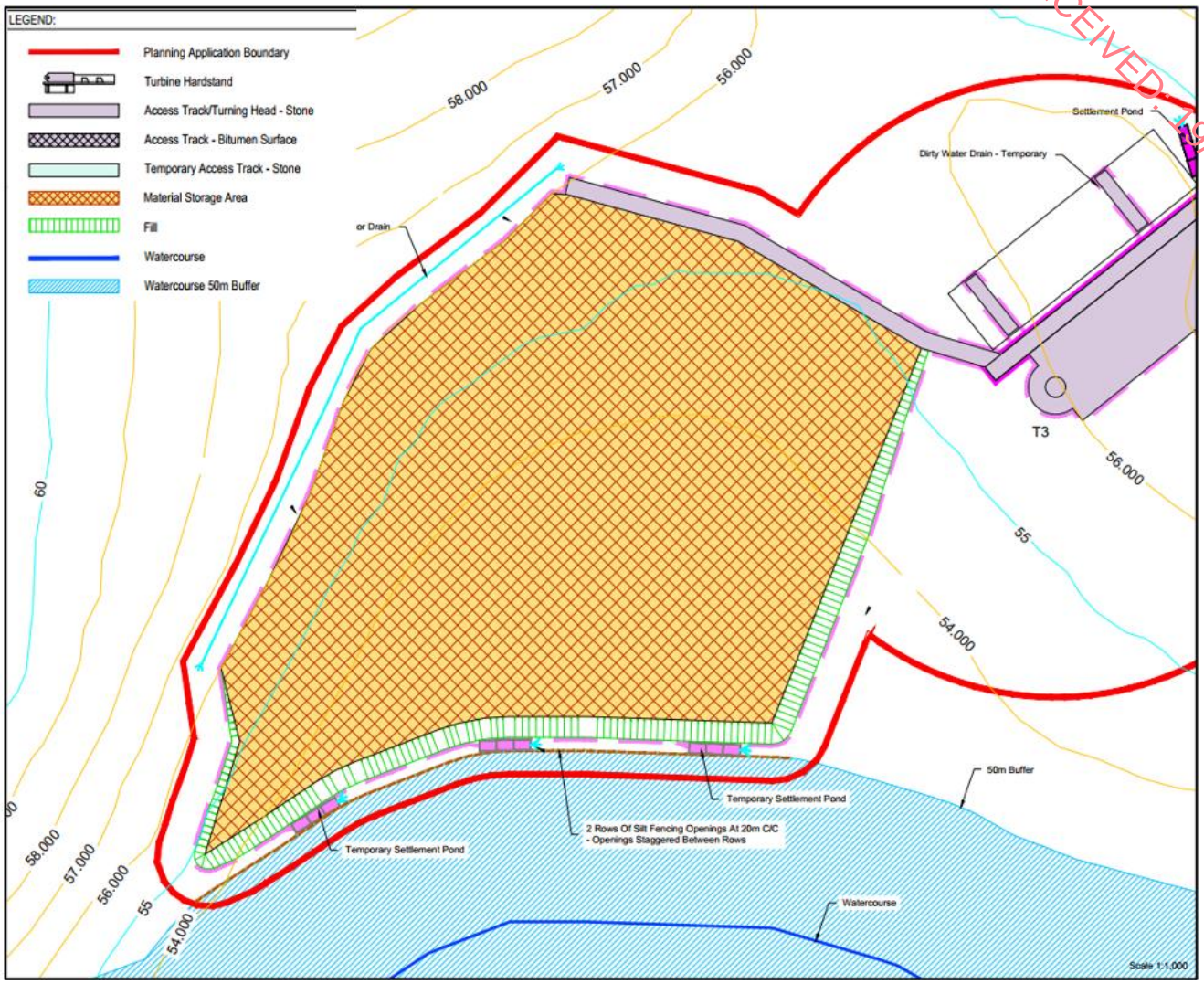

Figure 25: Extract from Planning Drawing 22569-MWP-00-00-DR-C-5412 illustrating how mitigation by avoidance has been incorporated into the design of the proposed Ballynisky Wind Farm through the use of a 50-metre buffer of the 'RATHNAGORE 24' Stream (EPA Code: 24R22) near T3.

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9.2 Mitigation by Management

9.2.1 Construction Environmental Management Plan (CEMP)

A **Construction and Environmental Management Plan (CEMP)** has been prepared (see **Appendix 3B** of **Volume III** of the **EIAR**) and will be updated throughout pre-construction and construction and will be implemented on site to reduce the risk of pollution and improve the sustainable management of resources – refer also to Section 3.5.6.1 in **Chapter 03 Description of Proposed Development**, in **Volume II** of the **EIAR**. The detailed **CEMP** will outline construction practices and environmental management measures which will be implemented during the construction phase to ensure that the entire development is constructed in accordance with best practice with minimum impact on the surrounding environment.

The **CEMP** will provide for systematic waste management identifying types and quantities of wastes arising, their management, documentation, treatment/disposal, and the parties responsible, at all stages of the proposed development. The implementation of the proposed and agreed mitigation measures, monitoring and follow-up arrangements, and management of impacts will be managed through the **CEMP**. The **CEMP** will ensure that the proposed development will be carried out in accordance with any planning conditions applicable and within the agreed schedule.

The construction works will be strictly managed in line with the Contractors **CEMP**, which will include measures for the management of fuel, concrete, stockpiles, run-off, spills and the provision of emergency procedures. The **CEMP** and associated pollution control measures have been devised with reference to the following:

- *Control of water pollution from linear construction projects. Technical guidance (C648)* (Murnane *et al.,* 2006).
- *Control of water pollution from construction sites. Guidance for consultants and contractors* (Masters-Williams, 2001).
- *The management of noxious weeds and non-native invasive plant species on National Roads* (NRA, 2010).

Construction method statements will be prepared prior to commencement of construction and incorporated into the **CEMP** which will be submitted to Limerick City and County Council for agreement and approval prior to commencement of any construction activity. The finalised **CEMP** will include, but not limited to, the following environmental controls:

- Management of excavations;
- Surface water management plan (sediment and erosion control);
- Fuels and oils management;
- Management of concrete;
- Construction waste management plan;
- Wheel wash management procedure;
- Construction dust management;
- Construction noise management;
- Ecological management plan for the protection of habitats and fauna;
- Management of invasive species;

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- Monitoring and auditing procedures;
- Environmental accidents, incidents and corrective actions.

9.2.2 Project Ecologist/Ecological Clerk of Works (ECoW)

A suitably qualified and experienced project ecologist/Ecological Clerk of Works (ECoW) will be employed during the construction phase of the proposed development to ensure all environmental impact prevention controls relevant to construction activities occurring at the time are in place. Duties will include, but are not limited to, a review of all method statements to ensure works are undertaken in compliance with the **CEMP** and the Conditions of Planning; delivery of toolbox talks; and monitoring of construction phase activities to ensure all environmental controls and **EIAR** mitigation is implemented in full. The ECoW will be awarded a level of authority and will be allowed to stop construction activities if he/she deems it necessary. Refer to the **CEMP** in **Appendix 3B** of **Volume III** of the **EIAR** for further detail.

9.2.3 Invasive Alien Plant Species (IAPS) Management

Any and all management and control measures implemented on-site during the construction phase will be carried out strictly in accordance with best practice guidance as set out in '*The Management of Noxious Weeds and Non-native Invasive Species on National Roads*' (NRA, 2010) and best practice management guidelines for various species published by Invasive Species Ireland[61].

Prior to being brought onto the site, all plant and equipment will be cleaned and free of soil/mud/debris or any attached plant or animal material. Prior to entering the site, all plant/equipment will be visually inspected by the Environmental Officer to ensure all adherent material and debris has been removed. A pre-construction survey for IAPS will be carried out by a suitably qualified ecologist prior to any works commencing. Where IAPS occur within the works footprint, the appointed Contractor will develop and implement an appropriate method statement regarding the on-site management of IAPS.

All footwear/waders and equipment that are to be placed (or could possibly be placed) within the water will be treated before using to prevent foreign flora and/or fauna entering the water, and they will be treated after use to prevent IAPS spread to other catchments. Non-native species control will be practised according to '*IFI Biosecurity Protocol for Field Survey Work*' (IFI, 2010) noting that some works components are located at/near watercourses.

9.2.4 Tree Felling and Vegetation Removal – Protection of Birds

To prepare the site for the construction of the internal tracks, turbines and hardstand areas, clearance of small areas of scrub and hedgerows is required. During construction, a limited number of trees will be felled where they occur in line with the infrastructural footprint of the wind farm. Tree felling will be undertaken in accordance with a tree felling licence, using good working practices as outlined by the Department of Agriculture, Food and the Marine (DAFM) Standards for Felling and Reforestation (DAFM, 2019). These standards deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils. Tree felling will also comply with all measures prescribed in the **CEMP** and in accordance with the proposed surface water management for the proposed development. All conditions associated with a proposed felling licence will be complied with.

[61] Resources - Invasives.ie Accessed: 25th May 2025

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Where possible, tree felling and vegetation clearance will only take place before or after the bird breeding season (1st April to August 31st, inclusive). Construction work should commence before the breeding season begins (1st April) to ensure that incubating birds or birds with young are not displaced by the disturbance.

9.2.5 Otter – Protection of Species

No otter holts were found within the proposed development site. No instream works are required for any of the watercourse crossings necessary for the proposed wind farm or along the proposed Grid Connection Options A and B.

For the proposed wind farm, one new watercourse crossing is required along the internal wind farm access track over the Ahacronane River using a clear span bridge design. A clear span bridge design was chosen to avoid impact on the watercourse and to ensure no fragmentation of riparian habitat. In addition to this, Horizontal Directional Drilling (HDD) will be used at 2 No. existing watercourse crossings on Option A Grid Connection Route to the existing Carrons substation.

From a precautionary basis, a pre-commencement otter survey will be undertaken in accordance with standard best practice guidance prior to the commencement of site works to ensure that the baseline assessment for otter has not changed in the intervening period between baseline surveys and that of commence of construction phase. In the unlikely event that an otter holt is identified within or immediately adjacent to the Proposed Project footprint, consultation will be undertaken with Limerick County Council and the National Parks and Wildlife Service (NPWS) and enabling works will only be undertaken under the appropriate NPWS licence.

9.2.6 Surface Water Management and Protection of Water Quality

The main risk to water quality arises from the potential for ingress of sediment or accidental fuel/oil spillages discharging to the watercourses at the proposed development site via the site drainage system or surface flow. Any pollutants entering these watercourses could then be transferred to the downstream freshwater and/or marine waters of the Lower River Shannon SAC and/or the River Shannon and River Fergus Estuaries SPA both located approximately 7.4 river kilometres downstream from WC3.

These risks are particularly acute during excavation and construction activities. Consequently, mitigation measures will be implemented to ensure that pollutants and sediment are not transferred to receiving watercourses via surface water and run-off on the site. Furthermore, the drainage system proposed for the construction phase of the proposed development has been designed to cause minimal disturbance to the current hydrological regime by maintaining diffuse flows. Cross-drains are designed to facilitate existing drains and overland flow, and maintenance of the construction drainage design will be required during the operational phase.

As discussed in Section 8.4.1, above, water quality is a crucial environmental factor underpinning the conservation condition of the complex of wetland habitats and aquatic species and birds that the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA are selected for. Increased sediment levels, nutrient-enrichment, and other aquatic pollution, which could arise in the absence of effective water quality protection measures, would impact on the freshwater ecology of watercourses within the vicinity of the works.

A site-specific Surface Water Management Plan has been designed and is summarised in Section 9.2.6, above, and described in full in the CEMP in Appendix 3B in Volume III of the EIAR. The following subsections provide further detail on the various mitigation measures that will be incorporated into the proposed development to avoid or minimise any water quality impacts that could significantly affect the Conservation Objectives of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.

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9.2.6.1 Drainage System Inspections and Surface Water Monitoring

The drainage and treatment system for the proposed wind farm will be managed and always monitored, particularly after heavy rainfall events during the construction phase. A programme of inspection and maintenance will be designed for dedicated construction personnel to manage ensuring that any failures are quickly identified and repaired to prevent water pollution. A checklist of the inspection and maintenance control measures will be developed, and records kept of inspections and maintenance works. These drainage controls will be kept in place during the operational phase of the wind farm until the vegetation is re-established.

A surface water monitoring schedule will be finalised prior to construction and then followed throughout the construction phase of the proposed development - refer to the Surface Water Management Plan in **Appendix 3E** in Volume III of the EIAR. Monthly monitoring of various parameters including pH, metals, nitrates, and phosphates will also take place. This will be compared with the baseline data obtained prior to construction, as described in **Section 4.2.7.6**, above. If the measured value exceeds the baseline values, the cause will be identified, and remedial measures put in place.

Further details on the surface water quality monitoring programme for all phases of the proposed development are available in **Chapter 08 Water**, in **Volume II** of the **EIAR**.

9.2.6.2 Management of Concrete

There shall be the requirement for some concrete works at the site. It is extremely important to prevent any concrete from entering surface water drains within or around the site as wet concrete is silty and very alkaline (high pH) and can have a serious effect on watercourses and aquatic life if ingress occurs. Refer to the CEMP in **Appendix 3B** of **Volume III** of the **EIAR** for further details.

The following measures will be implemented during concrete works at the site:

- A designated trained operator, experienced in working with concrete, will be employed during the concrete-pouring phase and pouring will be supervised by the Construction Manager, a suitably qualified Engineer, and the Environmental Manager/ECoW.
- There shall be no pouring of concrete during extreme/prolonged rainfall or forecasted heavy rainfall.
- The use of concrete close to drainage features will be carefully controlled to avoid spillage.
- Any small volumes of incidental wash generated from cleaning hand tools, cement mixers or other plant, as required, will be trapped on-site to allow sediment to settle out and reach neutral pH before clarified water is released to the surface water drains or allowed to percolate to ground. Settled solids will need to be appropriately disposed of off-site.
- There will be a dedicated concrete chute washout area on site. To reduce the volume of cementitious water, washout of concrete trucks will not take place on site. Concrete trucks will be washed out off site at the source quarry.

9.2.6.3 Construction Wheel Wash

Wheel washes will be provided for heavy vehicles exiting the site to ensure that roads outside of the site boundary are clean. These can take the form of dry or wet wheel wash facilities. In the case of a wet wheel wash a designated bunded and impermeable wheel wash area will be provided, and the resultant wastewater will be diverted to a settlement pond for settling out of suspended solids. The wheel wash area will be cleaned regularly to avoid the buildup of residue.

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9.2.6.4 Management of Fuel/Oil

Site management will include the checking of equipment, materials storage and transfer areas, drainage structures and their attenuation ability on a regular basis during the construction phase of the proposed development. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations. Refer to the **CEMP** in **Appendix 3B** of **Volume III** of the **EIAR** for further details.

Appropriate fuel management will include the following elements:

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas on flat ground a minimum distance of 50 metres from any watercourse or other water-conducting features e.g. drains.
- Fuel containers will be stored within a secondary containment system e.g., bund for static tanks or a drip tray for mobile stores. Chemicals will be bunded and where applicable, stored within double skinned tanks/containers with the capacity to hold 110% of the volume of chemical contents.
- Ancillary equipment such as hoses and pipes will be contained within the bund.
- Taps, nozzles or valves will be fitted with a lock system and be regularly inspected for leaks and/or signs of damage. Fuel/oil stores including tanks and drums will also be inspected regularly for the same reasons.
- Where required, refuelling on-site will only be carried out at a designated area at least 50 metres from any watercourse with the use of a delivery fuel truck, operated by appropriately trained personnel. Only designated trained operators will be authorised to refuel plant on site.
- Only mechanically sound plant will be permitted to gain access to the site.
- Controls will be regularly inspected and maintained. Regular cleaning and servicing of bunds, gullies, pipe work, oil interceptors will be carried out to ensure this system is operating at its optimum.
- Procedures and contingency plans will be set up to deal with emergency accidents or spills. An emergency spill kit with oil boom and absorbers will be kept on site in the event of an accidental spill. The contents of the spill kit will be replenished if used and they will be checked on a scheduled basis during environmental inspections and audits. All crews will be trained in the use of spill kit equipment.
- All emergency procedures and equipment will be in place prior to the commencement of any works.

9.2.6.5 Refuelling of Construction Plant On-Site

All plant, such as excavators and dumpers, will be refuelled on-site while rigid and articulated vehicles and all site vehicles (jeeps, cars and vans) will be refuelled off-site. Refer to the **CEMP** in **Appendix 3B** of **Volume III** of the **EIAR** for further detail. The plan outlined will have regard to the following elements:

- Refuelling will be carried out using 110% capacity double-bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained to use.
- Plant nappies or absorbent mats will be placed under the refuelling point during all refuelling to absorb drips.
- Mobile bowsers, tanks and drums will be stored in secure and impermeable storage areas, 50 metres away from drains and open water.

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- To reduce the potential for oil leaks, only vehicles and machinery will be allowed onto the site that are mechanically sound. An up-to-date service record will be required from the main contractor.
- Should there be an oil leak/spill, it will be contained immediately using oil spill kits. All oil and contaminated material will be removed from site and properly disposed of in a licensed facility.
- Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and within site vehicles and machinery.
- Correct action in the event of a leak or spill will be facilitated by training all vehicle/machinery operators in the use of the spill kits and the correct containment and cleaning up of oil spills or leaks. This training will be provided by the Environmental Manager at site induction.
- In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill-kits kept inside site vehicles and machinery.

9.2.6.6 Storage

The storage of materials, containers, stockpiles and waste, however temporary, will follow best practice at all times and be stored at the designated areas. All containers will be stored upright and clearly labelled. Sufficient storage will be supplied near all working areas.

Storage will be located as follows:

- Away from drains and streams;
- On an impermeable base;
- Under cover to prevent damage from the elements;
- In secure areas;
- Well away from moving plant, machinery and vehicles.

Temporary storage of Cement Bound Granular Mixtures (CBGM) during construction of the cable trench will be on hardstand areas, or areas that are not prone to run off and where there is no direct drainage to surface waters. The area will be appropriately bunded in the form of sandbags, geotextile sheeting, or silt fencing. This method will prevent any solids run-off.

9.2.6.7 Excavations

All site excavations and construction will be supervised by a suitably qualified and experienced engineer. The Contractor's method statements for each element of work will be reviewed and approved by the engineer prior to site operations. Specific method statements will be developed for each turbine and hardstanding location within the site.

Prior to excavation, drains will be established to effectively intercept overland flow prior to earthworks. The existing network of drainage within the site will be used whenever possible.

Bulk excavations will be done during periods of dry weather to avoid run off from exposed excavation areas. Weather will be monitored during the proposed development, and no excavation works will be allowed during severe or heavy rainfall events. All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Where appropriate and necessary, cuts and excavations will be protected against ingress of water or erosion using cut-off drains around the excavation works. Temporary works will be such that they do not adversely interfere with existing drainage channels/regimes.

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Plant and materials will be stored in approved locations only (such as the proposed site compound) and will not be positioned or trafficked in a manner that would surcharge existing or newly formed slopes. Vehicular movements will be restricted to the footprint of the permitted development, particularly with respect to the newly constructed access tracks. This implies that machinery will be restricted to use on existing tracks/hardstands/yard areas and, aside from advancing excavations, will not move onto areas that are not permitted for the development.

9.2.6.8 Excavated Materials and Soil Management

All soils generated from excavation works within the proposed wind farm site such as from turbine, track and internal cable construction will be retained on site and reused in bunding, landscaping and restoration of deposition areas. No soils will be removed from the site. Stockpiling of soils will be avoided on site. After completion of the construction phase works, no permanent stockpiles will be left on site apart from material placed in the designated permanent storage area.

During grid connection excavations, excavated material will be temporarily stockpiled adjacent to the section of trench as it is removed for re-use as backfill. Excess/unsuitable material will be immediately removed to a deposition area. Appropriate siltation measures will be put in place prior to excavations. Stockpiles will be temporarily stored a minimum of 50 metres back from watercourses on level ground. Silt-retaining measures (silt fence/silt curtain or other suitable materials) employed to reduce the risk of silt run-off will be installed along the downgradient edges of stockpiled earth materials.

9.2.6.9 Dewatering

All groundwater/surface water that may enter turbine foundations or cable trenches/joint bays will be removed and treated and disposed of appropriately, in accordance with the measures outlined hereunder. Any dewatering (if/where required) will adhere to the following measures:

- Groundwater/surface water will not be pumped directly into trackside drains/watercourses;
- Groundwater/surface water within the turbine base excavations will be conveyed through drainage channels to the drainage and settlement system. High-capacity pumps will be avoided to prevent significant flow rates to the drainage and settlement system that may overload the system; and
- Where necessary, temporary storage of groundwater/surface water will be provided within the excavations and dewatering carried out at a flow rate that is within the capacity of the settlement ponds.

9.2.7 Risk of Accidents

Given the temporary nature of the construction stage and the scale of the proposed development, as well as the environmental controls that will be implemented from the outset, the risk of disasters (typically considered to be natural catastrophes e.g. a very severe weather event) or accidents (e.g. fuel spill, traffic accident) is considered low. To minimise environmental risk, no concrete pours will take place during severe weather events such as during flooding or heavy rainfall (10 mm/hr).

Best construction practice, including that for Health and Safety, will be employed to minimise the risk of any accidents occurring. All work on site will be carried out in compliance with the Health and Safety Act 2005, the Health and Safety (Construction) Regulations 2013, and all relevant Legislation and Work Practice to ensure that the construction areas, site environs and public roads remain safe for all users.

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9.3 Operational Phase

9.3.1 Water Quality Measures

Following completion of construction, on-site levels of traffic and excavation works will be extremely low, and the risk of sediment run-off will be negligible. Sediment ponds and silt fences erected for the protection of water quality during the construction phase will remain in place, although it is proposed to partly fill in the sediment ponds with stone so that they will not present a long-term safety risk. Run-off from the tracks, hard-standings, and other works areas will continue to be directed to these ponds and from there to the outfall weirs. Check dams within the drainage channels will also remain in place.

There will be increased rates of surface water run-off at the site due to the increased amount of hard surface areas of the development which could lead to an increased flood risk down-gradient of the site. The retention of the drainage infrastructure will ensure that run-off continues to be attenuated and dispersed across existing vegetation before reaching downstream receiving waters. The run-off control measures for the wind farm site have been designed in the context of storm events of varying duration and intensity. The settlement ponds have been designed to cater for a maximum continuous flow rate associated with a medium intensity rainfall event. Higher intensity run-off will be attenuated by the open drain collection system which provides temporary storage and limits the rate at which the run-off enters the settlement ponds.

The surface water drainage system will be managed and appropriately maintained as per standard best practice to ensure an adequate discharge quality and to control the quantity of run-off. Regular inspections by the operational maintenance personnel will ensure culverts are free from blockages and that there is no damage or erosion of the stream crossing wing walls, particularly after storm events. Silt ponds will also be inspected and maintained before drains and verges have vegetated.

Water monitoring will continue during Years 1 and 2 of the operational phase, commencing after completion of the construction phase.

Biological water quality monitoring will be undertaken to monitor surface water quality during the operational phase. It is proposed that macroinvertebrates be sampled annually for the first three years at the aquatic survey sites summarised in **Table 1** and **Figure 2**, above, and detailed in the Aquatic Ecology Report in **Appendix 6C** of Volume III of the EIAR. Should it be found that there is instability within the macroinvertebrate communities, the surveys will continue beyond Year 3 until stabilisation of the communities has been achieved.

9.3.2 Lights on Turbines

Lights on turbines can reduce the potential risk of collision to birds. The use of “white lights” on the turbines will be avoided as these can attract insects, which may then attract insectivorous bird species or night-flying birds such as migrating individuals.

Any form of lighting on turbines or other structures will be agreed in advance with the Irish Aviation Authority.

Any lighting introduced to the proposed development site will follow guidance in the following documents:

- *Guidance Note GN 08/23. Bats and Artificial Lighting at Night* (BCT, 2023); and
- *Bats and Lighting: Guidance Notes for planners, engineers, architects and developers* (BCI, 2010).

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9.4 Decommissioning Phase

Mitigation measures for the decommissioning phase will be like those of the construction phase; however, decommissioning will be of a significantly lesser scale, as large-scale excavations will not be required.

10. Monitoring (Avian Fauna)

A programme of operational-phase avian monitoring will be undertaken in prescribed monitoring years during the operational lifetime of the proposed Ballynisky Wind Farm. The SNH guidance document '*Monitoring the impact of onshore wind farms on birds*' (SNH, 2009) requires that bird monitoring in wind farms should occur in years 1, 2, 3, 5, 10 and 15 after the turbines become operational.

The following ornithological surveys will be undertaken during prescribed monitoring years with the methodologies summarised in the sub-sections hereunder:

- Vantage point surveys
- Transect walkover surveys
- Collision monitoring surveys

10.1 Vantage Point (VP) Surveys

Vantage point (VP) surveys will be undertaken to monitor flight activity within a 500-metre radius of the proposed turbine positions. Surveys should be conducted from the same two fixed point vantage points as were used during pre-planning surveys (**Figure 7-3**). Should vantage point locations need to be moved, a viewshed analysis will be conducted to ensure there is still comprehensive coverage of the 500-metre radius of turbines at the new locations.

Flight activity of target species will be mapped and recorded as per defined flight bands chosen in relation to the dimensions of the turbines as built: below rotor swept height, at the rotor swept height and above rotor swept height. In addition, the presence of any non-target species will be recorded to inform the evaluation of supporting habitat.

10.2 Transect Surveys

In accordance with SNH guidance (SNH, 2017) and current best practice guidance (NatureScot, 2025), VP surveys will be accompanied by transect surveys to record supplementary information on bird populations within 500 metres of the site. Transect surveys will be undertaken during the breeding and non-breeding seasons.

10.3 Collision Searches

The objective of collision monitoring and corpse searches is to establish whether bird fatalities are occurring as a result of collision with turbine blades.

Carcass searches were traditionally completed by human observers whose efficiency is influenced by several factors including carcass type, environmental conditions, and observer competence. Numerous studies have been conducted demonstrating that dogs have a superior ability to detect bird and bat carcasses when compared with humans, particularly with small carcasses or in dense vegetation. A trained dog under the control of a handler will be used to carry out carcass searches at Ballynisky Wind Farm once operational.

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A comprehensive onsite fatality monitoring programme will follow best practice guidance (SNH, 2009) and include:

- Carcass removal trials to establish levels of predator removal of possible fatalities. This should be done following recommended best practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. At the time of publication, predation trials set using trail cameras following guidance set out in (Smallwood, 2010) provide the most accurate results.
- Turbine searches for fatalities should be undertaken with the use of conservation dogs following best practice in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above. At the time of publication, the typical search area surrounding the turbine bases follows '*Impacts Of Wind Energy Developments On Birds And Bats: Looking Into The Problem*' by Edkins (2014) who recommends the ''search width should be equal to the maximum rotor tip height''.
- Search intervals would follow (SNH, 2021).
- Recorded fatalities should be calibrated against known predator removal rates to provide an estimate of overall fatality rates. The analysis tool Evidence of Absence V2 (Dalthorp *et al*. 2017) is recommended as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.

Post-construction fatality monitoring will be carried out in Years 1, 2, 3, 5, 10 and 15 after the turbines become operational. Monitoring reports to be submitted to Limerick City and County Council after each year of monitoring. At the end of this period, the results will be reviewed in consultation with Limerick City and County Council and NPWS, and future monitoring needs and gaps will be identified to determine the frequency of monitoring in subsequent years including any decision to reduce the frequency of surveys. This will be agreed with NPWS, allowing an adaptive approach to monitoring at site.

11. Residual Impacts

Based on the above information in the preceding sections, in view of best scientific knowledge, on the basis of objective information, there is no potential for adverse effect on the identified QIs or SCIs and their associated targets and attributes, or on any European Site. Potential pathways for effect have been robustly blocked through measures to avoid impacts and the incorporation of best practice/mitigation measures into the project design.

Taking cognisance of measures to avoid impacts and best practice/mitigation measures incorporated into the project design which are considered in the preceding sections, the Proposed Development will not have an adverse effect on the integrity of any European Site.

Based on the above, it can be concluded in view of best scientific knowledge, on the basis of objective information that the Proposed Development will not adversely affect the Species Conservation Interests or Qualifying Interests associated with the screened in European Sites as follows:

- Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA,
- River Shannon and River Fergus Estuaries SPA.
- Lower River Shannon SAC

With the implementation of the mitigation measures, as outlined in Section 9 above, it is objectively concluded that significant adverse residual impacts on the Conservation Objectives of any of the identified European sites evaluated herein, namely the Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA, the

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Lower River Shannon SAC, and the River Shannon and River Fergus Estuaries SPA, will not occur as a result of the proposed development, either independently or in combination with other plans or projects.

12. Conclusion

The Habitats Directive 92/43/EEC provides legal protection for species and habitats of European importance via the selection of geographical areas considered to be of particular importance to a region's most valuable and threatened species. This pan-European Natura 2000 network of protected areas, otherwise known in Ireland as 'European sites', includes Special Areas of Conservation (SACs) designated for habitats, plants and non-avian species, and Special Protection Areas (SPAs) designated for avifauna and their habitats (under the Birds Directive (79/409/ECC as codified by Directive 2009/147/EC)). To ensure the longevity of these European sites and to maintain or restore the favourable conservation statuses of the habitats and species within them, Articles 6(3) and 6(4) of the Habitats Directive set out a series of steps/stages that must be applied to plans and projects that may have a significant effect on a European site.

A Screening for Appropriate Assessment (Stage 1) was undertaken to identify whether the proposed Ballynisky Wind Farm development is likely to have significant direct or indirect impacts (or significant impacts could not be ruled out) on European sites identified as being within the zone of impact influence of the proposed development. The zone of impact (ZOI) was ascertained through the application of the Source-Pathway-Receptor (SPR) model and all European sites deemed to be located within this ZOI were considered. The screening process concluded that the proposed construction, operation and eventual decommissioning of Ballynisky Wind Farm was not likely to have significant direct or indirect effects, either individually or in combination with other plans or projects, on three European sites within the zone of influence. However, the same conclusion could not be reached with regards three other European sites, namely the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, the Lower River Shannon SAC, and the River Shannon and River Fergus SPA, and therefore, significant effects because of the proposed development could not be ruled out. Consequently, the project proceeded to Stage 2 of the Appropriate Assessment process, and a Natura Impact Statement was produced.

This Natura Impact Statement (Stage 2) has considered the impact of the proposed development on the integrity of three European sites, namely the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, the Lower River Shannon SAC, and the River Shannon and River Fergus SPA, either alone or in combination with other plans or projects, in relation to the structure, function and conservation objectives of each site. Following an examination, analysis and evaluation of the relevant information and best scientific knowledge, including in particular the nature of the predicted impacts from the proposed development, and with the implementation of the mitigation measures proposed, it has been determined the proposed construction, operation and eventual decommissioning of a 6-turbine wind farm at Ballynisky in County Limerick will not adversely affect (either directly or indirectly) the integrity of the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA or the Lower River Shannon SAC or the River Shannon and River Fergus SPA, either alone or in combination with other plans or projects, in light of the specific conservation objectives of each site.

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Appendix 1

Screening for Appropriate Assessment Report

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MWP

Screening for Appropriate Assessment Report

Ballynisky Wind Farm, County Limerick

Ballynisky Green Energy Limited

December 2025

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Appendices

Appendix 1 – Stages of Appropriate Assessment

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1. Summary of Findings

1.1 Screening for Appropriate Assessment

Project Title	Ballynisky Wind Farm
Project Proponent	Ballynisky Green Energy Limited
Project Location	The proposed development site is situated in the townlands of Ballynisky, Graigoor, Ballyegny More, Kilbradran, Ballysteen, Dunmoylan, Carrons, and Lisbane to the west of Coolcappa in northwest County Limerick, approximately 6 kilometres northwest of Rathkeale and 9 kilometres north of Newcastle West.
Screening for Appropriate Assessment	The screening for Appropriate Assessment report is undertaken to determine the potential for likely significant effects of a proposed wind energy development, individually, or in combination with other plans or projects, in view of the conservation objectives of certain European sites identified within this report.
Conclusion	It has been objectively concluded during the screening process that significant effects on the following European sites are not likely to occur because of the proposed development: ▪ Askeaton Fen Complex SAC (002279) ▪ Barrigone SAC (000432) ▪ Curraghchase Woods SAC (000174) However, it cannot be objectively concluded, at this stage, that the proposed Ballynisky Wind Farm will not result in in likely significant effects on the following designated European sites: ▪ Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161) ▪ Lower River Shannon SAC (002165) ▪ River Shannon and River Fergus Estuaries SPA (004077) Therefore, an Appropriate Assessment is required, and a Natura Impact Statement is necessary to assess the implications of the project alone and in-combination with other plans and projects on the integrity of the European sites in view of their conservation objectives.

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2. Introduction

2.1 Purpose of the Assessment

This screening for Appropriate Assessment (AA) report has been undertaken to determine whether a proposed wind energy development, 'Ballynisky Wind Farm', consisting of six (6) No. turbines and grid connection cable route within the townlands of Ballynisky, Graigoor, Ballyegny More, Kilbradran, Ballysteen, Dunmoylan, Carrons, and Lisbane in northwest County Limerick is likely to result in significant effects on nearby sites with European conservation designations (i.e. Natura 2000 Sites)[1].

This report has been prepared in order to provide a sufficient level of information to the competent authority, in this case Limerick City and County Council (LCCC), on which to base an Appropriate Assessment of the proposed wind energy development described in Section 4.2.

The report comprises a description of the proposed development, particularly the aspects that could interact with the receiving environment, the identification in Section 4.7 of the impacts that are reasonably foreseeable as potentially ensuing from it, and a determination as to whether these predicted impacts, either alone or in combination with the other plans or projects identified in Section 4.5, are likely to have significant direct and/or indirect effects on the European sites identified in Section 4.6, in view of those sites' conservation objectives.

2.2 Statement of Competency

This screening for Appropriate Assessment report has been prepared by Úna Williams (BSc. MSc.), Senior Ecologist and Environmental Scientist, at Malachy Walsh and Partners (MWP) Engineering and Environmental Consultants.

Úna has worked with MWP in County Kerry for over six years and is an experienced field ecologist. She is familiar with various ecological survey methodologies including habitat/survey mapping and zoological surveys and has worked on research teams both in Ireland and abroad. She has undertaken assessments for a wide variety of projects including for renewable energy developments, and infrastructural and coastal developments. Úna has designed and carried out several Collision Risk Models for proposed wind farms and has authored many ecological reports including Screenings for Appropriate Assessment Reports (Stage 1), Natura Impact Statements (Stage 2), and Ecological Impact Assessments. She graduated from Queen's University Belfast in 2018 with an MSc in Animal Behaviour and Welfare, and from Trinity College Dublin in 2008 with an Environmental Science degree.

This report was reviewed by Gerard Hayes (BSc.), a Senior aquatic ecologist formerly of MWP with over fifteen years experience of environmental consultancy. He is a member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and the Freshwater Biological Association (FBA). Gerard has a diverse ecological profile - Phase 1 habitat, mammal (including bats), bird, amphibian, macroinvertebrate, and tree survey experience. He has had numerous responsibilities including waste assimilation capacity assessment, report writing (EIS, EIA, EA, AA, NIS) and ecological monitoring. His project involvement has been primarily in the areas of wind energy development, wastewater treatment plants, roads/bridges, water supply, flood defence and hydro schemes. He has co-authored and/or carried out surveys for NPWS Irish Wildlife Manual No. 15, 24, 26, 37, 45.

[1] 'European sites' are defined in Section 177R of Part XAB of the Planning and Development Act 2000 and include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) at all stages of designation.

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2.3 Project Overview

Ballynisky Green Energy Limited ('the Applicant') is submitting a planning application for developing and operating a six-turbine wind farm development on privately-owned lands at Ballynisky in County Limerick. For the purposes of this assessment, the 'proposed development' refers to all elements of the proposed wind energy project including all wind farm infrastructure, new on-site 38kV electrical substation, and two Grid Connection Options – Option A and Option B - discussed further in **Section 4.2.2**, below.

It is envisaged that the proposed six-turbine development will have an output of approximately 27MW (megawatts). The Applicant is seeking a 10-year permission to construct the development which, once commissioned, will have an expected operational life of no less than 35 years from the date of commissioning.

MWP was commissioned by the Applicant to complete a Screening for Appropriate Assessment Report and, if necessary, a Natura Impact Statement (NIS). MWP have also prepared an Environmental Impact Assessment (EIA) and an Environmental Impact Assessment Report (EIAR) that are submitted as part of the planning application.

2.4 Legislative Context

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and wild fauna and flora through the designation of Special Areas of Conservation (SACs), while the Birds Directive (2009/147/EC) seeks to protect bird species of special importance via the designation of Special Protection Areas (SPAs). It is the responsibility of each European Union (EU) member state to designate SPAs and SACs that form part of Natura 2000, a network of protected sites throughout the European Community. The European Communities (Birds and Natural Habitats) Regulations 2011-2021 transpose the Habitats Directive and the Birds Directive into Irish law. The requirement for Appropriate Assessment of the implications of plans and projects on the Natura 2000 network of sites comes from the Habitats Directive (Article 6(3)). Further information is available at:

http://ec.europa.eu/environment/nature/legislation/habitatsdirective/

http://www.npws.ie/planning/appropriateassessment/

The current assessment was conducted within this legislative framework and in accordance with the following:

- The European Commission (EC) guidelines '*Assessment of plans and projects in relation to Natura 2000 sites - Methodological Guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*' (EC, 2021);
- The EC Notice '*Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*' (EC, 2019);
- The National Parks and Wildlife Service (NPWS) guidelines '*Appropriate Assessment of Plans & Projects - Guidance for Planning Authorities'* (DEHLG, 2010); and,
- The Office of the Planning Regulator (OPR) Practice Note '*Appropriate Assessment Screening for Development Management*' (OPR, 2021).

As outlined in these, it is the responsibility of the proponent of the project, in this case Ballynisky Green Energy Limited ('the Applicant'), to provide a comprehensive and objective screening for Appropriate Assessment report and a sufficient level of information to the competent authority to assist them in completing their own screening exercise.

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If it is determined that an Appropriate Assessment is required in respect of the construction, operation and decommissioning of the proposed wind farm, a Natura Impact Statement (NIS) must be prepared. The NIS will assist the competent authority to conduct the Appropriate Assessment for the proposed development.

2.5 Stages of Appropriate Assessment

The Appropriate Assessment process is a four-stage process with issues and tests at each stage. The purpose of the screening assessment is to record in a transparent and reasoned manner the likely effects on European sites of a proposed development or proposed works. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four different stages are set out in **Appendix 1** of this report. This proposal has proceeded as far as Stage 1.

3. Methodology

3.1 Appropriate Assessment Guidance

A plan or project can only be authorised by a competent authority if it has made certain that it will not adversely affect the integrity of the European sites relevant to the project in view of their conservation objectives, either alone or in combination with other plans and projects. This can only be the case where "no reasonable scientific doubt remains as to the absence of such effects"[2].

As set out in the NPWS guidance, the task of establishing whether a plan or project is likely to influence a European site(s) is based on a preliminary impact assessment using available information and data, including that outlined above, and other available environmental information, supplemented as necessary by local site information and ecological surveys (DoEHLG, 2010). This is followed by a determination of whether it is likely that the effects identified could be significant. The precautionary principle approach is required in line with the Commission of the European Communities Guidelines - '*Communication from the Commission on the Precautionary Principle*'[3].

Once the potential impacts that may arise from the proposal are identified, the significance of these is assessed using the following key indicators:

- Water quality and resource;
- Habitat loss or alteration;
- Disturbance and/or displacement of species; and
- Habitat or species fragmentation.

3.2 Consultation

A pre-planning consultation with Limerick City and County Council (LCCC) occurred on 10th November 2022. During the meeting, the Applicant and MWP presented an overview of the proposed development to LCCC that included details of the development's location, layout, constraints, traffic and access, and progress to date. The grid connection options, the turbine delivery route from Foynes Port, any potential visual impacts, public

[2] European Court of Justice Case C-127/02 Landelijke Vereniging tot Behoud van de Waddenzee
[3] Communication from the Commission on the precautionary principle - Publications Office of the EU Accessed: 24th July 2025

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consultation, the Natura Impact Statement (NIS) and the Environmental Impact Assessment Report (EIAR) were also all discussed during the meeting.

A second meeting was held with LCCC on 17th July 2024 whereby the proposed underground grid connection options were further discussed. A third pre-planning meeting was held with LCCC on the 18th December 2025.

On the 19th/22nd August 2022, the following statutory and non-statutory bodies were consulted, amongst others, in relation to the proposed development:

- Department of Housing, Local Government and Heritage (DoHLGH);
- Department of Environment, Climate and Communications (DoECC);
- Department of Agriculture, Food and the Marine (DoAFM);
- National Parks and Wildlife Service (NPWS);
- Geological Survey Ireland;
- An Taisce - The National Trust for Ireland;
- Bat Conservation Ireland (BCI);
- Inland Fisheries Ireland (IFI);
- BirdWatch Ireland;
- Irish Wildlife Trust;
- Irish Aviation Authority (both the Headquarters and the Shannon Centre); and
- Transport Infrastructure Ireland (TII) (formerly called the National Roads Authority (NRA)).

A full list of the organisations/groups consulted, copies of the consultation documents and the responses received are provided in **Appendix 1B** in Volume III of the EIAR.

In October 2022, the Applicant commenced public consultation on the proposed wind energy development prior to hosting a public consultation event on 7th December 2022 at Coolcappa Community Hall. Community members were encouraged to attend and use the opportunity to engage with Ballynisky Green Energy Limited to acquire further information regarding the proposed development. Community consultation has been ongoing since then.

3.3 Desktop Study

To complete the screening for Appropriate Assessment report, certain information on the existing environment is required. A desktop study was carried out to collate information available on the proposed development site's natural environment. This comprised a review of relevant publications, data and datasets from the following sources:

- Ordnance Survey Ireland (OSI) aerial photography, 1:50000 mapping, GeoHive and online satellite imagery sources;
- National Parks and Wildlife Service (NPWS);
- National Biodiversity Data Centre (NBDC) (online map-viewer);
- Central Statistics Office (CSO) – Census of Agriculture (online);
- BirdWatch Ireland;
- Bat Conservation Ireland (BCI);

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- Geological Survey Ireland (GSI) area maps (including Teagasc soil area maps);
- Environmental Protection Agency (EPA) water quality data and maps;
- Shannon International River Basin District (ShIRBD) datasets (Water Framework Directive);
- Inland Fisheries Ireland (IFI) online fish sampling reports and fish data;
- Review of requested records from NPWS Rare and Protected Species database;
- Limerick Development Plan (2022 – 2028)[4]; and
- Other sources and research listed in **Section 5**, below, and as footnotes throughout the report.

3.3.1 Data Requests and Database Searches

The proposed development site lies within the Ordnance Survey Ireland (OSI) National Grid hectad[5] R24 (western side of site) and hectad R34 (eastern side of site). Concise and site-specific information on species records available in this hectad was retrieved from the NBDC on-line database and reviewed.

On 11th February 2022, a request was made to NPWS for Sensitive Data Access and for records of rare or protected species within a 5-kilometre radius of the proposed development site encompassing hectads R24 and R34, as well as smaller northern sections of hectads R23 and R33. Information was provided by NPWS on 17th February 2022. On 28th November 2022, an additional request was made to NPWS for Sensitive Data Access for hectads R24 and R34, and the information was provided by NPWS on 30th November 2022.

A data request was also submitted to Bat Conservation Ireland (BCI) on 21st January 2023 for the provision of bat records within a 10-kilometre radius of the proposed development site. All available records were provided by BCI on 24th January 2023. To supplement this data, any available NBDC and BCI databases were consulted for details on bat records held for the proposed development site and its environs on 21st April 2023 with a recheck of these databases carried out on 28th October 2023.

Information received via the NPWS, BCI and the NBDC was used to help inform the impact assessment in relation to the proposal.

3.4 Study Area and Zone of Influence (ZOI) of the Proposed Development

The zone of influence (ZOI) for the proposed development is the geographical area over which construction and/or operation and/or decommissioning of the proposed wind farm has the potential to affect the receiving environment in such a manner as to significantly affect the Qualifying interests (QI) of a European site. The area over which ecological features may be affected by biophysical changes because of the proposed project and associated activities is likely to extend beyond the project site where, for example, there are ecological or hydrological links beyond the site boundaries (CIEEM, 2018). Consequently, and to ensure completion of an integrated assessment, the study area for this project included the entire proposed development site, its adjacent habitats and the downstream watercourses ecologically connected to them (see **Figure 1**, below).

For information on the use of the Source-Pathway-Receptor (SPR) model in determining which European sites should be further assessed, refer to **Section 4.6.1**, below.

[4] Limerick Development Plan 2022-2028 | Limerick.ie Accessed: 6th June 2025
[5] Hectad - unit of land area measuring 10 km x 10 km.

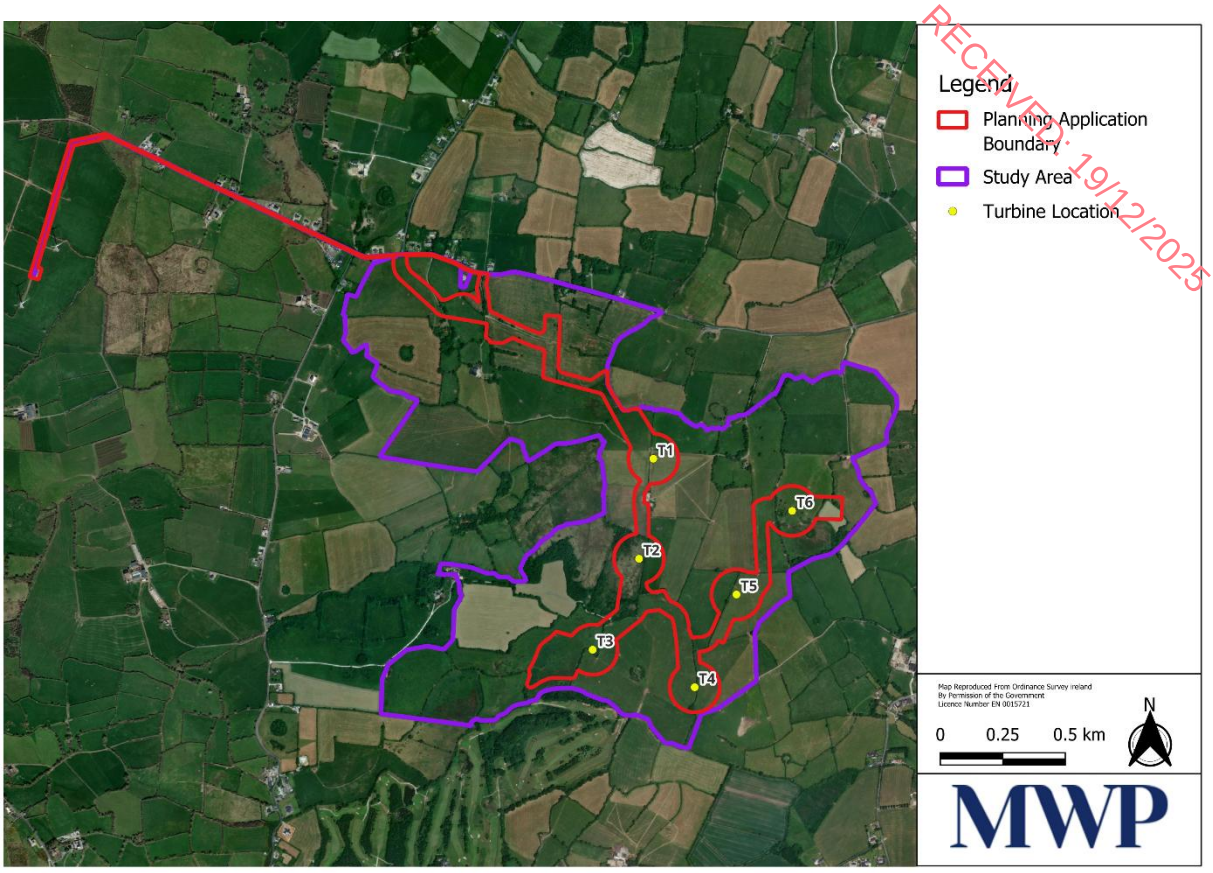

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Figure 1: Proposed development site boundary and study area of Ballynisky Wind Farm, County Limerick

3.5 Field Surveys

Ecological field surveys and aquatic ecology surveys were undertaken at the proposed development site on multiple dates between 2020 and 2025 to establish the site's ecological features and resources, particularly for any rare or protected species and habitats present within the study area. Multidisciplinary walkover surveys were carried out to identify any ecological features and resources that may potentially be impacted by the proposed development. Surveys were undertaken by MWP ecologists with the assistance of external consultants/field surveyors in areas including the proposed wind farm site, adjoining habitats and watercourses located downstream of the site, and the proposed grid connection route options (see **Figure 1**).

Field surveys carried out on-site in support of the development application and relevant to this assessment include the following:

- Habitat surveys and mapping;
- Non-volant mammal[6] surveys;
- Invasive alien plant species (IAPS) surveys;
- Aquatic ecology and water quality surveys;
- Breeding bird surveys including Vantage Point surveys; and
- Wintering bird surveys including Vantage Point surveys

[6] Non-volant mammals – Land-based mammals incapable of flight i.e. all land-based mammals excluding bats.

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Full details of survey methodologies have been presented in **Chapter 06 Biodiversity**, and **Chapter 07 Ornithology**, of **Volume II** of the **EIAR**, and accompanying appendices in **Volume III** of the **EIAR**.

4. Screening for Appropriate Assessment

The purpose of the screening assessment is to record in a transparent and reasoned manner the direct and indirect likely effects, on relevant European sites, of the project, either alone or in combination with other plans and projects, and whether these likely effects are significant. Screening for Appropriate Assessment (Stage 1) determines the need for a full Appropriate Assessment (Stage 2) and consists of several steps, each of which is addressed in the following sections of this report:

4.1 Establish whether the project is necessary for the management of a European site(s).

4.2 & **4.3** Description of the project (construction of a 6-turbine wind energy development at Ballynisky in County Limerick).

4.4 Description of the existing site's ecological characteristics and a summary of the results of the field surveys.

4.5 Identification of other plans, projects and activities with which the proposed development could interact to create in-combination effects.

4.6 Identification of European site(s) potentially affected.

4.7 Identification and description of potential individual and cumulative impacts (in-combination effects) of the project.

4.8 Assessment of the significance of potential impacts on European site(s).

4.9 Conclusion of screening stage.

4.1 Management of European Sites

The proposal is not connected with or necessary to the conservation management of a European site.

4.2 Description of Proposed Development

4.2.1 Site Location and Context

The proposed development site, including the grid connection route, encompasses an area of approximately 43.02 hectares and is situated within the townlands of Ballynisky, Graigoor, Ballyegny More, Kilbradran, Ballysteen, Dunmoylan, Lisbane, and Carrons in County Limerick, approximately 6 kilometres northwest of Rathkeale town and approximately 9 kilometres north of Newcastle West - refer to **Figure 2**, below. The lands that make up the site are rural in nature and privately-owned and are predominantly used for agricultural activities to varying degrees of farming practice intensity. The area surrounding the site is characterised by agricultural holdings and one-off residential dwellings and is located within a 'Preferred Area' for wind energy development as defined in the current Limerick Development Plan (2022 – 2028)[7].

[7] Limerick Development Plan 2022-2028 | Limerick.ie Accessed: 6th June 2025

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The topography of the proposed development site is relatively flat ranging from 46 to 56 metres above ordnance datum (AOD) with a terrain that is dotted with small hills and depressions, and slopes gently upwards in a southwesterly direction. Maximum elevation within the study area is approximately 78 metres AOD.

The proposed development site can be accessed via the local road network and various surrounding regional roads - the R521 (Shanagolden to Newcastle West) to the west; the R518 (Askeaton to Rathkeale) to the east; and the R523 (Ardagh to Rathkeale) to the south. The N69 (Limerick to Listowel) national primary road runs from east to west along the coast north of the proposed development site (see **Figure 2**).

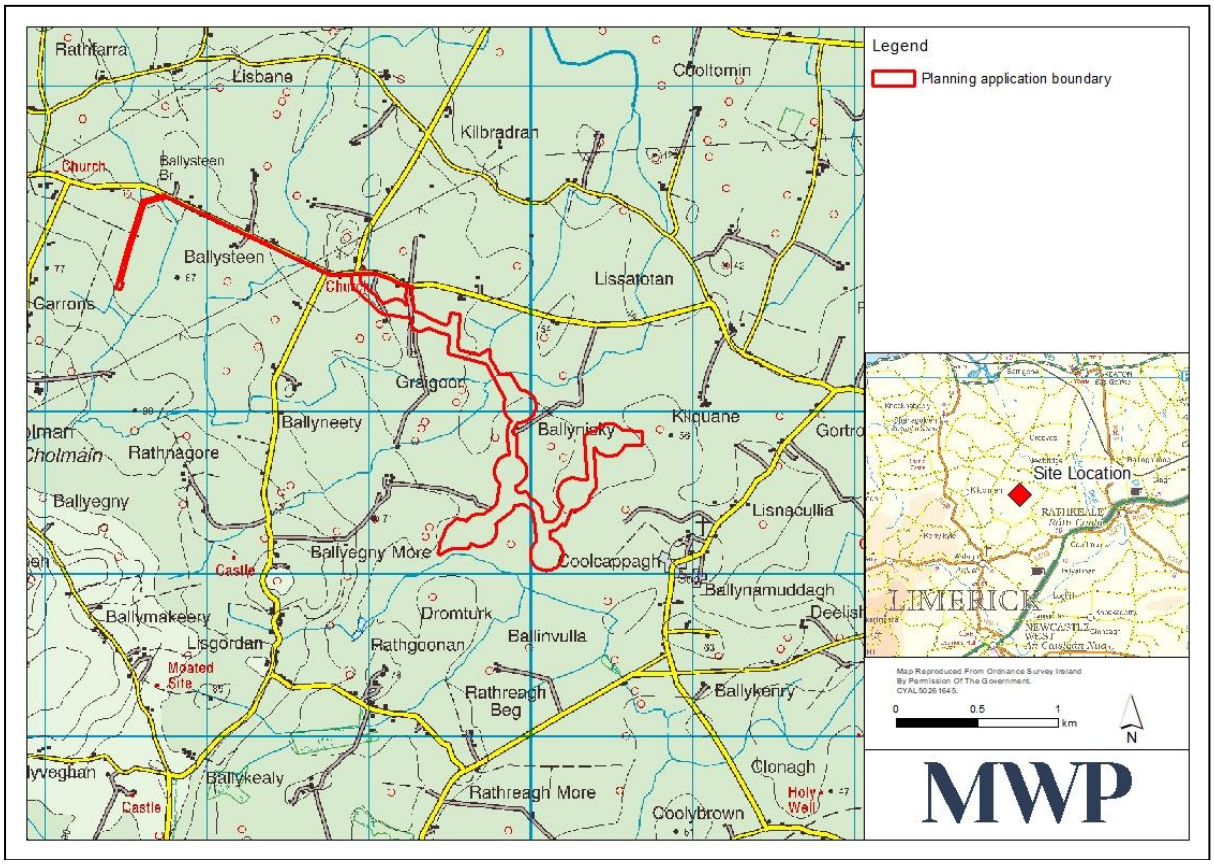

Figure 2: Location of the proposed development site at Ballynisky in County Limerick.

4.2.2 Brief Project Description

It is proposed to erect a six (6) No. turbine wind farm at a location in northwest County Limerick, approximately 31.5 kilometres southwest of Limerick City Centre. The total footprint of the site encompassing six wind turbines, access tracks, crane hardstand areas, 38kV underground electrical cable, permanent meteorological mast, material deposition areas, clear span bridge crossing, and temporary construction compound is approximately 43.02 hectares (see **Figure 3**).

There are two proposed grid route options under consideration to connect the electrical energy generated by Ballynisky Wind Farm to the National Electricity Grid (NEG) – Option A and Option B. However, the final selected grid route and connection strategy will be confirmed via a future grid connection offer process as determined by EirGrid.

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The Option A Grid Connection Route consists of approximately 2.54 kilometres of 38kV underground electrical cable which will be installed along the L1219 local road to the north extending west and through private lands to connect the wind farm substation to an off-site substation at Carrons Wind Farm (refer to **Figure 3**, below).

Alternatively, the Option B Grid Connection Route would loop into the existing 38kV overhead line that transects the site. The line would be cut, and an unground line run to the proposed new 38kV substation on site and back out to connect to the existing line before continuing towards the existing Rathkeale 110kV substation.

The characteristics of the proposed development and the design are briefly described in **Section 4.3**. A site layout map is shown in **Figure 3**, below. More detailed site layout drawings are provided in **Planning Drawings 22569-5005**, **22569-5007** and **22569-5406** enclosed with the Planning Application.

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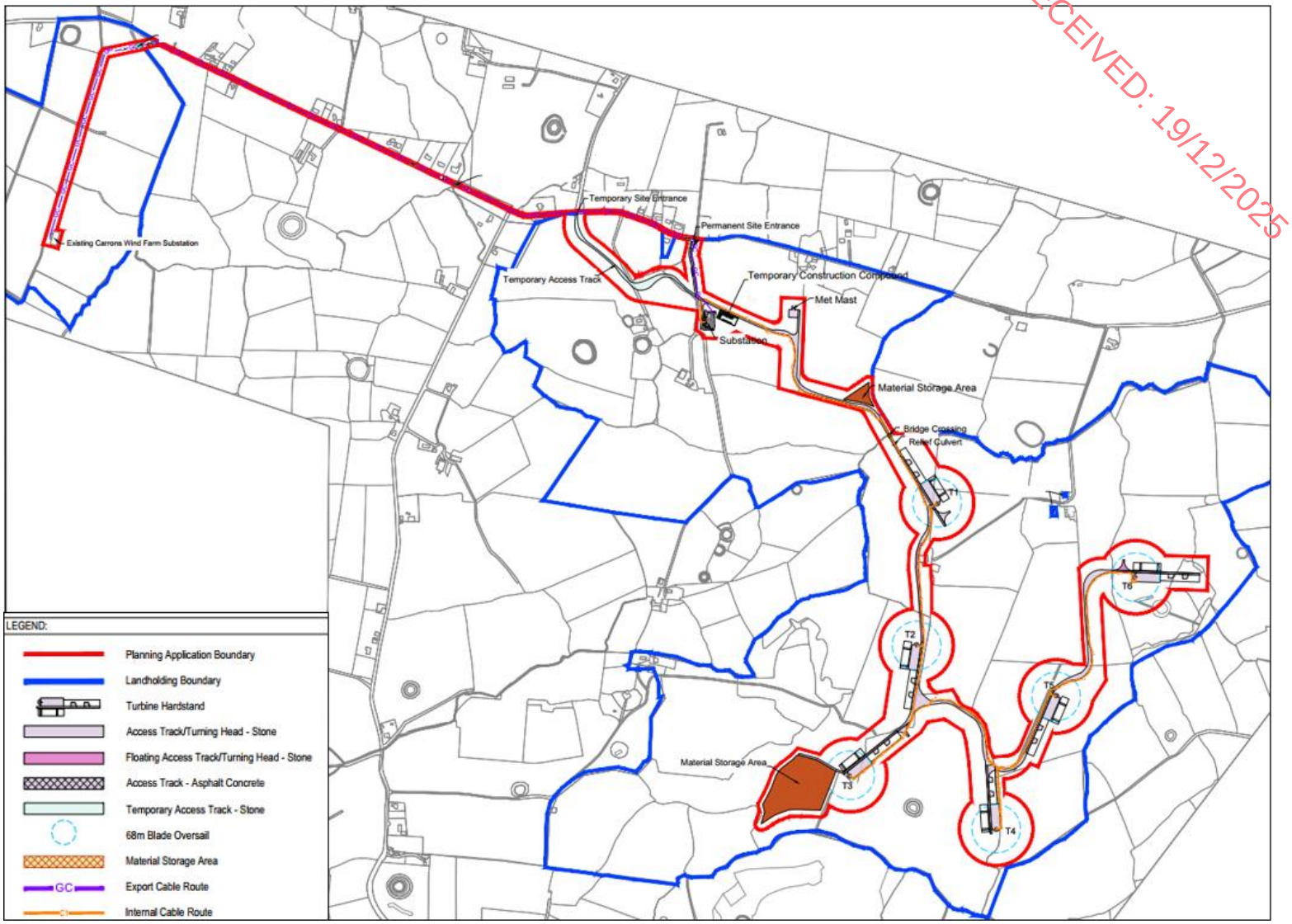

Figure 3: Site layout of proposed Ballynisky Wind Farm in County Limerick.

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4.2.3 Purpose of the Proposed Development

The purpose of the proposed development is for the generation of electricity from a renewable resource by means of a commercially viable 6-turbine wind farm which will supply electricity to the National Electricity Grid (NEG).

4.3 Characteristics of the Proposed Development

The following sets out the elements of the proposed development for which development consent is being sought and all other associated development components:

Table 1. Characteristics of the proposed Ballynisky Wind Farm development in County Limerick.

Proposed development for which consent is sought	Core Wind Farm Components ▪ Six (6) No. wind turbines with a tip height of 158 m, a rotor diameter of 136 m and all associated foundations and hardstanding areas. ▪ One (1) No. 38kV on-site substation compound containing a substation building, associated electrical equipment and transformers with separate client side and ESB entrances. The building will contain a control room, switchgear room, ESB room and storeroom. ▪ Underground electrical and communications cabling between wind turbines and on-site substation. ▪ Grid Connection Option A: 2.54km-long 38kV underground cable connection from the on-site substation to the existing Carrons Wind Farm substation to the west of site. ▪ Grid Connection Option B: Loop into existing 38kV overhead line via the proposed new 38kV substation. ▪ A new temporary site entrance off the L1219 local road to the west of the permanent site entrance for the duration of the construction phase only. ▪ Upgrade of existing farm entrance and access track off L1219 local road at the northwest of site to serve as a permanent site entrance for the operational wind farm. ▪ Approximately 3.4 km of new site access tracks with associated turning areas and drainage. This includes approximately 490 m of temporary access tracks that will be reinstated following construction. ▪ Upgrade of approximately 470 m of existing site access tracks. ▪ A 9 m-long clear span bridge crossing of the Ahacronane River by an internal site access track to the northwest of turbine T1, and an associated 1.5 m x 1.0 m relief culvert. ▪ A permanent meteorological mast with a height of 90 m, a foundation and hardstand. ▪ Two (2) material storage areas with a total capacity of approximately 39,300 m^3. ▪ A temporary construction compound with an area of approximately 1,375 m^2. ▪ All associated site development works, including drainage, diversion or undergrounding of low voltage powerlines, landscaping and revegetation

4.4 Description of Existing Site

4.4.1 General Site Description

The proposed development site is comprised predominantly of farmland (a mixture of both marginal and more improved areas), used primarily as grazing for cattle. Lands surrounding the site are mainly used for agricultural purposes, interspersed with conifer plantations, small urban areas, and single residential dwellings.

There are three operational quarries located within 10 kilometres of the proposed development site - Knockbowheen Quarry and Michael O'Donovan Quarries to the southwest, and Hogans Quarry to the north (see Section 4.5.7, below, for more quarry details). The Aughinish Alumina refinery is located approximately 7.2

kilometres north of the proposed development, while the 4.6MW Carrons Wind Farm and substation lies approximately 1.8 kilometres to the west of the proposed permanent entrance on the L1219 local road.

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The CORINE[8] (2018) land cover category for the entire development site and most of the surrounding area is classed as 'Pastures'. Newcastle West Golf Club House is situated approximately one kilometre south of the nearest proposed turbine (T3) with landcover at the Golf Course categorised as 'Sport and leisure facilities'. Small pockets of 'Non-irrigated arable land' lie to the north and northeast while areas of 'Coniferous forests', 'Peat bogs' and 'Transitional woodland scrub' are located to the west[9].

A review of bedrock mapping determined that the geological units underlying the north and east of the site are 'Dark muddy limestone and shaly mudstone' of the Rathkeale Formation while to the south and west are 'Undifferentiated limestones'. A small section of the proposed grid route passes over 'Massive unbedded lime-mudstone' of the Waulsortian Limestones Formation. Soils at the proposal site are categorised[10] as 'Grey Brown Podzolics, Brown Earths' (derived from mainly calcareous parent materials), 'Surface water Gleys, Ground water Gleys' (derived from mainly calcareous parent material), 'Variable' (mineral alluvium), and 'Renzinas, Lithosols' (derived from mainly calcareous parent material)[11].

4.4.2 Hydrology and Hydrogeology

The entire development site is situated within the Shannon Estuary South (24) Water Framework Directive (WFD) catchment. Most of the site is located within the Shanagolden[Stream]_SC_010 WFD sub-catchment, with only T3 and T4 at the southern extreme of the site situated within the Deel[Newcastlewest]_SC_040 sub-catchment - refer to **Figure 4**, below.

[8] **C**o-**OR**dinated **IN**formation on the **E**nvironment – data series initiated in 1985 by the European Commission to gather environmental data.
[9] EPA Maps Accessed: 12th June 2025
[10] Teagasc Soils - classifies soils on a categorically simplified but cartographically detailed basis into 25 classes using an expert rule-based methodology. Produced by Teagasc (Kinsealy), EPA and GSI, it identifies and maps soils in the Republic of Ireland by parent material. Teagasc Soils - Overview Accessed: 26th May 2025
[11] https://www.heritagemaps.ie Accessed: 20th June 2025

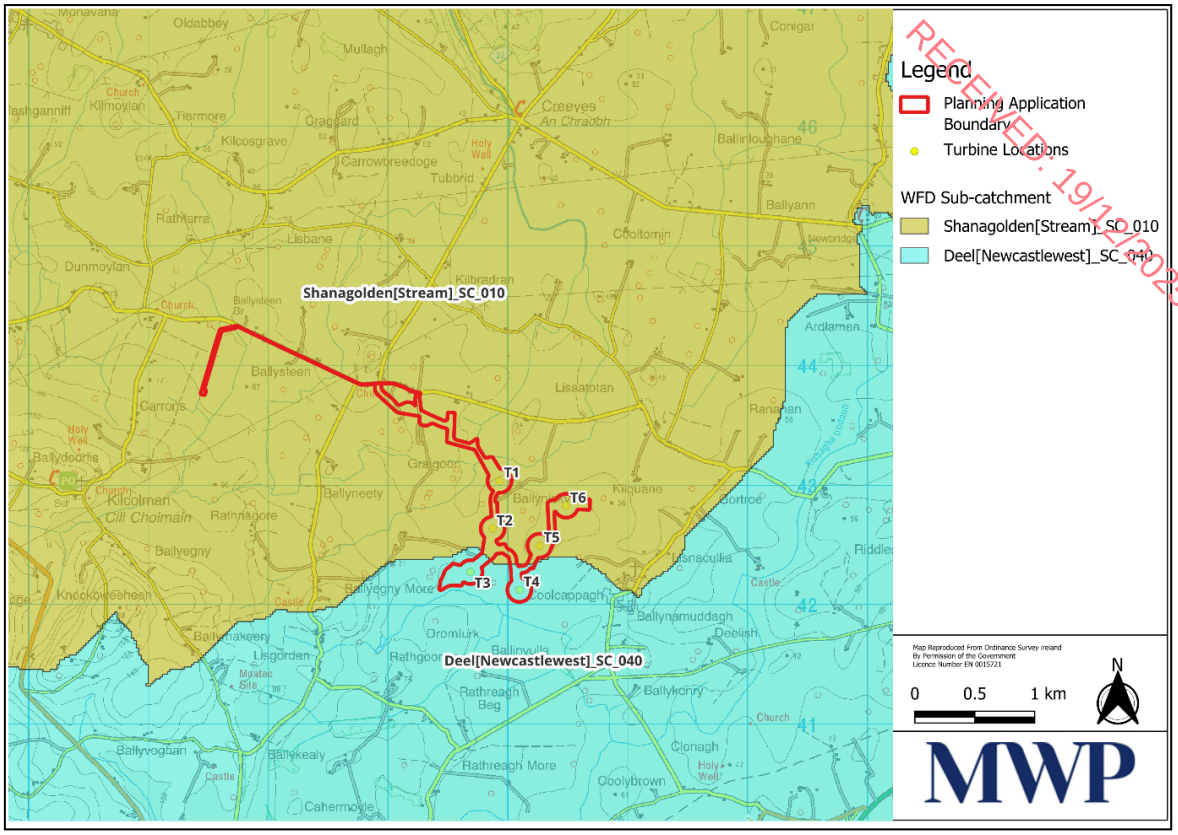

Figure 4: Layout of the proposed development site in relation to Shanagolden[Stream]_SC_010 sub-catchment and Deel[Newcastlewest]_SC_040 sub-catchment.

A review of the EPA map-viewer determined that there are several watercourses within and around the proposed wind farm site boundary – refer to **Figure 5**. The 1st Order 'RATHNAGORE 24' Stream (EPA Code: 24R22) lies approximately 50 metres south of the larger material storage area at T3 and approximately 217 metres south of T3 forming the site's southern border before merging with the 2nd Order Riddlestown River - both watercourses are part of the Deel(Newcastlewest)_130 River Waterbody[12]. The Riddlestown River continues southeastwards before veering north and eventually joining the 6th Order Deel River, approximately 7.5 river kilometres (rkm)[13] downstream.

Within the mid-section of the site, both the 1st Order 'Rathnagore_24' Stream (EPA Code: 24R40) and the 1st Order Ahacronane Stream flow from southwest to northeast towards the proposed development site before merging to form the 2nd Order Ahacronane River approximately 215 metres northwest of T1 and approximately 120 metres southeast of the smaller material storage area. These watercourses form part of the Ahacronane_010 River Waterbody[14]. The Ahacronane River continues northwards from the proposal site for approximately 8.7 river kilometres before emptying into the Lower Shannon Estuary at Oorla.

The 1st Order Lissatotan Stream rises within a field approximately 65 metres east of the proposed met mast location before continuing north and eventually merging with the Ahacronane River. Similarly, the 1st Order Creeves Stream crossed by the proposed grid connection route approximately 680 metres west of the proposed permanent site entrance flows northwards before also joining the Ahacronane River. Both the Lissatotan Stream and the Creeves Stream are part of the Ahacronane_020 River Waterbody[15]. Refer to **Figure 5**, below.

[12] EPA River Waterbody Code: IE_SH_24D021320
[13] River kilometres (rkm): measure of the distance in kilometres along the path of a watercourse (as opposed to a linear measure such as "as the crow flies").
[14] EPA River Waterbody Code: IE_SH_24A010400
[15] EPA River Waterbody Code: IE_SH_24A010900

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Finally, as it continues westwards along the local road from the new on-site substation to the existing substation at Carrons Wind Farm, the proposed grid connection route crosses the 2nd Order Knockardnacorlan River approximately 1.74 kilometres from the proposed permanent site entrance. The Knockardnacorlan River flows from south to north past Carrons Wind Farm approximately 180 metres east of the existing Carrons Substation and is part of the Dooncaha Stream_010 River Waterbody[16]. Refer to **Figure 5**, below. From where it is crossed by the proposed grid cable, the Knockardnacorlan River flows northwards, eventually merging with the 4th Order Shanagolden (Stream) and emptying to the Lower Shannon Estuary at Churchfield, approximately 7.4 river kilometres downstream from the grid connection river crossing point.

There will be three watercourse crossings necessary for the construction and operation of the proposed development – the crossings are shown as WC1, WC2, and WC3 in **Figure 5**, below. A clear span bridge crossing (WC1) will be constructed where the internal site access track crosses the Ahacronane River between the temporary site compound and T1. There will be two watercourse crossings (WC2 and WC3) below ground level along the proposed Option A grid connection route. All three watercourse crossings are located between 7.4 river kilometres and 9 river kilometres upstream of the Lower River Shannon SAC [002165] and the River Shannon and River Fergus Estuaries SPA [004077].

The aquifer underlying the site is classified as a locally important aquifer - bedrock which is moderately productive only in local zones. The groundwater vulnerability ranges from moderate vulnerability along the south-western area of the site to high and extreme along the northeast sections of the site. There are also areas of rock at or near the surface, identified in the northeast of the site.

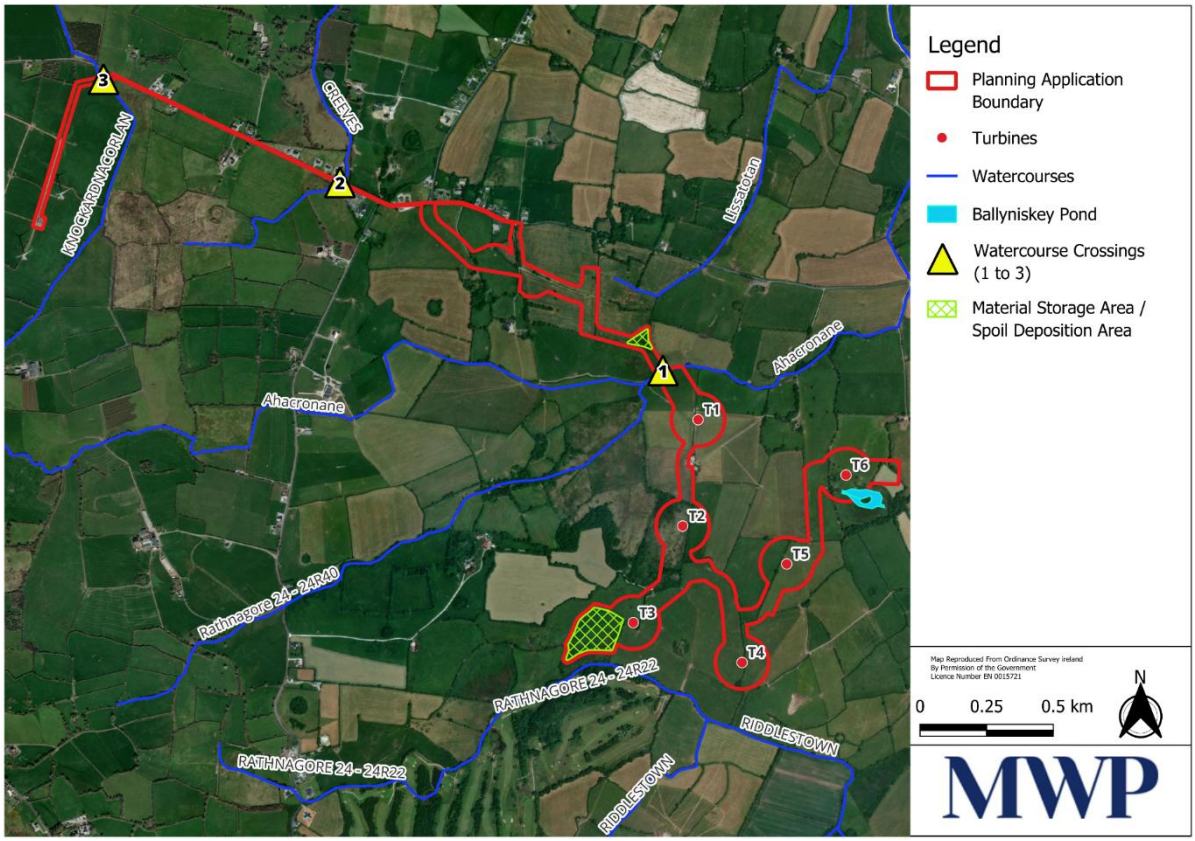

Figure 5: Hydrological features at Ballynisky with locations of three watercourse crossings and two Material Storage/Spoil Deposition Areas.

Compliance with the reporting requirements of the WFD (Directive 2000/60/EC) obliges each member state to publish reports providing summary information about individual waterbodies relating to their status, risks and objectives. The Deel(Newcastlewest)_130 River Waterbody has a WFD Status (2016 – 2021) of 'Moderate' and is

[16] EPA River Waterbody Code: IE_SH_24D071200

located within the Deel [Newcastlewest]_SC_040 sub-catchment. There are no EPA water quality monitoring stations located along this waterbody and, therefore, no Q-values[17] available. The Deel(Newcastlewest)_130 River Waterbody has been assigned a WFD risk status of 'Review' as there is no monitoring data currently available. A review of the '*Deel [Newcastlewest]_SC_040 Sub-catchment Assessment WFD Cycle 2*' report[18] determined that the main pressures exerted on waterbodies within the sub-catchment are those associated with agriculture (specifically some large dairy farms) and industrial discharges. The Transitional Waterbody WFD latest status (2016 – 2021) of the Deel Estuary[19] into which these waterbodies drain is 'At risk'.

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The WFD Status (2016 – 2021) of the Ahacronane_010 River Waterbody is 'Poor'. The nearest downstream EPA water quality monitoring station is located at the 'Bridge south of Spa Wells' (Station ID: RS24A010400), approximately 1.7 river kilometres downstream of the proposed new clear span bridge crossing. The latest river Q value at this location is 'Q3, poor', recorded by the EPA in 2020.

The WFD Status (2016 – 2021) of the Ahacronane_020 River Waterbody is also 'Poor'. The nearest downstream EPA water quality monitoring station is located at the 'Ahacronane Bridge (north of Nutgrove House)' (Station ID: RS24A010700), approximately 5.2 river kilometres downstream of where the proposed grid connection route crosses Creeves Stream. The latest river Q value at this location is 'Q3, poor', recorded by the EPA in 1989. More recently, a monitoring station further downstream was recorded as having a Q value of 'Q3, poor' in 2020.

The WFD Status (2016 – 2021) of the Dooncaha Stream_010 River Waterbody is 'Poor'. The nearest downstream EPA water quality monitoring station is located at the 'Bartholomew's Bridge (R6)' (Station ID: RS24D071200), approximately 4.8 river kilometres downstream of where the proposed grid connection route crosses the Knockardnacorlan River. The latest river Q value at this location is 'Q3, poor', recorded by the EPA in 1989. More recently, a station further downstream was recorded as having a Q value of 'Q3, poor' in 2020.

The three waterbodies located within the Shanagolden[Stream]_SC_010 sub-catchment - the Ahacronane_010, Ahacronane_020, and Dooncaha Stream_010 - have all been assigned a WFD risk status of 'At risk'. A review of the '*Shanagolden [Stream]_SC_010 Sub-catchment Assessment WFD Cycle 2*' report[20] determined that the following pressures are exerted on waterbodies within this subcatchment: agriculture, quarries, riverbank erosion, wastewater discharge and peat extraction. The Transitional Waterbody WFD latest status (2016 – 2021) of the Lower Shannon Estuary[21] into which these waterbodies drain is 'Not at risk'.

4.4.3 Desktop Study and Field Survey Results

4.4.3.1 Habitats

The dominant habitat[22] occurring at the subject site is **Improved agricultural grassland (GA1)**. This grassland habitat is intensively managed for agricultural purposes and as such is considered a highly modified grassland habitat comprised of a relatively uniform sward of perennial ryegrass (*Lolium perenne*). **Hedgerows (WL1)** are the second most commonly occurring habitat at the site and are typically associated with the improved agricultural grassland field boundaries systems distributed within the site, sometimes occurring together with **Drainage ditches (FW4)** and/or **Treelines (WL2)** along field boundaries.

Areas of *Molina*-dominated semi-natural habitat comprising **Wet grassland (GS4)** are present at the west of the site at T2 and appears largely unmanaged except for low-intensity cattle grazing. An area of wet grassland can

[17] Quality Rating (Q) System devised by Toner *et al.* (2005). This method categorises invertebrates into one of five groups (A-E), depending on their sensitivity to pollution. Q values range from Q1-Q5 with Q1 being the poorest quality and Q5 being pristine/unpolluted conditions. The system is used by the EPA and is the standard biological assessment technique used when surveying rivers in Ireland under the WFD.
[18] Available at Subcatchment Assessment (catchments.ie) Accessed: 14th June 2025
[19] EPA Transitional Waterbody Code: IE_SH_060_0600
[20] Available at Subcatchment Assessment (catchments.ie) Accessed: 14th June 2025
[21] EPA Transitional Waterbody Code: IE_SH_060_0300
[22] Habitats as categorised by Fossitt (2000), available at A Guide to Habitats in Ireland - Fossitt.pdf (npws.ie) Accessed: 14th June 2025

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also be found at T6 extending southeastwards towards the eastern boundary and includes species such as abundant creeping bent (*Agrostis stolonifera*), Yorkshire fog (*Holcus lanatus*), hard rush (*Juncus inflexus*) and occasional perennial ryegrass. Within the northern section of the proposed development site, an area of wet grassland occurs between T1 and the met mast and will be bisected by a new access track. Finally, two pockets of wet grassland occur in the southwestern region – one located outside the proposed development site approximately 200 metres to the southwest of the boundary, and one located within the proposed development site's boundary immediately west of T3.

Areas of **Scrub (WS1)** are present to the south and west of T2 with semi-natural established/establishing edges and limited agricultural land management improvements/inputs. Species within these areas of scrub include grey willow (*Salix cinerea*), lesser celandine (*Ranunculus ficaria*), nettle (*Urtica dioica*), ground ivy (*Glechoma hederacea*), primrose (*Primula vulgaris*), meadowsweet (*Filipendula ulmaria*) and bramble (*Rubus fructicosus*). Most of the existing farm tracks within the site are classified as **Spoil and bare ground (ED2)**, while public access roads, farm buildings and yards and several derelict buildings are classified as **Buildings and artificial surfaces (BL3)**. **Stone Walls (BL1)** are also present in the northeast section of the site in areas of agricultural grassland and are heavily vegetated with climbing ivy (*Hedera hibernica*).

As discussed in **Section 4.4.2**, above, there are four semi-natural **Eroding Freshwater River (FW1)** watercourses within the study area; the Lissatotan Stream (to the north), the RATHNAGORE 24 Stream (EPA Code: 24R22) and the Ahacronane River (in the centre), and the Rathnagore_24 Stream (EPA Code: 24R40) (to the south) – refer to **Figure 5**, above. A section of the RATHNAGORE 24 (EPA Code: 24R22), where it flows through the proposed development footprint, has been modified for agricultural site drainage purposes. The Lissatotan Stream is somewhat modified but maintains more semi-natural characteristics, not dissimilar to the Ahacronane Stream.

The Ahacronane River flows eastwards towards the proposed development area and is culverted (piped) beneath the existing farm access track before continuing northwards. The stream bed is approximately 2 to 3 metres wide with a predominately rock/stone substrate. Its western bank is bordered by agricultural wet grassland, with some bank erosion evident while the eastern bank is comprised of hedgerow. Since the water of the Ahacronane River is shallow and relatively fast-flowing, there is limited sediment deposition and restricted establishment of wetland vegetation within the stream channel overall. The Rathnagore_24 Stream (EPA Code: 24R40) flows west to east contiguous to the site's southern boundary, and maintains more overall semi-natural characteristics and appears less modified than the other aforementioned watercourses within the site.

In a field southwest of the proposed location of T6, there is small seasonal waterbody known as Ballynisky Pond which corresponds to '**Poor fen and flush (PF2)**'. Bottle sedge (*Carex rostrata*) is the principal floral species at Ballynisky pond along with bogbean (*Menyanthes trifoliata*), marsh horsetail (*Equisetum fluviatile*), pondweed (*Potamogeton natans*), common spike-rush (*Eleocharis palustris*), yellow iris (*Iris pseudacorus*) and water mint (*Mentha aquatica)*. The water level of the pond depends on groundwater levels, and it is connected to the Ahacronane River via the local drainage network.

A habitat map was prepared for this proposed development and is presented in **Figure 6** and **Figure 7**, below.

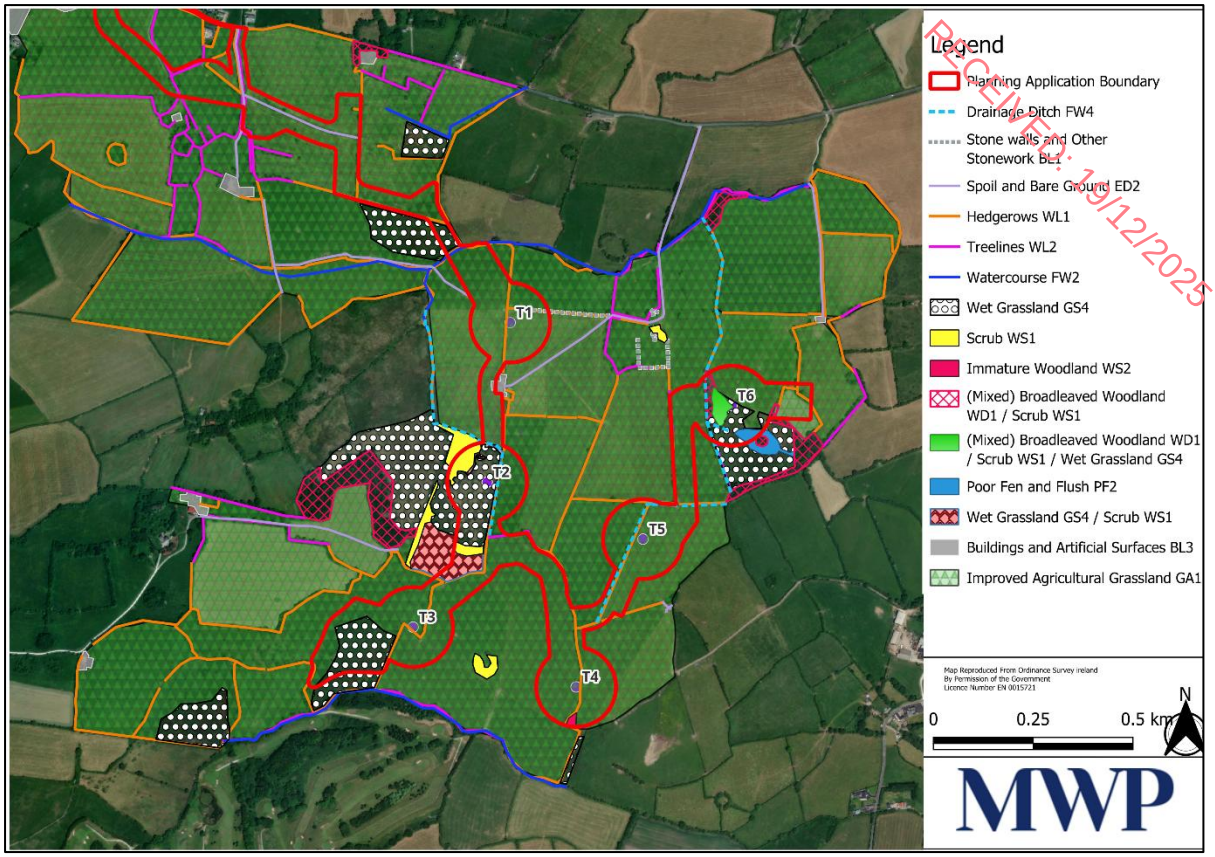

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Figure 6: Habitat map for the proposed Ballynisky Wind Farm site in County Limerick (Map 1 of 2).

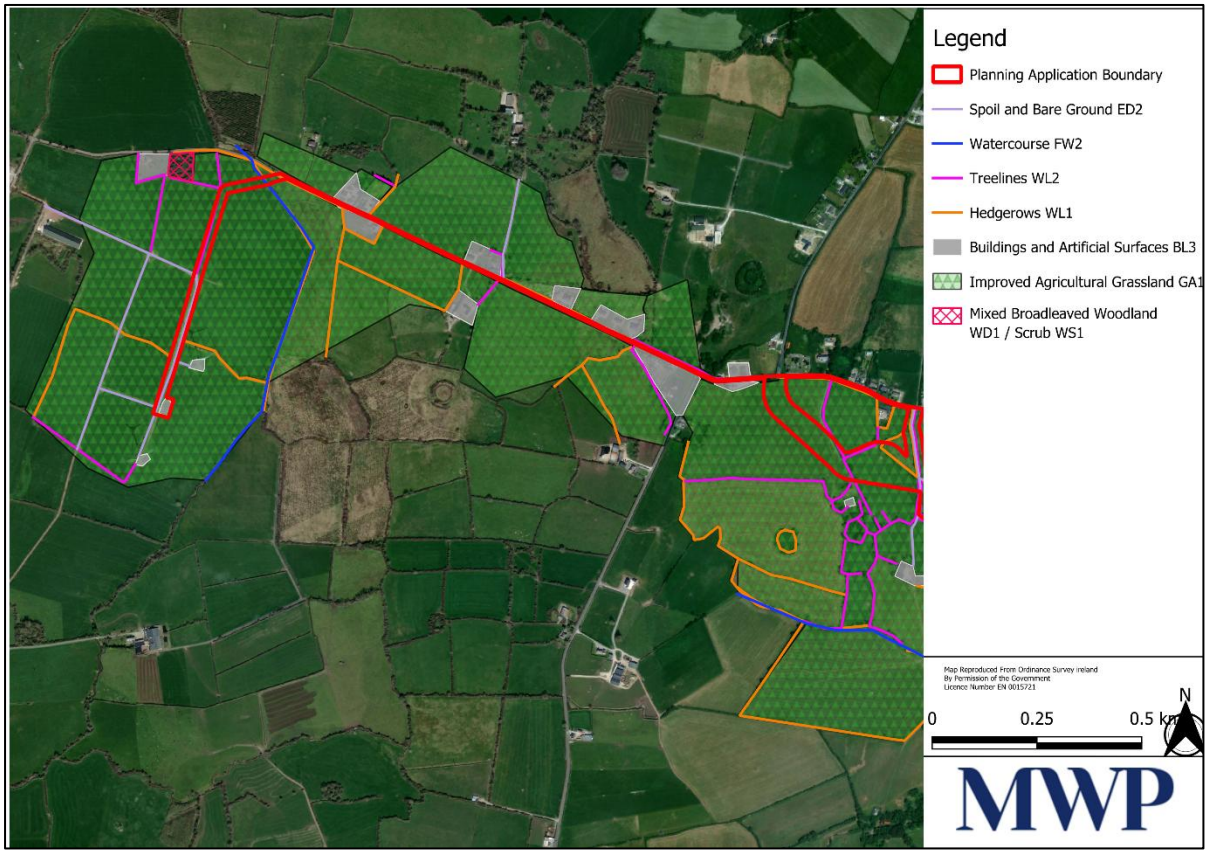

Figure 7: Habitat map for the proposed Ballynisky Wind Farm site in County Limerick (Map 2 of 2).

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4.4.3.2 Rare and Protected Flora

No rare or protected flora species were recorded at the proposed development site during any of the ecological surveys.

4.4.3.3 Invasive Alien Plant Species (IAPS)

Documented NBDC records of high-impact invasive species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011, as amended) exist within the hectads R23 and R34 encompassing the study area for Indian balsam (*Impatiens glandulifera*), Canadian waterweed (*Elodea canadensis*), cherry laurel (*Prunus laurocerasus*), and Japanese knotweed (*Fallopia japonica*). Documented records of medium-impact invasive species listed on the Third Schedule also exist for Hairy rocket (*Erucastrum gallicum*) and Sycamore (*Acer pseudoplatanus*).

During ecological field surveys of the proposed development site no invasive alien plant species were recorded.

4.4.3.4 Otter (*Lutra lutra*)

No evidence of otter (*Lutra lutra*) was recorded during any of the ecological field surveys nor during any of the dedicated terrestrial mammal walkover surveys carried out in Autumn 2022, Spring 2023, and January 2025. There were no otter breeding/resting places identified within the study area. Additionally, there are no NBDC documented records of otter within the proposed development site.

The most recent downstream NBDC record for otter is a live sighting of an individual in 2013 at a location beside the Quay on the River Deel in Askeaton town approximately 15.5 river kilometres downstream of the proposed development site's southern border. There are no suitable fish habitats within the proposed development site since all waterbodies are deemed too small with poor water quality. Minor watercourses within the subject site may have some potential as foraging or commuting habitat, but since they do not support any notable fish populations, they are considered to comprise sub-optimal habitat for otter.

For more details, refer to **Chapter 06 Biodiversity**, of **Volume II** of the **EIAR**.

4.4.3.5 Aquatic Ecology

The proposed development site is positioned across four different river sub-basins – the Deel[Newcastlewest]_130, the Ahacronane_010, the Ahacronane_020, and the Dooncaha Stream_010 – that lie adjacent to the upper transitional zones of the Lower Shannon Estuary and the Deel Estuary. The carrying capacity for fish of these sub-basins is limited due to their relatively small drainage areas in a somewhat coastal context with watercourses classified no larger than 3rd Order (apart from the 6th Order River Deel located within the Deel[Newcastlewest]_130 sub-basin, approximately 7.5 river kilometres downstream from the proposed development's southern border). The watercourses draining the proposed development site are low gradient streams. Their lotic[23] carrying capacity is limited by certain characteristics including morphological condition, small size, riparian conditions (e.g. overshading) and / or pollution.

Brown trout, European eel and three-spined stickleback (*Gasterosteus aculeatus*) were recorded during the aquatic surveys of watercourses draining the proposed Ballynisky Wind Farm site in July and August 2022. The total number of fish recorded was 85, comprising 63 three-spined stickleback, 11 European eel, and 11 brown trout.

The watercourses draining the proposed development site are deemed to be of variable suitability for early life stages of salmonids[24] but such reaches do not occur within the actual proposed development site itself due to the small size of the watercourses. The drainage ditches within the site may support a nominal population of

[23] of organisms or habitats inhabiting or situated in rapidly moving fresh water
[24] Salmonids – family (*Salvelinus*) of fishes that include salmon, trout, and chars.

three-spined stickleback. Lower reaches of the Ahacronane River and Riddlestown River draining the proposed development site are more suitable for adult fish due to their greater fluvial area and presence of larger pools with associated increasing size. Indeed, the only trout recorded during the 2022 surveys was in the Ahacronane River at a considerable distance downstream of the proposed development site.

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Overall, the watercourses draining the proposed development site collectively support brown trout, European eel, three-spined stickleback, and possibly brook lamprey (*Lampetra planeri*). Deeper parts of the subject streams are important refugia for trout and European eel, the latter of which occurred in good numbers in the rocky substrate pools of the Ahacronane River. However, based on the habitats recorded and the results of the electrical fishing surveys, salmon (*Salmo salar*) or migratory lampreys (river lamprey (*L. fluviatilis*) and sea lamprey (*Petromyzon marinus*)) are highly unlikely to occur in the reaches of watercourses potentially affected by the proposed development. The only nearby freshwater receptor that supports salmon is the River Deel into which the Riddlestown River discharges, approximately 7.5 river kilometres downstream from the proposed development's southern border.

The proposed development site is not located within a freshwater pearl mussel (*Margaritifera margaritifera*) (FPM) catchment (*Margaritifera* Sensitive Area) according to NPWS data maps available online[25] and there was no live FPM nor evidence of FPM (e.g. shells) recorded during the aquatic ecology surveys carried out at sites within and around the proposed development site. In general, the sedimentation levels recorded were generally indicative of artificially induced siltation with these conditions considered unfavourable in terms of FPM habitat.

4.4.3.6 Ornithology

The results of the ornithological surveys are summarised in this section with full details available in **Chapter 07 Ornithology**, of **Volume II** of the **EIAR**.

A comprehensive suite of ornithological surveys was carried out at the proposed Ballynisky Wind Farm site over 60 months from April 2020 to March 2025, inclusive. These surveys included vantage point (VP) surveys, walkover transect surveys, wintering waterbird distribution surveys, hinterland surveys, breeding wader surveys, breeding bird of prey surveys, and targeted hen harrier (*Circus cyaneus*) roost surveys.

Table 2, below, lists the primary and secondary target species recorded during the vantage point and transect surveys at the proposed wind farm site (species listed on Annex I of the Birds Directive[26] are highlighted in bold). The dedicated hen harrier roost watches were undertaken at suitable roosting habitat at Carrigkerry Bog more than five kilometres west of the proposed development site. Twelve roost surveys were completed, and hen harrier was observed on nine separate occasions at distances of between five and seven kilometres southwest of the proposed development site boundary at T3.

[25] EPA Maps Accessed: 17th June 2025
[26] Annex I lists 194 species and sub-species of birds that are particularly threatened. EU Member States must designate Special Protection Areas (SPAs) for them and all migratory bird species.

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Table 2. Primary and secondary target species recorded during Vantage Point (VP) and transect surveys undertaken at the proposed Ballynisky Wind Farm site between April 2020 and March 2025, inclusive.

Species	Summer 2020	Winter 20/21	Summer 2021	Winter 21/22	Summer 2022	Winter 22/23	Summer 2023	Winter 23/24	Summer 2024	Winter 24/25
Black-headed gull (*Chroicocephalus ridibundus*)*		X	X	X		X	X	X	X	X
Buzzard (*Buteo buteo*)	X	X	X	X	X	X	X	X	X	X
Common gull (*Larus canus*)		X	X					X		X
Cormorant (*Phalacrocorax carbo*)*			X				X	X	X	X
Curlew (*Numenius arquata*)*			X							X
Golden plover (*Pluvialis apricaria*)*						X		X		X
Great black-backed gull (*Larus marinus*)	X		X			X				
Great white egret (*Ardea alba*)								X		
Grey heron (*Ardea cinerea*)	X						X		X	X
Hen harrier (*Circus cyaneus*)^						X				
Herring gull (*Larus argentatus*)	X	X	X							
Kestrel (*Falco tinnunculus*)	X	X	X	X	X	X	X	X	X	X
Lapwing (*Vanellus vanellus*)*										X
Lesser black-backed gull (*Larus fuscus*)	X	X	X	X	X		X	X	X	X
Little egret (*Egretta garzetta*)	X	X	X	X		X	X	X	X	X
Mallard (*Anas platyrhynchos*)		X				X		X	X	X
Mute swan (*Cygnus olor*)								X	X	X
Peregrine (*Falco peregrinus*)						X			X	X
Snipe (*Gallinago gallinago*)	X	X		X		X	X	X	X	X
Sparrowhawk (*Accipiter nisus*)	X	X		X		X	X	X	X	X
Whimbrel (*Numenius phaeopus*)							X		X	
Whooper swan (*Cygnus cygnus*)*				X						

*Special Conservation Interest (SCI) species for which the River Shannon and River Fergus Estuaries SPA (004077) is designated. The SPA is located 6 km north of proposal site. Refer to **Section 4.6**, below.

^SCI species for which Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA (004161) is designated. The SPA is located 3.7 km west of proposed T1 location. Refer to **Section 4.6**, below.

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4.5 Identification of Other Projects or Plans or Activities

4.5.1 Introduction

A review of relevant existing and permitted projects, plans and activities occurring within the wider geographical area around the proposed development site was conducted and the results are presented in the following sections. In-combination impacts will be considered in Section 4.8.6.

4.5.2 Plans

Plans that are relevant to the region encompassing the proposed Ballynisky Wind Farm site include the Limerick County Development Plan (2010 – 2016)[27] and the Limerick Development Plan (2022 – 2028)[28].

At a special meeting on 17th June 2022, elected members of Limerick City and County Council adopted the Limerick Development Plan (2022 – 2028) which then came into effect on 29th July 2022. Included in Section 9.4.4 in Chapter 9 of Volume 1 of the Plan is 'Objective CAF O28 Assessment of Renewable Energy Projects' which asserts that one of the aims of LCCC is to

'*encourage the development of wind energy, in accordance with Government policy and having regard to the principles and planning guidance set out in the Department of Housing, Planning and Local Government publications relating to* Wind Energy Development *and the* DCCAE Code of Practice for Wind Energy Development in Ireland *and any other relevant guidance, which may be issued in relation to sustainable energy provisions*'[29].

4.5.3 Other Permitted and Proposed Developments in the Locality

A search of LCCC's online planning enquiry system for granted or on-going planning applications for townlands encompassed within the site boundary, namely Ballynisky, Graigoor, Ballyegny More, Kilbradran, Ballysteen, Dunmoylan, Carrons, and Lisbane was undertaken on 21st May 2025 with results summarised. The results are summarised in Table 3.

[27] limerick-county-development-plan-2010-2016-with-variation-1-3-and-5-6_0.pdf Accessed: 16th June 2025
[28] Limerick Development Plan 2022-2028 | Limerick.ie Accessed: 16th June 2025
[29] Limerick-Development-Plan-Volume-1-Written-Statement-including-Variation-No-1.pdf Accessed: 18th June 2025

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Table 3. List of granted and/or on-going planning applications within the vicinity of the proposed development site.

Application number	Applicant	Location	Proposed development	Decision	Decision date
2460064	Adrian Dore	Ballysteen, Shanagolden, Co. Limerick	The construction of a new dwelling house, adjoining domestic garage, domestic wastewater treatment system, entrance & associated site works.	Granted	17/05/24
221095	Dermot O'Connor	Lisbane, Shanagolden, Co. Limerick	The construction of a new slatted livestock house adjacent to existing slatted livestock house. Proposed livestock house to incorporate easy feed, flow channel & underground slatted slurry tank with external agitation points & ancillary concrete, and all associated ancillary site works.	Granted	17/02/25
2360864	Ashfort Green Ltd.	Dunmoylan, Shanagolden, Co. Limerick	Pump house and filtration shed and elevational changes to existing house.	Granted	28/02/24
23503	John McCarthy	Graigoor, Shanagolden, Co. Limerick	Dwelling house, wastewater treatment system, percolation area, site entrance and all associated site works.	Granted	14/12/23
221055	On Tower Ireland Limited	Knockbweeheen, Ardagh, Co. Limerick	Removal of existing telecommunications support structure and replacement of this structure	Granted	18/11/22
21478	Donal Donovan	Grouse Lodge, Kilcolman, Ardagh, Co. Limerick	Construction of machinery shed and all associated site works.	Granted	02/06/21
21166	David McDonnell	Carrons, Kilcolman, Ardagh & Dunmoylan, Shanagolden, Co. Limerick	Construction of poultry house, soiled water storage tank, rainwater harvesting tank, upgrade existing agricultural entrance and all associated ancillary site works.	Granted	20/05/21
20866	Allken Farms Ltd.	Ballynacally & Coolacokery, Ardagh, Co. Limerick	Construction of livestock underpass, effluent holding tank & associated siteworks	Granted	30/04/21
20718	Irish Forestry Unit Trust	Boughilbo, Ardagh, Co. Limerick	Construction of 2 no. new entrances and access road to existing forestry plantations on the site of existing entrances	Granted	01/04/21
201135	David & Rosanne McDonnell	The Old Presbytery, Carrons, Kilcolman, Ardagh, Co. Limerick	Demolition of existing porch & conservatory, modification to existing roof to accommodate changes, construction of 2 no. mixed single/two storey extensions to existing dwelling house, associated site works and services.	Granted	19/03/21
201082	Nigel Sheehy	Carrons, Kilcolman, Ardagh, Co. Limerick	Relocation of the existing site entrance and all associated site works	Granted	14/12/20
208004	PART 8	Ardagh Station House, Kilreash, Ardagh & Barnagh Station House, Ballymurragh East, Co. Limerick	Refurbishment of Ardagh Station House (which is a protected structure) and goods shed and change of use to commercial, community and tourism use.	Granted	11/12/20
20921	Noel O'Brien & Evelyn Scanlon	Kilcolman, Ardagh	Extension private residence	Granted	05/11/20
19819	Donie & Dympna O'Connor	Kilcolman, Ardagh	A change of site boundaries as previously granted 06/3318.	Granted	19/11/19
19774	Danny Mulcahy	Kilcolman, Ardagh	Extension for machinery storage to existing farm buildings.	Granted	20/09/19
1945	Vodafone Ireland Ltd	Grouselodge House, Grouselodge, Ardagh.	An existing 16.5-metre-high telecommunications support structure. The development forms part of Vodafone Ireland Ltd's existing GSM and 3G Broadband telecommunications network. (Previous Planning Ref. No. 11/279)	Granted	13/03/19

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4.5.4 Other Wind Energy Developments

Within County Limerick, there are fourteen operational wind farms including the 18-turbine Tournafulla Wind Farm to the south of the proposed development site and the 19-turbine Dromada Wind Farm to the southwest – refer to – refer to **Figure 8** and **Table 4**, below, for more details. Wind farms located within 20 kilometres of the proposed Ballynisky Wind Farm are highlighted in bold in **Table 4**, below.

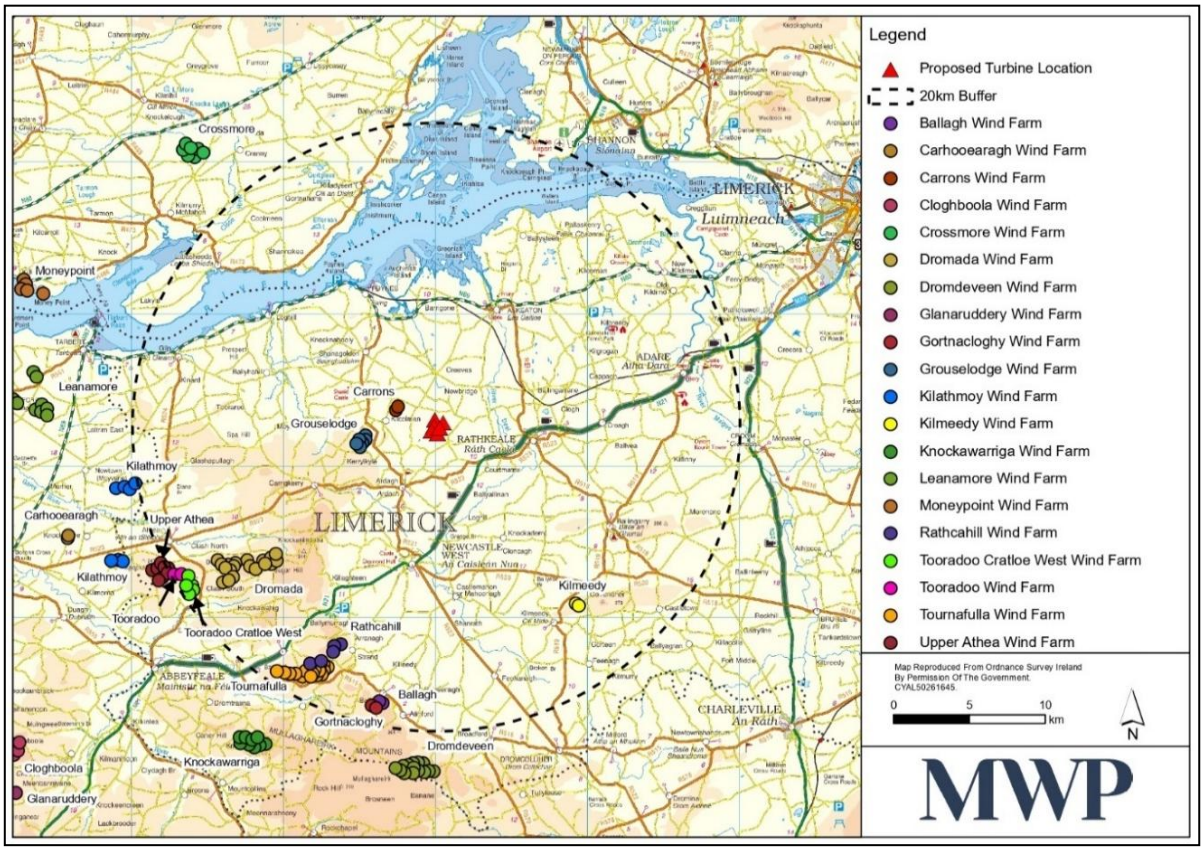

Figure 8: Operational wind farms in County Limerick and within border areas of surrounding counties.

Table 4. Operational wind farms within County Limerick and their locations in relation to the proposed Ballynisky Wind Farm site (those located within 20 km are highlighted in bold).

Wind Farm	Year connected to grid	Output (MW)	Number of turbines	Approximate distance & direction from proposed development site (PDS)
Mauricetown	2019	13.8	6	20.5 km south of PDS
Gortnacloghy	2018	4.4	2	**18.5 km south of PDS**
Vistakon, Castletroy	2017	2	1	36.2 km northeast of PDS
Ballagh	**2016**	**2.3**	**2**	**18.1 km south of PDS**
Athea	**2014**	**34.35**	**16**	**18.3 km southwest of the PDS**
Dromdeveen	2011	27.5	14	21.7 km south of the PDS
Grouselodge	**2011**	**15**	**6**	**4.5 km southwest of PDS**
Rathcahill	**2011**	**12.5**	**5**	**15.3 km southwest of PDS**
Carrons	**2010**	**4.6**	**2**	**2.5 km west of PDS**

Wind Farm	Year connected to grid	Output (MW)	Number of turbines	Approximate distance & direction from proposed development site (PDS)
Kilmeedy	**2010**	**4.7**	**2**	**14.5 km southeast of PDS**
Dromada	**2009**	**28.5**	**19**	**13 km southwest of PDS**
Knockastanna	2009	7.5	4	56.8 km northeast of PDS
Knockawarriga	2008	22.5	8	23 km southwest of PDS
Tournafulla	**2007**	**27**	**18**	**16.8 km southwest of PDS**
Total Output		210.15		

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4.5.5 Solar Energy Developments

A search of LCCC's online planning enquiry system and the An Coimisiún Pleanála website on 21st May 2025 found that within a 20-kilometre radius of the proposed development site there are several planning applications for solar farm developments, as summarised in **Table 5**.

Table 5. Status of solar energy projects located within 20 kilometres of proposed Ballynisky Wind Farm.

Planning reference	Solar Farm location	Applicant	Application status	Approx. distance from development site
LCCC: 2460320 ACP: 321242	Ardgoulbeg, near Rathkeale, Limerick	Harmony Solar Rathkeale Ltd.	LCCC Refused: 22/10/24 ACP Granted: 27/03/25	3.2 km northeast of site
221258	Ellaha & Mullagh, Limerick	Solas Éireann Development Ltd.	Granted: 22/06/23	2.6 km north of site
1918	Deelish & Mullagh, Shanagolden, Limerick	Solas Éireann Development Ltd.	Granted: 26/04/19	2.5 km north of site
171220	Ellaha & Ballinknockane, Limerick	Solas Éireann Development Ltd.	Granted:23/08/18	4.3 km north of site

4.5.6 EPA Licenced/Registered Facilities

A review of the EPA mapping tool determined that there are no IPPC, IPC, and IEL[30] facilities within five kilometres of the subject site. The nearest two to the proposed development site are the Gortadroma Landfill Site (IEL Registered Licence No. W0017-04) located 5.4 kilometres to the west, and Anglo Beef Processors Ireland t/a ABP Rathkeale (IEL Registered Licence No. P0191-0) located at Rathkeale approximately 5.5 kilometres to the east.

Other EPA licenced facilities comprise Ardagh[31] sewerage treatment works (<500 p.e.[32]) located within the townland of Minister's-land near Ardagh, approximately 2.8 kilometres south of the proposed wind farm site. This treatment works has a plant design capacity of 450 with an agglomeration p.e. of 372 and discharges treated effluent to the Slewaun Stream (North Branch)_010 River Waterbody[33]. The nearest urban wastewater treatment (UWWT) facility is located at Rathkeale (2,001 to 10,000 p.e.), approximately 5.4 kilometres to the east of the proposed development site, with treated effluent discharged to the River Deel.

[30] Integrated Pollution Control (IPC) Licence (formerly IPPC Licence), and Industrial Emissions Licence (IEL)
[31] Ardagh Reg Number: A0214-01
[32] Defined using population equivalent value (p.e.)
[33] EPA River Waterbody Code: IE_SH_24D021000

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4.5.7 Existing Land-use and On-going Activities

Agricultural practices are the chief land-use activity in the Shannon Estuary South (24) Catchment that could act in combination with the proposed development to negatively affect water quality. Excessive nutrient loss and alteration of the hydromorphological regime is an ongoing issue for many waterbodies in the catchment due to the combined pressures of agricultural practices, peat/mineral extraction, and industrial activities.

Other land-uses within the catchment include village settlements, one-off housing, and urban settlements such as Limerick City, Newcastle West, Adare, and Rathkeale.

There are three operational quarries located within 10 kilometres of the proposed development site as presented in Table 6.

Table 6. Summary of operational quarries located within 10 kms of proposed development site (PDS).

Quarry name	Quarry number	Rock type	Operation type	Product summary	Approximate distance and direction from PDS
Hogans Quarry	LK009	Limestone	Crushed rock	General fill, aggregates, blocks	3.3 km north of site
Knockbowheen Quarry	LK004	Limestone	Crushed rock	Graded shale products	1.7 km southwest of site
Michael O'Donovan Quarries	LK005	Shale/pencil	Crushed rock	Variously sized screened shale rock	2.2 km southwest of site

4.5.8 Potential for Significant In-combination Effects

It is considered that agriculture, on-going and future potential quarrying and industry operations (including other wind farms and solar farms), and to a lesser extent forestry and one-off rural residential developments comprise the land-uses and activities which could potentially interact synergistically with the proposed development to result in significant cumulative or in-combination effects.

The potential in-combination effects are discussed further in Section 4.8.6, below.

4.6 Identification of European Sites

4.6.1 Zone of Impact Influence and Selection of European Sites

As discussed in Section 3.4, above, the ZOI for the proposed development is the geographical area over which there is potential for the Qualifying interests (QI) of a European site to be affected by biophysical changes arising from the construction and/or operation and/or decommissioning of the proposed wind farm. To establish which European sites are located within the ZOI, the Source-Pathway-Receptor (SPR) model is applied during the screening stage of Appropriate Assessment, since, according to the Office of the Planning Regulator guidelines (OPR, 2021), 'a European site will only be at risk from likely significant effects where the Source-Pathway-Receptor link exists between the proposed development and the European site'.

The SPR model firstly considers the nature, size and location of the proposed development and then identifies characteristics that may provide a source of direct (e.g. water, noise, habitat loss) or indirect (e.g. collision risk, impact to the prey species of a QI) ecological impacts. Secondly, any pathways (e.g. watercourses) that exist linking the proposed development site to the European site(s) are identified, before, finally, establishing 'the location, nature and sensitivities of the qualifying species and habitats, the ecological conditions underpinning their survival and the conservation objectives specified to maintain or restore favourable conservation status' (OPR, 2021).

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Following this, and in view of best scientific knowledge, an assessment is made to ascertain whether the proposed development, individually or in combination with other plans/projects, is likely to have a significant effect on a European site(s) in view of its conservation objectives. If there are any significant, potentially significant, or uncertain effects, it will be necessary to proceed to Appropriate Assessment and submit an NIS.

With regards the proposed Ballynisky development and identification of potentially affected European sites, adoption of the SPR risk assessment principle and use of the precautionary approach, has led to the inclusion of all sites within a 15-kilometre radius of the proposal site – see **Table 7** and **Figure 9**, below.

Table 7. European Sites within the zone of potential impact of the proposed development at Ballynisky.

Designated Site & Code	Approximate distance of designated site from subject site	Hydrological/ ecological connection?
Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA (004161)	3.7 km west of T1 1.7 km west of Carrons substation	Yes – within maximum foraging range of hen harrier (SNH, 2016)
Lower River Shannon SAC (002165)	6 km to the north 7.4 rkm downstream from closest point (WC3)	Yes – via several watercourses draining site
River Shannon & River Fergus Estuaries SPA (004077)	6.8 km to the north 7.4 rkm downstream from closest point (WC3)	Yes – via several watercourses draining site
Askeaton Fen Complex SAC (002279)	5.9 km to the northeast	No
Barrigone SAC (000432)	6 km to the north	No
Curraghchase Woods SAC (000174)	10.5 km to the northeast	No

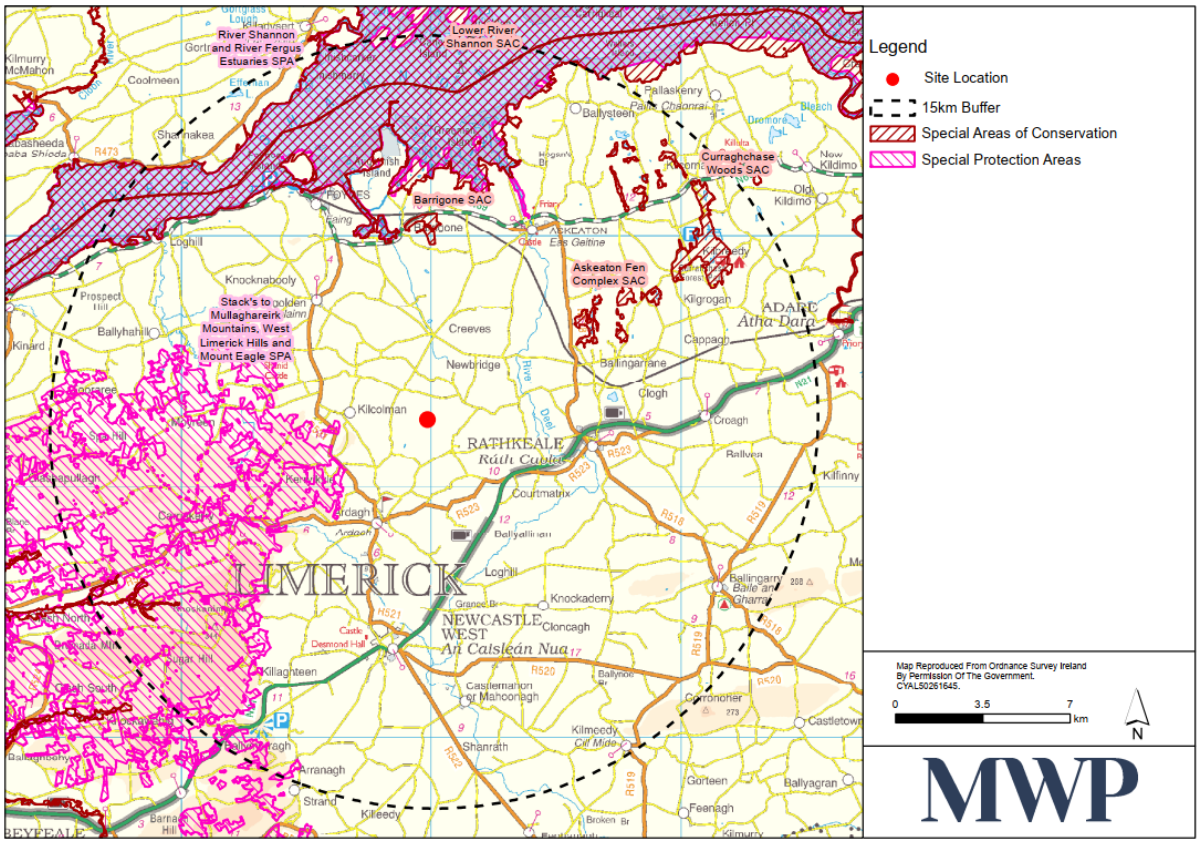

Figure 9: European sites within the zone of potential impact of the proposed development at Ballynisky.

4.6.2 Characteristics of European Sites

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The following table, **Table 8**, lists the qualifying features of conservation interest for the European sites identified in **Table 7,** above. Information pertaining to the European sites is taken from the site synopses, conservation objectives and other information available on www.npws.ie.

Table 8: European sites within the zone of potential impact (and within 15 km) of the proposed development, and their associated qualifying interests (QI) or special conservation interest (SCI) species.

Designated site	Qualifying features of conservation interest[34]
Stack's to Mullaghareirk Mountains: West Limerick Hills and Mount Eagle SPA (004161)	- Hen Harrier (*Circus cyaneus*) [A082]
Lower River Shannon SAC (002165)	- Sandbanks which are slightly covered by sea water all the time [1110] - Estuaries [1130] - Mudflats and sandflats not covered by seawater at low tide [1140] - Coastal lagoons [1150] - Large shallow inlets and bays [1160] - Reefs [1170] - Perennial vegetation of stony banks [1220] - Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] - *Salicornia* and other annuals colonising mud and sand [1310] - Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] - Mediterranean salt meadows (*Juncetalia maritimi*) [1410] - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] - *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] - Freshwater Pearl Mussel *(Margaritifera margaritifera*) [1029] - Sea Lamprey (*Petromyzon marinus*) [1095] - Brook Lamprey (*Lampetra planeri*) [1096] - River Lamprey (*Lampetra fluviatilis*) [1099] - Salmon (*Salmo salar*) [1106] - Common Bottlenose Dolphin (*Tursiops truncatus*) [1349] - Otter (*Lutra lutra*) [1355]
River Shannon and River Fergus Estuaries SPA (004077)	- Cormorant (*Phalacrocorax carbo*) [A017] Wintering and breeding - Whooper Swan (*Cygnus cygnus*) [A038] Wintering - Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Wintering - Shelduck (*Tadorna tadorna*) [A048] Wintering - Wigeon (*Anas penelope*) [A050] Wintering - Teal (*Anas crecca*) [A052] Wintering - Pintail (*Anas acuta*) [A054] Wintering - Shoveler (*Anas clypeata*) [A056] Wintering - Scaup (*Aythya marila*) [A062] Wintering - Ringed Plover (*Charadrius hiaticula*) [A137] Wintering - Golden Plover (*Pluvialis apricaria*) [A140] Wintering - Grey Plover (*Pluvialis squatarola*) [A141] Wintering - Lapwing (*Vanellus vanellus*) [A142] Wintering

[34] Asterisk (*) denotes a priority habitat considered to be in danger of disappearance.

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Designated site	Qualifying features of conservation interest[34]
	- Knot (*Calidris canutus*) [A143] Wintering - Dunlin (*Calidris alpina*) [A149] Wintering - Black-tailed Godwit (*Limosa limosa*) [A156] Wintering - Bar-tailed Godwit (*Limosa lapponica*) [A157] Wintering - Curlew (*Numenius arquata*) [A160] Wintering - Redshank (*Tringa totanus*) [A162] Wintering - Greenshank (*Tringa nebularia*) [A164] Wintering - Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wintering - Wetland and Waterbirds [A999]
Askeaton Fen Complex SAC (002279)	- Calcareous fens with *Cladium mariscus* & species of *Caricion davallianae* [7210] - Alkaline fens [7230]
Barrigone SAC (000432)	- *Juniperus communis* formations on heaths or calcareous grasslands [5130] - Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] - Limestone pavements [8240] - Marsh Fritillary (*Euphydryas aurinia*) [1065]
Curraghchase Woods SAC (000174)	- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] - Taxus baccata woods of the British Isles [91J0] - Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1016] - Lesser Horseshoe Bat (*Rhinolophus hipposideros*) [1303]

4.6.3 Conservation Objectives

According to the Habitats Directive, the *conservation status of a natural habitat* is defined as the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. A habitat will be taken as 'favourable' within its biogeographic range when:

- Its natural range and areas it covers within that range are stable or increasing;
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is 'favourable' as defined below.

According to the Habitats Directive, the *conservation status of a species* means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' within its biogeographical range when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The conservation objectives for each individual site listed in **Table 7** and **Table 8**, above are available on www.npws.ie. These have been accessed on the 24th August 2025. Management plans are not currently available for any of the designated sites.

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Site-specific conservation objectives were available for the following sites:

- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161). Version 1.0. Produced 23rd September 2022;
- Lower River Shannon SAC (002165). Version 1.0. Produced 7th August 2012;
- River Shannon and River Fergus Estuaries SPA (004077). Version 1.0. Produced 17th September 2012;
- Askeaton Fen Complex SAC (002279). Version 1.0. Produced 18th May 2018;
- Barrigone SAC (000432) Version 1.0. Produced 15th February 2019; and
- Curraghchase Woods SAC (000174). Version 2.0. Produced 20th January 2023.

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4.7 Identification of Potential Impacts

Potential likely direct, indirect or secondary ecological impacts arising from the proposed development (either alone or in combination with other plans/projects) are identified in this section.

Table 9. Identification of the potential impacts of the proposed wind energy development at Ballynisky in County Limerick.

Description of elements of the project likely to give rise to potential ecological impacts sites.	Wind Farm Construction Phase ▪ Excavations, ground moving, and heavy engineering required to construct windfarm tracks & hardstands, sub-station, underground cabling, grid connection, surface water drainage system, permanent met mast, buildings & fencing. ▪ Presence and sustained use of heavy and light plant machinery onsite at variable rates/levels during daylight hours for works duration. ▪ Use of fuels/oils/lubricants, concrete and other such substances considered harmful to the aquatic environment. ▪ Human presence: Sustained increase in human activity at variable rates and levels during daylight hours for the duration of the works. ▪ Increased noise and air emissions associated with construction activity. ▪ Permanent deposition of excavated spoil at specific areas on site. ▪ Erection of turbines. Introduction of large physical structures in a previously unoccupied and uninterrupted air space. ▪ Temporary site compound. ▪ Temporary surface water flow management systems for specific engineering elements as required at various locations. Wind Farm Operational Phase ▪ Operation of wind turbines at six locations (rotation of turbine blades). ▪ Operation of substation. ▪ Operational maintenance works. ▪ Human presence (wind farm staff and increased vehicular activity). Wind Farm Decommissioning Phase ▪ Decommissioning of wind farm infrastructure including excavation and heavy engineering works, ground moving, use of machinery, temporary storage of spoil, temporary site drainage. ▪ Increased human activity, increased noise and air emissions. ▪ Permanent disassembly and removal of wind farm components including turbines. ▪ Permanent disposal and storage of excavated materials. ▪ Temporary site compound.
Describe any likely direct, indirect or secondary ecological impacts of the project (either alone or in combination	Wind Farm Construction Phase ▪ There is no spatial overlap between subject site and any European site; therefore, there will be no direct habitat loss/alteration/land-take within any European site. There will be loss/alteration of habitats (mainly agricultural grassland with smaller areas of other habitat such as wet grassland and hedgerows) within the construction footprint.

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with other plans or projects) by virtue of:

- *Size and scale*
- *Land-take*
- *Distance from Natura 2000 Site or key features of the site*
- *Resource requirements*
- *Emissions*
- *Excavation requirements*
- *Transportation requirements*
- *Duration of construction, operation etc.*
- *Other.*

- Potential for direct species disturbance/displacement impacts due to construction activity including fugitive noise emissions from machinery, human activity.
- Rock blasting is unlikely to be required but should it occur, any excessive dust generated has potential to affect soils and/or nearby aquatic environments while the resulting noise/vibrations have potential for species disturbance/displacement impacts.
- Subject site is hydrologically connected to the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA via watercourses draining the site.
- Potential for water quality impacts through the erosion/run-off of silt, and/or ingress of fuels/oils, cementitious material, or other such substances via overland flow and/or the existing/proposed drainage network to local watercourses and the estuarine waters of the River Shannon into which they drain.
- Potential for groundwater contamination via spillage of oils/fuels/chemicals.
- Potential for indirect alteration of habitats located outside the development site but hydrologically linked to it.
- Potential for indirect species disturbance/displacement due to *in-situ* or *ex-situ* habitat loss/alteration impacts, impairment of water quality and/or impacts on prey availability.
- Potential for spread of invasive species.

Wind Farm Operational Phase

- Risk of bird mortality through collision or interaction with turbine blades or other infrastructure.
- Potential for species disturbance/displacement (indirect habitat loss) due to operation/maintenance of wind turbines and substation.
- Potential for species displacement because of 'barrier effects' whereby species are deterred from using normal routes to access breeding, foraging or roosting habitats. For example, behavioural responses to the presence of turbines could cause some species to stop using or reduce their use of foraging grounds in proximity to the turbine envelope.
- Potential for water quality impacts through the erosion and run-off of silt, and/or ingress of fuels/oils via overland flow and/or the drainage network to local watercourses and the estuarine waters of the River Shannon into which they drain.
- Potential for groundwater contamination through spillage of oils, fuels and chemicals.
- Potential for indirect alteration of habitats outside of but hydrologically linked to the development site.
- Potential for indirect species disturbance/displacement due to impairment of water quality and/or impacts on prey availability.

Wind Farm Decommissioning Phase

- Potential for water quality impacts, as above.
- Potential for groundwater contamination, as above.
- Potential for direct species disturbance/displacement due to fugitive noise emissions associated with disassembly and/or removal of wind farm components and human activity.
- Potential for indirect alteration of habitats outside of but hydrologically linked to the development site.
- Potential for indirect species disturbance/displacement due to impairment of water quality and/or impacts on prey availability.
- Potential for spread of invasive species.

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4.8 Assessment of Significance of Potential Impacts

This section considers the list of sites identified in **Section 4.6**, above, together with the potential ecological impacts identified in **Table 9**, above, and determines whether the proposed development is likely to have any significant effects on a European site. When assessing impact, European sites are only considered relevant where a credible or tangible source-pathway-receptor link exists between the proposed development and a protected species or habitat type. For an impact to occur there must be a risk initiated by having a 'source' (e.g. excavation), and an impact pathway between the source and the receptor (e.g. a waterbody which connects the proposal site to the protected species or habitats).

An evaluation based on these factors to determine which (if any) European site(s) are the plausible ecological receptors for potential impacts of the proposed development will be conducted in **Sections 4.8.1** and **4.8.2**, below. The evaluation takes cognisance of the scope, scale, nature and size of the project, its location relative to the European sites listed in **Table 7**, above, and the degree of connectedness that exists between the project and each European site's potential ecological receptors.

4.8.1 European Sites Outside the Likely Zone of Impact after Application of SPR Model

With regards to the proposal, it is considered that the works do not include any element that has the potential to significantly affect the conservation objectives for which certain European sites are designated. Although located within 15 kilometres of the proposed development site, these European sites are deemed to be outside the zone of potential impact influence of the proposed development due to the absence of plausible impact pathways upon application of the SPR model (see **Section 4.6.1**, above, for details of the model). Therefore, it is objectively concluded that significant effects on the conservation objectives of these sites are not reasonably foreseeable because of the proposed development described in **Section 4.3**, above. These sites are listed in **Table 10**, below, along with their approximate distances from the proposed development site and the rationale for their exclusion from further consideration within this report.

Table 10. European Sites excluded from further assessment, including rationale for exclusion.

Designated Site	Approximate distance from proposed development site	Rationale for Exclusion from Further Assessment
Askeaton Fen Complex SAC (002279)	5.9 km northeast of site	- Designated for calcareous fens and alkaline fens habitats. - No spatial overlap with the proposal site. - Located upstream from proposed development and within a separate ground waterbody. - No plausible impact pathway for significant effects to the SAC.
Barrigone SAC (000432)	6 km north of site	- Designated for two grassland habitats, limestone pavement habitat, and marsh fritillary. - No spatial overlap with proposal site and no hydrological connection between the two. - During terrestrial invertebrate surveys, one marsh fritillary larval web was recorded within the proposed development area near T2 but at a location outside the development's construction footprint. The site itself supports only small pockets of Devil's-bit scabious (*Succissa pratensis*), the food plant of the marsh fritillary. - No plausible impact pathway for significant effects to the SAC.

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Designated Site	Approximate distance from proposed development site	Rationale for Exclusion from Further Assessment
Curraghchase Woods SAC (000174)	10.5 km northeast of site	- Designated for alluvial forests, woodlands, Desmoulin's whorl snail and lesser horseshoe bat. - No spatial overlap with proposal site and no hydrological connection between the two. - Proposal site located outside the maximum foraging range of lesser horseshoe bat (circa 6 km) (BCI, 2012). - Intensively managed agriculture land unsuitable for Desmoulin's whorl snail. - No plausible impact pathway for significant effects to the SAC.

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4.8.2 European Sites Within the Likely Zone of Impact (ZOI) after Application of SPR Model

The assessment of significance of potential impacts that follows will focus on the three remaining European sites identified in **Table 11**, below. When the SPR framework is applied, these sites are deemed to have the potential to be impacted by the proposal described in **Section 4.3**, due to the existence of plausible impact pathways linking the proposed development site (source) to the Qualifying Interest species and habitats (receptors) of the European sites. Therefore, it is objectively concluded that significant effects on the conservation objectives of these three European sites because of the proposed development described at **Section 4.3**, have the potential to occur and cannot be ruled out at this stage. These sites are listed in **Table 11**, along with their approximate distances from the subject site and will be subjected to further assessment in this report. Refer to in **Figure 5**, above, for Watercourse Crossing (WC) locations.

Table 11. European sites within the likely zone of impact and rationale for inclusion for further assessment.

Designated Site	Approximate distance from subject site	Rationale for Inclusion for Assessment
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	3.7 km west of T1 1.7 km west of existing Carrons substation	- Designated for hen harrier – supports the largest concentration of the species in the country.[35] - Proposed development site lies within the 2-km core foraging range of the species (SNH, 2016). - Habitats on site largely unsuitable for nesting but may hold some value as foraging habitat. - Potential for turbines to act as barrier to movement and/or increase species mortality due to collision risk. - Potential for significant impacts to the SPA's Conservation Objectives - Further assessment required.
Lower River Shannon SAC (002165)	6 km north of subject site 7.4 rkm downstream from site via Knockardnacorlan River at closest point (WC3).	- Designated for wide variety of aquatic and terrestrial habitats and species. - No spatial overlap: however, several watercourses draining the proposal site drain to the SAC. - Direct hydrological connection exists between proposal site and SAC (SAC is located approximately 7.4 rkm downstream at closest point (WC3)). - Habitats within the proposal site suitable for some QIs. - Potential for significant effects to the SAC - Further assessment is required.
River Shannon and River Fergus Estuaries SPA (004077)	6.8 km north of subject site 7.4 rkm downstream from site via Knockardnacorlan River at closest point (WC3).	- Designated for wide variety of predominantly wintering waterbird species, and wetland habitat. - No spatial overlap: however, several watercourses draining the proposal site drain to the SPA. - Direct hydrological connection exists between the proposal site and the SPA (SPA is located approximately 7.4 rkm downstream at closest point (WC3)). - Agricultural/wet grassland within proposal site suitable foraging/roosting habitat for some SCI species. - Potential for turbines to act as barrier to SCI species movement and/or increase mortality due to increased collision risk, particularly black-headed gull which was recorded in almost every season flying through the proposed wind farm site. - Further assessment is required.

[35] SITE SYNOPSIS (npws.ie) Accessed: 20th April 2025

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As discussed previously in Section 3.1, above, the likelihood of significant effects from the project to the European sites outlined above was determined based on several indicators including:

- Water quality;
- Habitat loss/alteration;
- Disturbance and/or displacement of species; and
- Habitat or species fragmentation.

The likelihood of significant cumulative or in-combination effects occurring is assessed in Section 4.8.6, below.

4.8.3 Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)

4.8.3.1 Water Quality

The SPA is not hydrologically connected to the proposed development site.

4.8.3.2 Habitat Loss and Alteration

There is no spatial overlap between the subject site and the SPA and, therefore, there will be no loss/alteration of any hen harrier habitat from within the SPA itself.

The guidance document '*Assessing Connectivity with Special Protection Areas (SPAs)*' (SNH, 2016) provides species-specific distances which may be reasonably considered to connect bird populations to SPA sites. For hen harrier, the guidance states that the 'core range' with regards to foraging distances of hen harrier from SPAs during the breeding season is two kilometres (with a maximum range of up to ten kilometres). This 'core range' is the buffer area around relevant SPAs within which hen harrier could reasonably be expected to regularly commute to outlying foraging areas from roost sites within the SPA boundary. The Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA is approximately 1.7 kilometres from the existing Carrons Wind Farm substation where the Option A Grid Connection route (the proposed 2.54 km-long grid connection) to the proposed wind farm will be installed. The nearest proposed turbine to the SPA is T01 located approximately 3.7 km northeast of the SPA boundary. Consequently, the proposed wind farm and Grid Connection Options are within the core foraging range for hen harrier.

The proposed development site is not considered to have significant areas of ecological value for foraging/nesting hen harrier. However, the site contains some pockets of scrub and hedgerow and lies within the species' maximum foraging range, therefore, under the precautionary principle, this SPA is considered for potential ex-situ effects. Accordingly, further assessment is required to establish the magnitude of connectivity between the proposed development site and Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA.

4.8.3.3 Disturbance and/or Displacement of Species

There is, therefore, the potential for disturbance and displacement effects to the SPA's hen harrier population due to fugitive noise emissions and/or increased human activity during all phases of the proposed development. However, it is noted that during construction these aspects of the proposal will be temporary in nature and will be carried out on a phased basis. Similarly, by virtue of the intervening distances of approximately 1.7 kilometres and 3.7 kilometres between the SPA and, respectively, the nearest point of the proposed development at Carrons Wind Farm substation and the nearest proposed turbine location at T01, fugitive noise emissions and levels of human activity expected during the operational or decommissioning phases of the project cannot be reasonably

assumed to have the potential to result in significant disturbance/displacement impacts to this SCI species. However, it has also been established in Section 4.8.3.2, above, that these intervening distances of 1.7 kilometres and 3.7 kilometres are both within the core foraging range of breeding hen harrier (SNH, 2016) and the site contains some minor areas of scrub and hedgerow that may be suitable for foraging hen harrier. Consequently, under the precautionary principle, there is potential for ex-situ disturbance/displacement effects on the SPA's hen harrier population with regards foraging habitat.

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Although there is a known hen harrier roosting area at Carrigkerry Bog located a minimum of five kilometres from the proposed development site, only one hen harrier was recorded in-flight during the 60 months of VP surveys carried out from April 2020 to March 2025, inclusive. It is reasonable, therefore, to conclude that hen harrier activity levels within the air space above the proposed development site is negligible and the species does not use the proposed development site when moving between suitable habitats within the greater area. However, with the employment of a precautionary approach and considering the intervening distance of 3.7 kilometres between the SPA boundary and nearest turbine, there may be the potential for disturbance/displacement effects on the species via avoidance of turbines and/or collision with rotating blades.

Two Whitfield & Madders (2006a; 2006b) reviews of the potential impacts of wind farms on hen harrier, namely disturbance/displacement, collision, direct habitat loss/damage, or barriers to movement, determined that hen harriers generally 'appear to be less vulnerable to collision than several other raptors' and that their 'foraging activity appears to be little affected by displacement'. Nevertheless, further assessment is required to establish the significance that any disturbance and/or displacement of hen harrier may have on the Conservation Objectives of the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA.

4.8.4 Lower River Shannon SAC (002165) and River Shannon and River Fergus Estuaries SPA (004077)

4.8.4.1 Water Quality

The topography of the proposed wind farm site is relatively flat, and elevations within the study area range from approximately 42 to 78 metres AOD with the terrain gently sloping downwards in a north-northeast direction towards the coast. As described in Section 4.4.2, above, watercourses leaving the proposed development site drain into larger watercourses that flow northwards and eventually drain into the Lower River Shannon SAC and the River Shannon and River Fergus SPA located, at their closest points to the proposed development site, approximately 7.4 river kilometres downstream. The three proposed watercourse crossings create a hydrological link between the development site and the two European sites located downstream. Furthermore, the overland and existing drain pathways also have the potential to hydrologically link the proposed development site to both European sites downstream.

As detailed in Table 8, above, the Lower River Shannon SAC is designated for a variety of marine and freshwater aquatic habitats and species, and the River Shannon and River Fergus Estuaries SPA is designated for a variety of water-dependant bird species and wetland habitat.

During a wind farm's construction phase, and in the absence of any pollution prevention controls, earthworks have the potential to adversely impact water quality due to soil erosion. The subsequent suspension of soil sediment particles in site run-off and overland flow can eventually reach the natural watercourses draining the site in the absence of implementation of appropriate controls and protective measures. Nutrients such as phosphorous can be bound to soil from past fertilisation of agricultural land and can become transported in overland flow. Potential also exists for accidental ingress of fuel and oils, concrete and cementitious material and other such substances considered harmful to the aquatic environment via overland flow, direct discharges to drainage features and/or leaching to groundwater in the event of a spillage and/or leakage.

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Water quality is a key environmental factor underpinning the conservation condition of the complex of aquatic and wetland habitats and species that support the qualifying features for which the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA are classified. There is a hydrological connection between the proposed development site and both the European sites via the various watercourses that drain the proposed development area – refer to **Figure 5**, above. Given the pollution risk associated with the construction phase of the works and this hydrological pathway, it is considered that potential significant effects to the water quality of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA cannot be ruled out without appropriate mitigation measures.

The decommissioning phase of the proposed development and, to a lesser extent, the operational phase are also considered to have the potential to result in water quality impacts.

Consequently, in the absence of mitigation, it is objectively concluded that significant water quality effects within the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA arising from the impacts identified in **Section 4.7**, above, have the potential to occur and further assessment is required.

4.8.4.2 Habitat Loss and Alteration

There is no spatial overlap between the subject site and either European site; therefore, there will be no direct loss/alteration of any of the qualifying habitats of conservation interest for which each European site is designated. Any direct habitat loss arising because of the proposal will be restricted to the proposed development site boundary. However, as detailed in **Section 4.4.2**, above, the proposed development site is hydrologically connected to both the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.

The Lower River Shannon SAC site is designated for fourteen Annex I habitat types as listed in **Table 8**, above. The River Shannon and River Fergus Estuaries SPA is designated for the protection of the habitat and species complex 'Wetlands and waterbirds [A999]' which requires the conservation of wetland habitat within the SPA as a resource for regularly occurring migratory waterbirds. As discussed in **Section 4.8.4.1**, above, significant indirect impacts to the water quality of the SAC and SPA have the potential to occur which subsequently creates the potential for an indirect loss and/or alteration of habitats within the SAC and/or the SPA located downstream.

Consequently, in the absence of mitigation, it is objectively concluded that significant loss and/or alteration of habitats within the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA arising from the impacts identified in **Section 4.7**, above, have the potential to occur and further assessment is required.

4.8.4.3 Disturbance and/or Displacement of Species

4.8.4.3.1 Lower River Shannon SAC (002165)

The Lower River Shannon SAC is designated for the following QI species:

- Freshwater pearl mussel (*Margaritifera margaritifera*) [1029];
- Sea lamprey (*Petromyzon marinus*) [1095];
- Brook lamprey (*Lampetra planeri*) [1096];
- River lamprey (*Lampetra fluviatilis*) [1099];
- Atlantic salmon (*Salmo salar*) [1106] (QI status pertains only to freshwater phases of life cycle);
- Bottlenose dolphin (*Tursiops truncates*) [1349]; and
- Otter (*Lutra lutra*) [1355].

All these QIs are exclusively aquatic in nature and/or dependant on aquatic habitats (i.e. otter) and require an adequate level of water quality to be maintained within their environments.

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The Conservation Objective for the freshwater pearl mussel within the SAC applies only to the population occurring within the Cloon River (NPWS, 2012) which is situated in a different catchment on the opposite side of the Shannon Estuary. There is no hydrological connection between the proposed development site at Ballynisky and the Cloon River and therefore no plausible pathway for impacts to the Cloon River's designated freshwater pearl mussel population to occur.

It has already been concluded in **Section 4.8.4.1**, above, that because of the proposal and in the absence of water quality protection mitigation measures, there is potential for significant impacts to the water quality of the watercourses draining the proposed development site and the SAC located approximately 7.4 river kilometres downstream from the proposed development site at its closest point.

A healthy population of juvenile trout were recorded at a site on the Ahacronane River at Creeves Cross, approximately 3.5 river kilometres downstream from the proposed development site but the area was deemed unlikely to support salmon due to the insufficient size of the river. Additionally, no species of lamprey was encountered during any aquatic survey, although it was deemed possible that brook lamprey may occur within the area but in low densities only. Based on aquatic surveys carried out in 2022, it is concluded that salmon and migratory lampreys (sea and river lamprey) are highly unlikely to occur in the reaches of watercourses surrounding the proposed development, as none were recorded during the aquatic surveys and because water quality issues, mainly due to silt, reduce the habitat value for these species.

Nevertheless, as a precautionary measure, it is assumed for this assessment that the watercourses draining the proposed development site have the potential, albeit slight, to support areas of habitat considered suitable for lamprey, salmon and otter which may be constituents of the SAC's QI populations. Therefore, there is potential for indirect disturbance and/or displacement of these species to occur via impairment of water quality and the resulting impacts on prey availability, and/or the indirect alteration of habitats located downstream. Such impacts could affect QIs within watercourses which are outside the SAC, but which have been identified as potential pathways for impacts in **Section 4.8.4.1**, above, as well as within the SAC boundary located downstream.

Since the drainage ditches within the site may support a nominal population of three-spined stickleback (see **Section 4.4.3.5**, above), the ditches are considered to comprise marginal or sub-optimal foraging habitat for otter. However, since the SAC's otter population may utilise foraging habitat outside the SAC boundary, there is potential for otter from the SAC to use some of the drainage ditches at the proposed development site as foraging habitat. As a precautionary measure, therefore, it is presumed that there is potential for disturbance and/or displacement of foraging otter at the proposed development site due to increased levels of noise, lighting and human activity, primarily during the construction phase and to a lesser extent during the operational and decommissioning phases.

Consequently, in the absence of mitigation, it is objectively concluded that significant disturbance and/or displacement of QI species within the Lower River Shannon SAC arising from the impacts identified in **Section 4.7**, above, have the potential to occur and further assessment is required.

4.8.4.3.2 River Shannon and River Fergus Estuaries SPA (004077)

The River Shannon and River Fergus Estuaries SPA is designated for the following SCI species:

- Cormorant (*Phalacrocorax carbo*) [A017];
- Whooper Swan (*Cygnus cygnus*) [A038];
- Light-bellied Brent Goose (*Branta bernicla hrota*) [A046];
- Shelduck (*Tadorna tadorna*) [A048];
- Wigeon (*Anas penelope*) [A050];
- Teal (*Anas crecca*) [A052];

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- Pintail (*Anas acuta*) [A054];
- Shoveler (*Anas clypeata*) [A056];
- Scaup (*Aythya marila*) [A062];
- Ringed Plover (*Charadrius hiaticula*) [A137];
- Golden Plover (*Pluvialis apricaria*) [A140];
- Grey Plover (*Pluvialis squatarola*) [A141];
- Lapwing (*Vanellus vanellus*) [A142];
- Knot (*Calidris canutus*) [A143];
- Dunlin (*Calidris alpina*) [A149];
- Black-tailed Godwit (*Limosa limosa*) [A156];
- Bar-tailed Godwit (*Limosa lapponica*) [A157];
- Curlew (*Numenius arquata*) [A160];
- Redshank (*Tringa 40totanus*) [A162];
- Greenshank (*Tringa nebularia*) [A164]; and
- Black-headed Gull (*Chroicocephalus ridibundus*) [A179].

This SPA site is selected for the resident population of one species – cormorant – and the migratory overwintering populations of twenty other SCI species, as listed above. The SCI species for which the SPA is selected comprise seabirds and wildfowl, both groups that are deemed to be at risk from wind farms (Percival, 2003). During the ornithological surveys at the proposed development site, there were eight SCI species recorded within five kilometres of the proposed development site – black-headed gull, cormorant, curlew, golden plover, lapwing, shoveler, teal, and whooper swan. Of these, black-headed gull was the only species observed at the proposed development site on multiple occasions during VP surveys and was the most frequently observed species across all surveys carried out. The other seven species were each seen on only a handful of occasions with almost all observations occurring outside the proposed development site boundary.

There are no waterbodies encompassed within the proposed development site in which any of the SCI species for which the SPA is designated could reasonably be expected to occur. However, depending on seasonal rainfall variations and local groundwater levels, the footprint of Ballynisky Pond (located southeast of T6) has the potential to expand and overlap with the proposed development's redline boundary. This waterbody is known to be used by teal on occasion, however there were no sightings of the species using the pond during any of the ornithological surveys.

SCI species of the SPA may fly over the proposed development site when moving between suitable habitats within the greater area, however, as mentioned above, only black-headed gull was recorded in any significant numbers within the proposed development's airspace during bird surveys of the area. A review of the BirdLife report on the potential impacts of wind farms on birds determined that most, if not all, of the SPA's SCI species have the potential to be disturbed and/or displaced from wind farms through collision, habitat loss/damage, or the barrier effect of turbines once operational (BirdLife, 2003).

Indirect ecological impacts potentially arising because of the proposed works include an increase in noise levels/human activity during the construction phase and/or the operational phase and/or decommissioning phase of the development whereby species are disturbed and avoid the area, although it is noted that these aspects of the proposal will be temporary in nature and will be carried out on a phased basis. Further assessment is required to determine whether any potential disturbance/displacement impacts to the SCI species for which the SPA is designated will be significant. Additionally, it has already been concluded in **Section 4.8.4.1**, above, that in the absence of water quality protection mitigation measures, there is potential for significant impacts to the water

quality of the watercourses draining the proposed development site and, therefore, to the SPA located approximately 7.4 river kilometres downstream at its closest point. This creates the potential for indirect disturbance and/or displacement of SCI species via impacts to aquatic habitats and/or prey resource.

Consequently, in the absence of mitigation, it is objectively concluded that significant disturbance and/or displacement of SCI species within the River Shannon and River Fergus Estuaries SPA arising from the impacts identified in Section 4.7, above, have the potential to occur and therefore further assessment will be required.

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4.8.5 Habitat or Species Fragmentation

Habitat fragmentation has been defined as 'reduction and isolation of patches of natural environment' (Franklin *et al.*, 2002; Morrison *et al.*, 2012) which results in spatial separation of habitat areas which had previously been in a state of greater continuity. Adverse effects of habitat fragmentation on species include the increased isolation of populations which can detrimentally impact upon the resilience or robustness of the populations.

The preceding Sections 4.8.3 and 4.8.4 have concluded that habitat loss and alteration impacts, water quality impacts and disturbance/displacement impacts cannot be ruled out for the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA because of the proposed development. Therefore, significant habitat or species fragmentation on these European sites also cannot be ruled out and further assessment is required.

4.8.6 Cumulative/In-combination Effects

The preceding sections have concluded that there is potential for the proposed development to cause indirect habitat loss/alteration, water quality impacts, disturbance/displacement of species, and/or habitat/species fragmentation impacts to the QI species and habitats for which three European sites are designated, namely the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, the Lower River Shannon SAC, and the River Shannon and River Fergus Estuaries SPA. However, as established in Section 4.8.1, above, no plausible pathway exists to connect any of these three European sites with the other designated sites listed in Table 10, above, that are located within 15 kilometres of the proposed development site but are outside the zone of impact. Therefore, the potential for cumulative impacts of the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, the Lower River Shannon SAC, and the River Shannon and River Fergus Estuaries SPA with other European sites as a result of the proposed development is negligible.

There is, however, the potential that any or all the possible effects to the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, or the Lower River Shannon SAC, or the River Shannon and River Fergus Estuaries SPA could cause significant cumulative/in-combination impacts with other developments, plans and activities within the area identified in Section 4.5, above. Further assessment is required to determine whether significant cumulative/in-combination impacts will ensue from the proposed development.

4.9 Conclusion of Screening Stage

In conclusion, to determine any potential impacts of the proposed development on six nearby European sites, a screening process for Appropriate Assessment was undertaken.

It has been objectively concluded during this screening process that the proposed construction, operation and eventual decommissioning of a 6-turbine wind farm at Ballynisky in County Limerick, either individually or in combination with other plans or projects, is not likely to have significant effects on the following three European sites located within 15 kilometres of the proposed development in view of those sites' Conservation Objectives, and further assessment is deemed unnecessary:

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- Askeaton Fen Complex SAC (002279);
- Barrigone SAC (000432); and
- Curraghchase Woods SAC (000174).

It cannot be objectively concluded at this stage that the proposed development at Ballynisky in County Limerick will not result in significant effects on the following designated European sites due to the impacts identified in Sections 4.8.3 to 4.8.6, above:

- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161);
- Lower River Shannon SAC (002165); and
- River Shannon and River Fergus Estuaries SPA (004077).

Consequently, it has been concluded that, in respect of these European sites, the project should proceed to Stage 2 of the Appropriate Assessment process and as such, a Natura Impact Statement is required. It is concluded that all other European sites have been correctly screened out or excluded from further consideration based on objective information that the project, individually or in-combination with other plans or projects, will have no, or no appreciable, effects on those sites.

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Appendix 1

Stages of Appropriate Assessment

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Stage 1 - Screening

This is the first stage of the Appropriate Assessment process and is undertaken to determine the likelihood of significant impacts to the Qualifying Interests of a Natura 2000 site arising due to a proposed project or plan. It determines the need for a full Appropriate Assessment.

If it can be concluded that no significant impacts to Natura 2000 site(s) are likely, then the assessment can stop here. If not, it must proceed on to Stage 2 for a more detailed assessment.

Stage 2 - Natura Impact Statement (NIS)

The second stage of the Appropriate Assessment process assesses the impact of the proposal (either alone or in combination with other projects or plans) on the integrity of the Natura 2000 site(s) with respect to the conservation objectives of the site(s) and its ecological structure and function. This is a much more detailed assessment than Stage 1. A Natura Impact Statement is required to contain a professional scientific examination of the proposal and include any mitigation measures deemed necessary to avoid, reduce or offset negative impacts.

If the outcome of Stage 2 is negative i.e. adverse impacts to the site(s) cannot be scientifically ruled out despite mitigation, the plan or project should proceed to Stage 3 or be abandoned.

Stage 3 - Assessment of alternative solutions

A detailed assessment must be undertaken to determine whether alternative ways of achieving the objective of the project/plan exists.

Where no alternatives exist, the project/plan must proceed to Stage 4.

Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain

The final stage is the main derogation process examining whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project to adversely affect a Natura 2000 Site where no less damaging solution exists.

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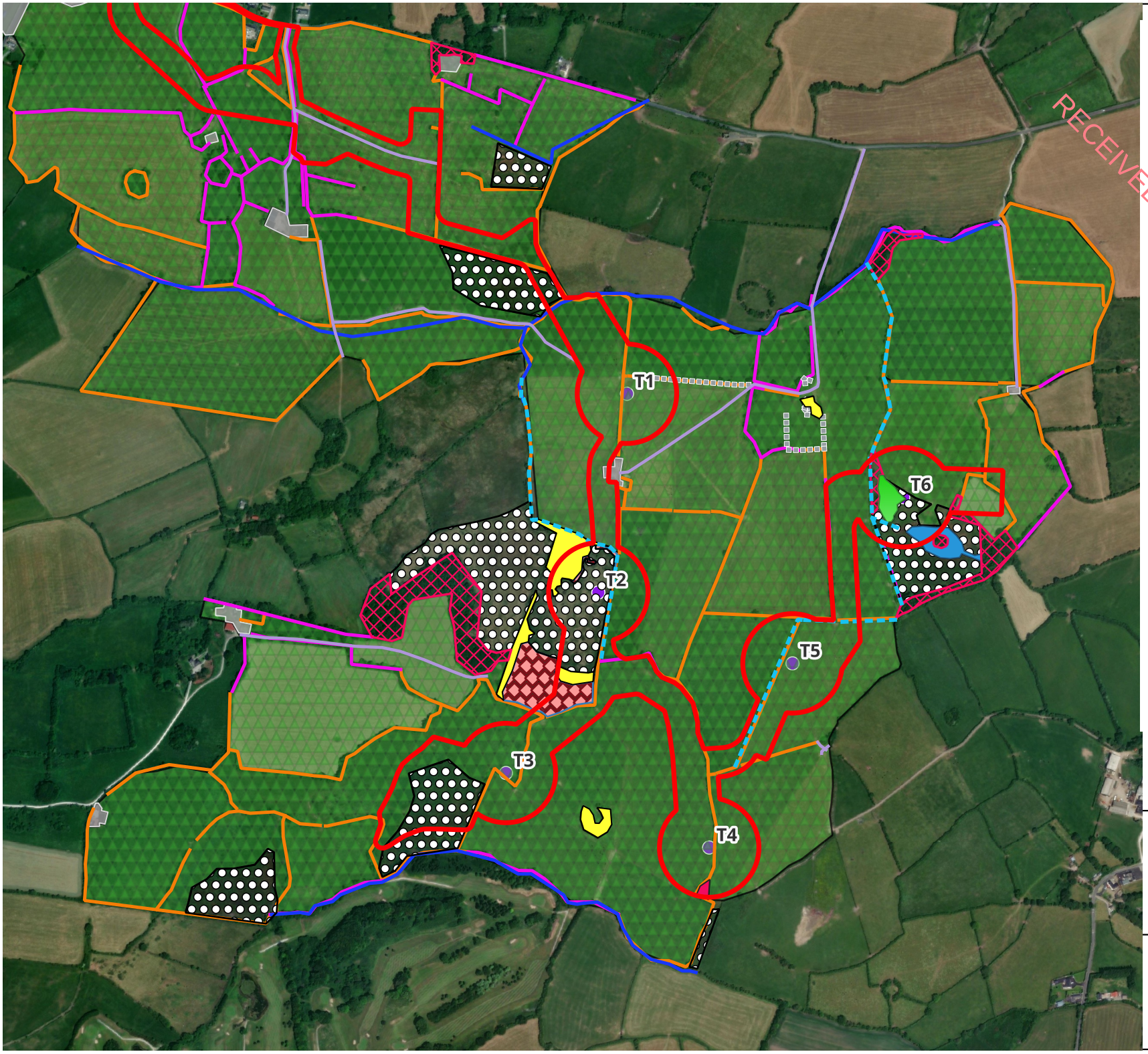
Appendix 2

Habitat Maps



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Legend

- Planning Application Boundary
- Drainage Ditch FW4
- Stone walls and Other Stonework BL1
- Spoil and Bare Ground ED2
- Hedgerows WL1
- Treelines WL2
- Watercourse FW2
- Wet Grassland GS4
- Scrub WS1
- Immature Woodland WS2
- (Mixed) Broadleaved Woodland WD1 / Scrub WS1
- (Mixed) Broadleaved Woodland WD1 / Scrub WS1 / Wet Grassland GS4
- Poor Fen and Flush PF2
- Wet Grassland GS4 / Scrub WS1
- Buildings and Artificial Surfaces BL3
- Improved Agricultural Grassland GA1

Ballynisky Wind Farm Habitat Map - Map 1 of 2

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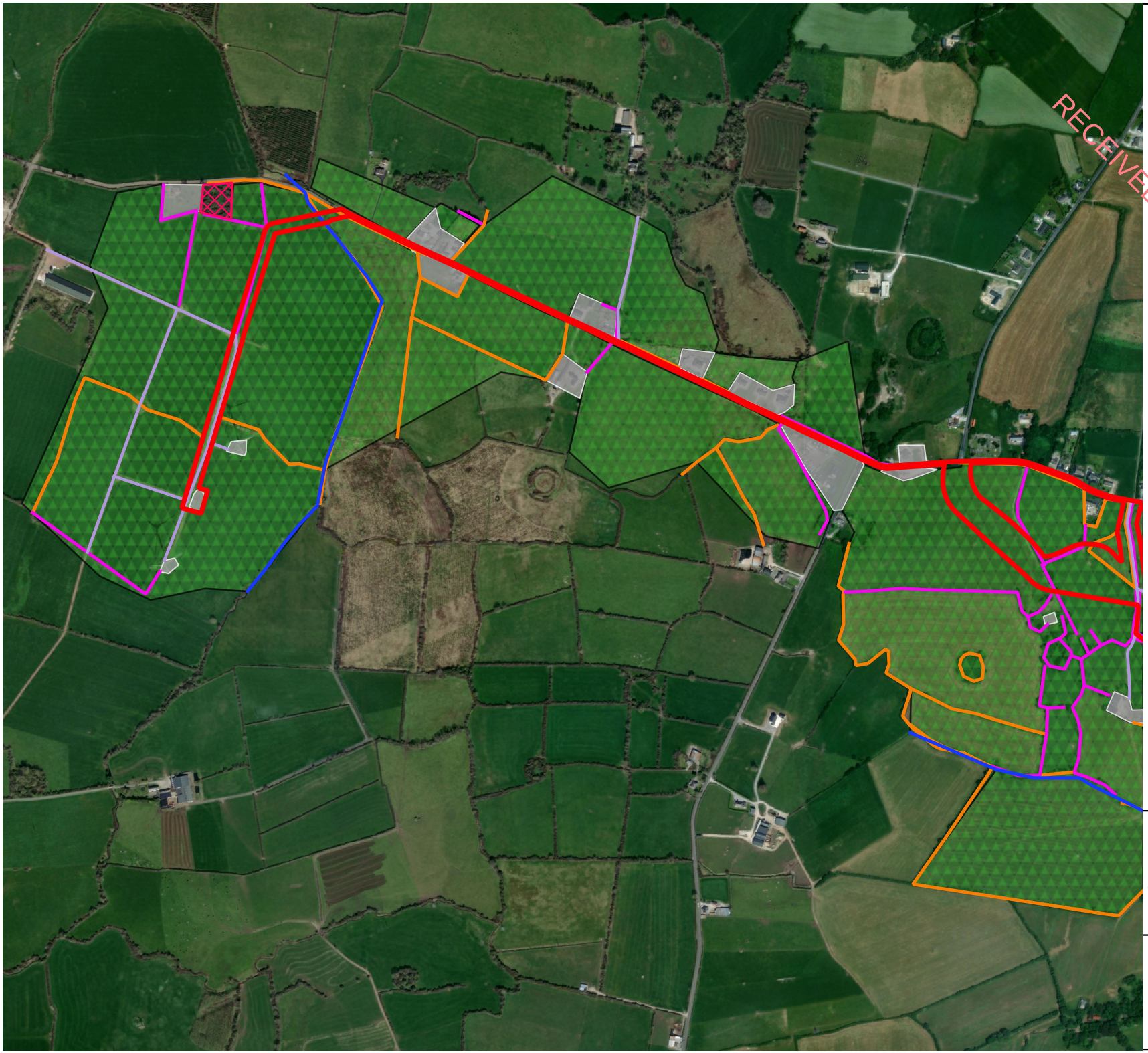

Legend

- Planning Application Boundary
- Spoil and Bare Ground ED2
- Watercourse FW2
- Treelines WL2
- Hedgerows WL1
- Buildings and Artificial Surfaces BL3
- Improved Agricultural Grassland GA1
- Mixed Broadleaved Woodland WD1 / Scrub WS1

Ballynisky Wind Farm Habitat Map - Map 2 of 2

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