GARRANE GREEN ENERGY LTD

GARRANE GREEN ENERGY PROJECT

CO. LIMERICK

VOLUME I

NON-TECHNICAL SUMMARY (NTS)

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Garrane Green Energy Limited,
C/O Greensource Sustainable Developments Limited
Station Road,
Adare,
Co. Limerick.

Jennings O'Donovan & Partners Limited,
Consulting Engineers,
Finisklin Business Park,
Sligo.
Tel.: 071 9161416
Fax: 071 9161080
email: info@jodireland.com

JENNINGS O'DONOVAN & PARTNERS LIMITED
Project, Civil and Structural Consulting Engin
FINISKLIN BUSINESS PARK,
SLIGO,
IRELAND.

Telephone (071) 91 61416
Fax (071) 91 61080

Email info@jodireland.com
Web Site www.jodireland.com

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GARRANE GREEN ENERGY PROJECT, CO. LIMERICK

NON-TECHNICAL SUMMARY

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NTS.1 INTRODUCTION

This Non-Technical Summary (NTS) summarises the Environmental Impact Assessment Report (EIAR) which accompanies the application for planning permission for the Garrane Green Energy Project (the Project) which is situated in the townlands of Ballynagoul, Creggane, and Garrane in County Limerick approximately 22.9km south of Limerick City, 46.9km north of Cork City and 2.5km (closest turbine) north of Charleville, Co. Cork.

The Developer is Garrane Green Energy Ltd. a subsidiary of Greensource Sustainable Developments Limited (Greensource Ltd.).

Greensource is an innovative Irish renewable energy company based in Adare, Co. Limerick that specialises in the development of renewable energy projects, working with communities from pre-planning to operation, and creating long-lasting local partnerships. Greensource has over ten years development and operational experience. Greensource has a highly skilled and experienced team who are committed to developing projects with successful outcomes for all stakeholders. Working with integrity and care for the local environment, the team has a strong track record, having successfully completed wind energy and other renewable projects in Ireland.

Permission is being sought by the Developer for the construction of 9 No. wind turbines, a permanent Met Mast, an on-site 110kV Substation with a 'loop in' Grid Connection to the existing 110kV OHL between Charleville and Limerick and all ancillary works.

The Environmental Impact Assessment Report (EIAR) presents information on the identification and assessment of the potential significant environmental effects of the Project and reports the findings of the Environmental Impact Assessment (EIA) which has been undertaken in accordance with the Planning and Development Act 2000, as amended, and the Planning and Development Regulations 2001, as amended. The EIAR comprises the following documents:

- This Non-Technical Summary (Volume I)
- The Main EIAR Report (Volume II)
- Supporting Figures and Drawings (Volume III)
- Supporting Appendices (Volume IV)
- Natura Impact Statement (NIS) (Volume V)

These documents inform the readers of the nature of the Project, likely environmental effects and measures proposed to protect the environment during each phase of the development.

The Project will comprise the following phases:

- Construction of the Project
- Operation of the Project
- Decommissioning of the Project

NTS.1.1 ENVIRONMENTAL IMPACT ASSESSMENT

EIA is required where there are likely to be significant effects on the environment due to the nature, size or location of a new development. Wind farms of the scale of the Project legally require an EIA to be carried out.

The EIAR has been prepared following a systematic approach to an EIA and project design, with knowledge of the potential effects being used to change the design so as to reduce those effects. The main EIA stages are:

- Scoping consultation (process of asking relevant organisations what they think should be included in the EIA) and how these topics are addressed
- Technical environmental assessments - baseline studies (understanding what the existing environmental conditions are), asking what potential significant environmental effects might occur, informing the design evolution and identification of measures to reduce undesirable effects
- Writing up the findings to include in the EIAR
- Submission of the planning application and the EIAR

Scoping and Community Engagement

Scoping and pre-application consultation is important to the development of a comprehensive and balanced EIAR. Requests for Scoping Opinions were submitted to the prescribed bodies and key consultees. The requests were accompanied by a Scoping Report which described the Project, the proposed EIA methodology and the key areas to be 'scoped in' or 'scoped out' of any further assessment. Scoping Opinions received are included as **EIAR Appendix 1.3**.

The public were informed about the project via a letters and leaflets, door-to-door visits, advertisements in the local paper and a dedicated project website www.garranegreenenergy.ie. This media outlined the project proposals, the community benefit fund, the environmental benefits, answers to frequently asked questions and contact

information for further information requests and consultations. The Community Engagement Report is attached as **Appendix 1.5**.

Environmental effects have been assessed in chapters of the EIAR, broadly with one chapter per technical discipline, generally representing a type of receptor of potential effects (e.g., birds). The assessments in each chapter follow a similar, systematic approach, to identify any effects that may be significant in the context of the EIA Regulations. The approach includes establishing the "baseline", this being the current state of the environment, to which the Project will be added. This identifies the key receptors, including how sensitive they are to the sort of change that might be caused by the Project. The potential size (or magnitude) of change caused by the Project is then assessed, and the sensitivity and magnitude are considered together to form a conclusion on significance. Effects can be desirable (or "positive", or "beneficial"), or undesirable (or "negative", or "adverse"). Mitigation is proposed where possible to prevent significant undesirable effects. The final, proposed effects are those after mitigation has been applied and are the "residual effects".

In accordance with the EIA Regulations, the assessment considered 'cumulative effects'. These are effects that result from cumulative changes caused by past, present or reasonably foreseeable actions together with the Project.

NTS.2 PROPOSAL FOR THE GARRANE GREEN ENERGY PROJECT

The Project will consist of the following:

- Erection of 9 No. wind turbines with a tip height of 170m. The wind turbines will have a rotor diameter of 150m and a hub height of 95m.
- Upgrade of existing Access Tracks and construction of new permanent Access Tracks, permanent turbine hardstand areas and turbine foundations.
- Construction of two new bridge crossings on-site, one over the River Maigue and one over the Charleville Stream.
- Upgrade of existing site drainage network and installation of new site drainage.
- Wind Farm Internal Cabling connecting the wind turbines to the electrical substation.
- Construction of a permanent on-site AIS 110kV Substation, with a 'loop in' Grid Connection to the existing 110kV overhead line between Charleville and Killonan, including two single-storey control buildings with welfare facilities, all associated electrical plant and equipment, security fencing, gates, signage, all associated underground cabling, private well for water supply, wastewater holding tank, and all ancillary structures and works.

- Construction of a permanent double circuit 110kV underground cable and two steel cable interface masts to connect to the existing overhead line.
- Erection of a permanent 60m Meteorological Mast for monitoring wind speeds.
- Construction of a Temporary Construction Compound for use during construction.
- Upgrade of the existing entrance on the N20 (Site Entrance 1) (to be used for abnormal loads and turbine component delivery) and upgrade of an existing site entrance on the L1537 (Site Entrance 2) (to be used for all construction traffic except for abnormal loads and turbine component delivery).
- 6 No. temporary spoil storage areas and 1 No. permanent spoil storage area.
- Biodiversity enhancement and improvements associated with the Project.
- Landscaping, fencing and all associated ancillary works.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought. However, the onsite Substation and the Grid Connection will be handed over to ESB networks to own and operate. As part of the national grid infrastructure, permission is sought for the Grid Connection and the Substation in perpetuity.

The EIAR assesses the Project which includes the works within the Redline Boundary as outlined above as well as the temporary accommodation requirements at 6 No. locations along the proposed TDR from Foynes Port. An alternative TDR from the Port of Galway was also assessed for the delivery of turbine blades only which includes temporary accommodation works at 11 No. locations.

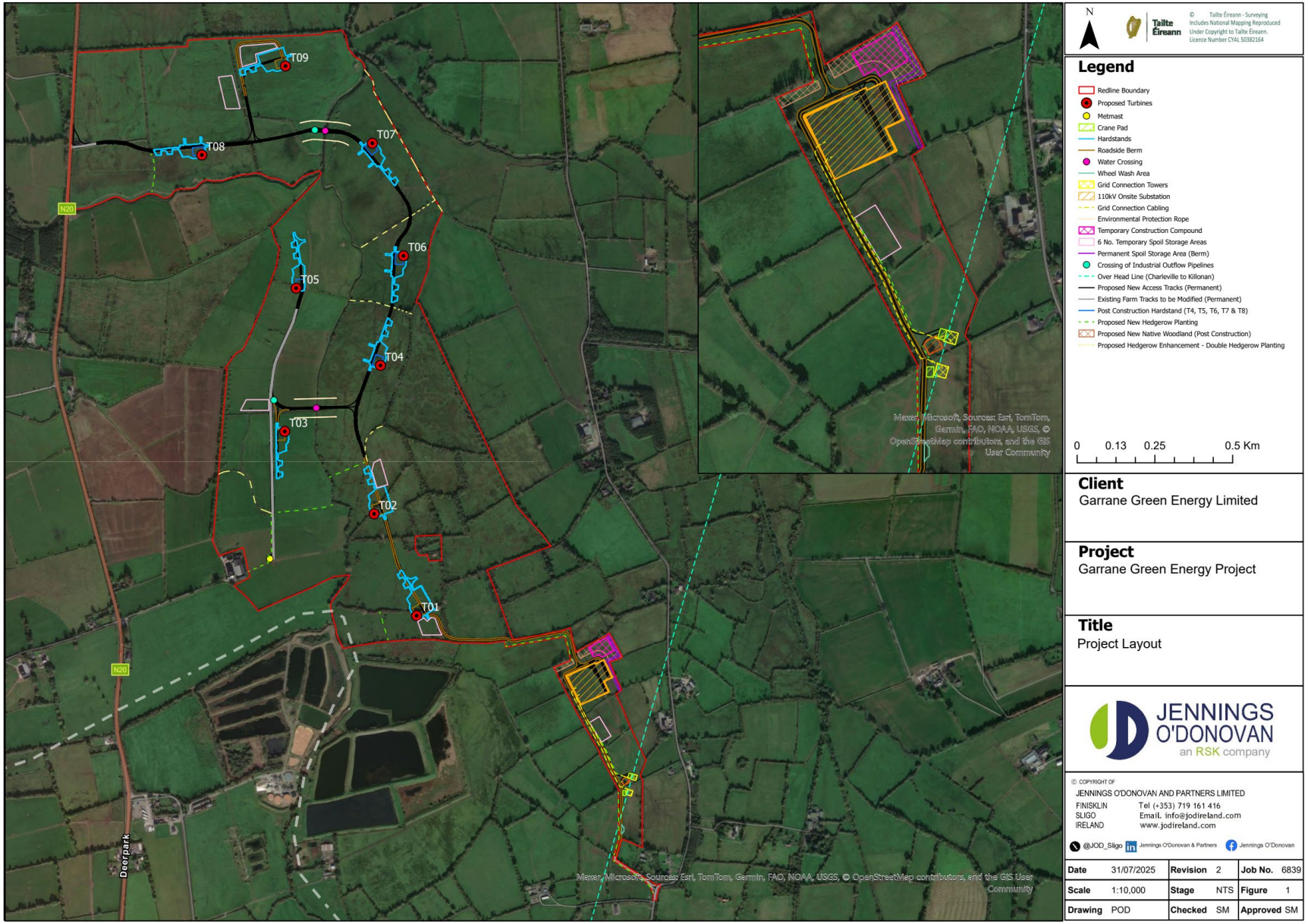

Figure NTS-1: Project Layout

2.1 Wind Turbines

The candidate wind turbines will have an overall ground to blade tip height of 170m. The candidate wind turbine will have a rotor diameter of 150m and a hub height of 95m.

The final choice of turbines will be guided by an assessment of the wind conditions and will take account of the available technology at the time of construction. The candidate turbine model used for assessments at the EIAR stage is the Vestas V150 with a maximum capacity of 6MW per turbine, giving an overall capacity of up to 54MW. The turbines may be direct drive machines or may contain a gearbox. The final turbine will be chosen in a competitive tendering process as part of the Project financing process, after all necessary consents have been secured.

The turbines will be of a typical modern, three blade, horizontal axis design, white or light grey in colour.

The turbines are computer controlled to ensure that at all times, the turbine faces directly into the wind to ensure optimum efficiency. The rotors of all turbines will rotate in the same direction relative to the wind direction.

Each wind turbine needs an area of compacted stone adjacent to the turbine base, known as a hardstanding. This is used principally by the crane and to accommodate turbine components when erecting the turbine.

2.2 Access to the Site

The main access for the delivery of turbine components will be from an existing entrance on the N20 (Site Entrance 1) which will be upgraded to allow access for the swept path of abnormal vehicles. This entrance will only be used for delivery of turbine components. All construction traffic will use proposed Site Entrance 2 on the L1537. Turbine components will use Site Entrance 1 for entry to the Site only and will use Site Entrance 2 for egress from the Site once the components have been delivered and the trailers can be shortened.

The turbine components for the Project will be shipped to Shannon Foynes Port or to the Port of Galway (turbine blades only). The turbine components will be transported on the public road network using abnormal load vehicles between the landing port and site Entrance 1 on the N20. The proposed turbine component delivery routes are shown in **Figure NTS-2**. There are temporary accommodation requirements required along the Turbine Delivery Routes. All works along the TDRs are assessed in **Chapter 17: Traffic and Transport** and shown on drawings attached as **EIAR Appendix 17.1**.

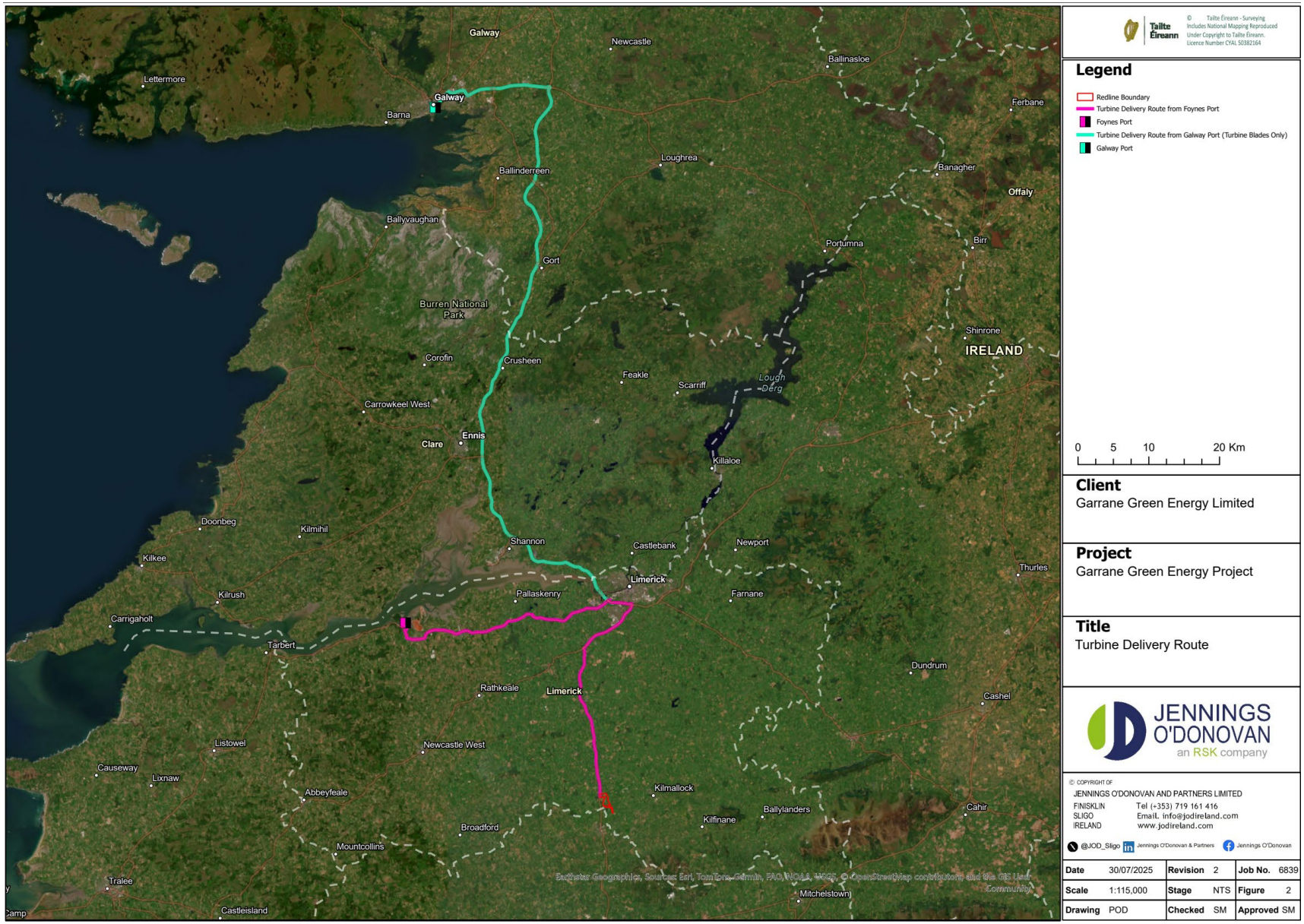

Figure NTS-2: Proposed Turbine Delivery Route

2.3 Grid Connection

The proposed Grid Connection will be a 'loop in' connection to an existing 110kV overhead line to the east of the proposed Substation. Underground cabling will link the turbine transformers to the proposed Substation. In order to connect the Project and provide the 'loop in/loop out' infrastructure, it is proposed to install two new end masts and c. 380m of underground 110kV electricity transmission line to each end mast. The underground cable (UGC) will be located fully within the Redline Boundary, alongside the proposed Access Tracks. The grid connection route can be seen in **Figure NTS-1**.

2.4 Construction Phase

The construction phase of the Project will take approximately 16-18 months in total. In general, working hours for construction activity will be from 07:00 to 19:00 throughout the week, with reduced working hours at weekends, from 08:00 to 13:00 on a Saturday. It should be noted that, during the turbine erection phase, operations will need to take place outside those hours to facilitate Turbine Foundation construction and so that lifting operations are completed safely. Hours of working for turbine foundation construction will be agreed with Limerick City and County Council prior to the commencement of Turbine Foundation construction.

The turbines will be located within an area of livestock and pasture farmland, however the land taken by the turbines and other infrastructure is a very small proportion of this, and substantial efforts have been made to re-use existing infrastructure rather than using new land. The area within the Redline Boundary is 158.75ha,The total land-take required for the Project, including infrastructure such as the Access Tracks, turbine hardstands, turbine foundations, Met Mast and the Substation etc is 11.256ha/7.1% (construction phase), 5.095ha/3.2% (operation phase) and 1.598ha/1.0% (decommissioning phase) The immediate surrounding agricultural grasslands will remain in agricultural use.

The Project will appoint a Civil Contractor who will have overall responsibility for management, including environmental management on the construction site. The Civil Contractor will ensure that construction activities are carried out in accordance with the mitigation measures outlined in the EIAR and as required by the planning permission, such as the Construction Environmental Management Plan (CEMP) included in **EIAR Appendix 2.1**. The services of specialist advisors will be retained as appropriate, such as an archaeologist and ecologist, to be called on as required to advise on specific environmental issues.

2.5 Habitat Restoration

Habitat retention, replacement and landscaping measures are proposed as part of the Project. This will involve the following:

- Planting an area of woodland of c.0.67ha on two plots north of the Substation
- Planting of c. 1,620m of hedgerow to compensate for the loss of existing hedgerow for infrastructure and from bat buffers
- Enhancement and re-vitalisation of 5,433m of existing degraded hedgerow

Further details on this can be found in **Chapter 6: Biodiversity** and in **Appendix 6.2 Biodiversity and Enhancement Management Plan**.

Figure NTS-3: Habitat Enhancement Areas

2.6 Operational Phase

The operational lifespan for the Project is 35-years. During the operational phase, turbine and infrastructure maintenance will be ongoing and regular. The Project will create approximately two full-time jobs during the operational phase. In addition to these jobs, various personnel will be required for the successful and continued operation of the Wind Farm. During the operational phase of the Project, the operation and reliability, maintenance

(turbines, civil works and electrical infrastructure) finance, ongoing compliance with permissions and permits, safety, security, community relations and benefits and land-owner agreements must be continually managed. These requirements are widely distributed over various employment sectors and are an integral part of the ongoing operation of the Project and will provide continuous employment for the lifetime of the Wind Farm.

NTS.3 SITE SELECTION AND DESIGN

The process of identifying a suitable area for a wind farm is influenced by a number of factors. It can be broken down into 3 No. phases:

A series of steps were undertaken in the screening:

- Phase 1: Initial Screening,
- Phase 2: Grid Constraints and Facilitators, and
- Phase 3: Other Constraints and Facilitators.

Phase 1

A number of criteria were applied to identify what sites might be available, in theory for wind energy development. Initially, the Developer considered suitable sites based on designations in the Limerick City and County Development Plan. The wind energy designations map of the Limerick City and County Development Plan in Chapter 9: 'Climate Action, Flood Risk and Transition to Low Carbon Economy'1 were used as the basis for the initial screening.

Five sites were identified in Phase 1 and were assessed against the following:

- Available Wind Resource
- Environmental designations such as Natura 2000 and Nationally Designated Sites (SAC, SPA, NHA, pNHA)
- Tourism
- Ornithology
- Planning Precedence
- Terrain / Land Use
- Archaeological Designations
- Landscape and visual designations

[1] https://www.limerick.ie/sites/default/files/media/documents/2023-05/Limerick-Development-Plan-Volume-1-Written-Statement-including-Variation-No-1.pdf

Phase 2: Potential for Grid Connection

As part of the site selection process, the Developer considered the potential grid connection, including distance to potential connection points and the capacity of the grid to accommodate the proposed development.

Following the application of grid constraints to the number of potential wind farm sites identified, a number of sites were discounted due to unviable grid connection points due to excessive distances, complex/expensive grid connection options or grid capacity not being available.

Phase 3: Other Constraints and/or Facilitators

Five potential sites remained following Phase 1 and Phase 2 screening. Phase 3 included the screening of known local issues or other constraints and/or facilitators such as:

- Amenity, Tourist or Scenic Areas designated in development plans
- Size of Site or Development Area
- Sensitive Habitats/Species
- Land Ownership Issues
- Sites with impractical/irregular shape/layout/topography

The Project site at Garrane in Co. Limerick, 2.5km north of Charleville, 22.9km south of Limerick City and 46.9km north of Cork City was the candidate site brought forward for more detailed analysis. Following phase 1 - 3 of the site selection process the Project site was the candidate site brought forward as it successfully met the key criteria for wind energy development. Overall, it is considered that the Project represents an optimum fit within the technical and environmental parameters of the Site.

NTS.4 LEGAL AND POLICY FRAMEWORK

The Project has had regard to the National Planning Framework, the Regional Spatial and Economic Strategy (RSES) for the Southern Region Assembly and the Limerick County Development Plan 2022-2028. These documents are relevant to the determination of the planning application by An Coimisiún Pleanála. **Chapter 4: Planning Policy Context** of the EIAR sets out the relevant planning policy and legislative background to the planning application.

The Climate Action Plan 2024 set outs a roadmap for meeting the ambitious and legally binding targets for Ireland to halve Irelands emissions by 2030 and to reach net zero no later than 2050. This plan also outlines the intention of the government to meet up to 80% of electricity demand from renewable power by 2030. The Project will contribute towards

meeting the (Climate Action Plan 2024) target of 9 GW of onshore wind energy generation by 2030. The targets set out in 2025 have been re-affirmed by CAP25.The Project would be integral to contributing to the Limerick Development Plan 2022-2028[2] target (**Section 9.4 Renewable Energy, Table 9.2**) of increasing the county's wind energy target to 386.45MW by the end of the plan period. This contribution is essential for achieving the strategic goal of transitioning to an economically competitive, low-carbon, climate-resilient, and environmentally sustainable county.

The Site is located in a "Preferred Area" for wind energy development in the LDP 2022-2028.

NTS.5 POPULATION AND HUMAN HEALTH

The potential effects of the construction and operation phases of the Project on socioeconomics, tourism and recreation and land use were identified and assessed in EIAR **Chapter 5: Population and Human Health** following desk-based collection of data and consultation with local stakeholders. Four (4 No.) geographical Study Areas were outlined for this assessment, namely:

- **Study Area 1: The Wind Farm Site and Environs – District Electoral Divisions (DEDs) Colmanswell, Tobernea, Rathluirc and Bruree** (90.20km^2).
- **Study Area 2**: **Limerick County** (2,755.8km^2).
- **Study Area 3: Cork County** (7,316km^2).
- **Study Area 4: The Republic of Ireland** (70,273km^2).

Population and Settlement Patterns: The settlement patterns and social patterns may be of benefit to the region in terms of the ability to provide electricity to industry and business in a high-quality supply. This will lead to the region becoming more attractive to business with the subsequent benefit of increased employment opportunities in the region. A renewable energy supply could potentially be attractive for companies looking to develop in County Limerick and be located in the vicinity of the Project. The overall effect of the construction phase is predicted to be slight positive and short-term in nature should construction workers relocate to the area for the duration of these phases. The overall effect is predicted to be **slight positive** at the local level in terms of settlement patterns where increased business is attracted to the area during the operational phase.

[2] https://www.limerick.ie/sites/default/files/media/documents/2023-05/Limerick-Development-Plan-Volume-1-Written-Statement-including-Variation-No-1.pdf Accessed 26/03/2025]

Economic activity: Economic activity is expected to benefit from all phases of the Project, through the local sourcing of materials, for example, ready-mix concrete and crushed stone will be sourced from a local supplier, subject to quality and availability and through payments to Limerick City and County Council from the annual rate payments. During the construction phase of the overall impact is predicted to be positive, moderate and short-term and positive, moderate and long-term during the operational phase.

Employment is expected to benefit from all phases of the Project, through direct, indirect and induced employment throughout the phases of the Project.

It is estimated that between 40 and 63 direct and indirect jobs could be created during the construction phase of the Project, through the employment of tradespeople, labourers, and specialised contractors for the construction phase. Indirect employment is also expected to increase through the increased activity in local businesses, such as restaurants, hotels and accommodation, shops and delicatessens. There is expected to be a **short-term significant, positive** impact on employment in the study area. On-going monitoring and maintenance work is expected to result in a long-term slight positive impact

Land use: The land use within and surrounding the Site is mainly comprised of agriculture, with some urban areas found to the north and south in the town of Charleville and the village of Bruree. The 9 turbines will be located on agricultural lands (improved agricultural grasslands). This will result in the change of use of some agricultural pastureland to wind farm use. This will have a long-term, slight, negative effect on agricultural land use due to the removal of grazing lands for the duration of the Project during construction and operation phases.

Tourism: Overall effects of the Project with regards to tourism are considered to be, slight, negative during the construction, operational and decommissioning phases.

All other aspects of human Health (Noise, Water, Air quality, Shadow Flicker, EMI and Traffic) are taken into account under NTS sections for: Noise, Hydrology and Hydrogeology. Air Quality and Climate, Shadow Flicker, Material Assets and Traffic and Transport).

NTS.6 BIODIVERSITY

The EIAR Biodiversity chapter presents an assessment of the likely significant effects from the Project on ecological receptors, i.e. all aspects of terrestrial ecology and biodiversity including bats. The assessment considers potential impacts and likely significant effects during the construction, operation, and decommissioning phases on ecological receptors.

All surveys were undertaken in line with prevailing best practice guidelines and the impact assessment followed Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (2018, CIEEM) and Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

The key infrastructure features of the Project that are relevant to ecology are the Site Access Tracks, Turbine Foundations and Hardstands areas, Turbine Delivery Route (TDR), and the Onsite Substation.

Ecological surveys were undertaken between June 2022 and May 2024. Surveys included: habitat and vegetation surveys, including surveys for potential Annex I habitats; terrestrial mammal surveys, including badger and otter surveys; bat surveys; amphibian and reptile surveys; invasive species surveys. Where survey limitations are identified, while not considered to affect the validity or robustness of the impact assessment, a precautionary approach has been taken at an appropriate scale, and mitigation measures included to fully protect species and habitats of conservation importance.

The nearest designated European site to the Project Site is the Blackwater River (Cork/Waterford) SAC, which is at a distance of approximately 6.4km to the south. A further four sites are at distances of between 9km and 14.7km from the Project Site. For these five European sites, there is no ecological or hydrological connectivity with any component of the proposed Project. Two additional sites at distances further than 15km have hydrological connectivity with the Site via the River Maigue, namely the Lower River Shannon SAC (approximate straight-line distance of 20km) and the River Shannon and River Fergus Estuaries SPA (approximate straight-line distance of 25km) and are considered in detail in this assessment.

The Project Site is dominated by improved agricultural grassland, wet grassland and neutral grassland (all of which are in current agricultural practice). Improved grassland is a habitat of low botanical interest - rated as Negligible Importance. Wet grassland and neutral grassland can vary in ecological interest depending on wetness and management practices but in general these habitats are rated as Local Importance (lower value). However, the very wet grassland areas to the east of the Charleville stream provide habitat for protected species including the common frog and breeding snipe, and are therefore rated as Local Importance (lower-higher value).

The hedgerows and treelines, with associated drainage ditches, within the Project Site vary in quality due mainly to recent management history. However, all provide useful habitat for

local wildlife within a landscape dominated by agriculture - rated as Local Importance (higher value).

No nationally rare or legally protected plant species listed in the 2022 Flora (Protection) Order were recorded from within the Wind Farm Site during the surveys nor are there any past records of such species from the study area.

The Wind Farm Site supports a typical mammalian fauna of agricultural pastoral land The watercourses within the Project Site provide feeding habitat for otter, though there was no evidence of otter breeding within the site. Otter is listed on Annex II and Annex IV of the EU Habitats Directive as amended.

The bat landscape association model suggests that the overall suitability for the Garrane site is high for brown long-eared bat, Leisler's bat, common pipistrelle and soprano pipistrelle. Relatively high levels of bat activity were recorded during the walked activity surveys (6 species) and the static activity surveys (8 species).

Potential impacts that could arise during the construction, operation and decommissioning are assessed for designated sites and biodiversity interests within the Site and surrounding areas. For designated sites, there is potential for effects on the European sites Lower River Shannon SAC (code: 002165) and the River Shannon and River Fergus Estuaries SPA (code: 004077) as a result of contaminants originating within the project area, and especially during the construction phase, reaching the relevant designated site and causing harmful effects on the interests of the designated site. The significance of any effect would be dependent on the magnitude and duration of a pollution event. Mitigation is therefore required to minimise this risk.

Impacts on terrestrial habitats and flora are considered under:

- permanent loss of habitat
- temporary loss of habitat
- disturbance to habitats

The proposed Project will result in the permanent loss of 1,008m of hedgerow to facilitate the construction of the wind farm infrastructure, including internal access tracks and access points from public roads. In addition, 641m of hedging outside of the civil works will be removed for the purpose of providing bat buffers around turbines to minimise collision risk. The total loss of hedgerows is 1,649m. The hedgerows affected are typical of the area

being mostly on low banks and associated with field ditches. Many of the hedges to be removed are in an unmanaged state and are no longer stockproof.

Mitigation through a Biodiversity Enhancement Management Plan (BEMP) will be provided to offset the loss of hedgerows on site. The BEMP includes an extensive planting and enhancement programme, as follows:

Planting of new hedging:	1,620m
Enhancement of existing hedging:	1,359m
Re-vitalisation of existing unmanaged hedging:	4,074m

The BEMP also includes the planting of 0.67 ha of native woodland to mitigate for loss of bat habitat. As native woodland is absent from the Site, this will be a positive biodiversity effect.

The principal impact on terrestrial mammal species would be on small mammal species, including protected species such as pygmy shrew and hedgehog, from the loss of hedgerows during the construction phase. However, the effects on these species will be mitigated through the BEMP.

While there was no evidence of otter breeding sites within the site area, otter forages within the various watercourses associated with the site, as well as downstream of the site. Such populations could be effected adversely by pollutants entering the watercourses as a result of activities associated with the proposed Project and especially during the construction phase.

The mitigation proposed to maintain water quality in the aquatic zones will ensure that the food supplies for otters within local watercourses are not affected by contaminants generated by the proposed Project.

A confirmatory survey for otter breeding sites will take place at the 2 no. crossing locations (upstream and downstream on both banks) prior to the commencement of works on site to ensure that otter holts have not been established since the baseline survey.

Whilst no signs of badger presence were found within the Project Site during the baseline surveys, badger does occur in the wider area and distribution of local populations can change over time. Should more than 36 months have elapsed since the baseline surveys in 2023 and the projected date for commencement of construction, a pre-construction

confirmatory survey will be undertaken in accordance with NRA Guidance. This will focus on the areas of the site where works will take place (to a distance of approximately 100m).

The common frog is widespread within the Project Site occurring in drains and wet fields. Areas where construction works are due to commence during the period February to August will be checked by the ECoW for the presence of frog spawn, tadpoles and adult frogs. If present, these will be removed under licence from NPWS and transferred to suitable ponds, drains or wetlands in the vicinity and away from the construction footprint.

A comprehensive bat roost survey effort was employed, and no evidence of roosting in either built structures or trees present within or immediately adjoining the proposed site was found. However, from the results of the extensive bat activity surveys within and surrounding the site for the Wind Farm, mitigation to minimise the risk of bat collision with rotating blades will be implemented. This will comprise the creation of buffers between the proposed turbines and surrounding vegetation, as well as implementation of curtailment and reduced rotation speeds at all turbines when the turbines are idling during the bat activity season (April to October). 'Feathering' of idling blades may reduce fatality rates by up to 50% and does not result in loss of output (NatureScot, 2021).

With the implementation of mitigation for bats, the potential risk of fatality from collision and/or barotrauma events to foraging and/or commuting high risk species has been significantly reduced. It is concluded that the Project will not have a long-term negative impact on the local bat populations as a result. The extensive hedge and woodland planting and enhancement programme will provide additional foraging habitat for bats and aid connectivity through the site.

NTS.7 AQUATIC ECOLOGY

Chapter 7 of the EIAR presents an assessment of the potential impacts of the proposed Garrane Green Energy Project on aquatic ecology, including watercourses, aquatic habitats, and species of conservation concern. The assessment has been carried out in accordance with the requirements of the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC), and the Birds Directive (2009/147/EC), with particular attention to species and habitats protected under European legislation. The evaluation considers the construction, operational, and decommissioning phases of the proposed Project, as well as cumulative effects arising from other developments in the surrounding area.

Receiving Environment and Baseline Conditions (Section 7.3)

The proposed Project is located in the townlands of Ballynagoul, Creggane, and Garrane in County Limerick. It is drained by several watercourses including the River Maigue, Loobagh River, Charleville Stream, and their tributaries. These rivers ultimately connect to the River Shannon and are ecologically significant, supporting a range of aquatic species and habitats. A desktop study review was carried out of existing data and records on the National Biodiversity Data Centre and National Parks and Wildlife Service websites. These included records for fish, protected aquatic species and habitats, and invasive species on watercourses at or hydrologically connected to the proposed Project.

Baseline surveys were conducted in 2022 and 2024 and included walkover habitat assessments, macroinvertebrate sampling (EPA Q-value methodology), physicochemical water quality testing, white-clawed crayfish surveys, and electrofishing. These surveys were designed to capture seasonal variation and ensure robust data collection.

The results indicated that many watercourses within the Zone of Influence (ZOI) are subject to moderate to poor water quality, primarily due to agricultural runoff, historical arterial drainage, and sedimentation. Elevated nutrient levels and low dissolved oxygen were observed at several sites, which can negatively affect aquatic biodiversity. Protected species such as white-clawed crayfish and otter were not recorded during recent surveys, although historical data confirms their presence in the wider catchment. Crayfish plague has been detected in the Maigue sub-catchment and may have contributed to the absence of crayfish in recent assessments. European eel and Atlantic salmon, both species of high conservation value, were recorded in certain watercourses, particularly the River Maigue and Charleville Stream.

Assessment of Likely Significant Effects (Section 7.4)

Potential impacts on aquatic ecology during the construction phase include sediment runoff from earthworks, pollution from hydrocarbons and concrete materials, disturbance of aquatic habitats at watercourse crossings, and cumulative effects from other developments. Without mitigation, these impacts could result in short-term degradation of water quality and harm to aquatic species and habitats. The operational phase presents lower risks, primarily related to maintenance activities and runoff from hard surfaces. The decommissioning phase poses similar risks to construction, though at a reduced scale.

The Grid Connection Route (GCR), assessed in **EIAR Chapter 3: Alternatives Considered**, involves a 'loop-in' underground connection to the existing 110kV overhead line. The preferred GCR runs entirely within the redline boundary and does not cross any

EPA mapped watercourses between the substation and loop in connection. As such, no direct impacts to aquatic habitats or species are anticipated. The underground cable will be installed using trenching methods that avoid sensitive aquatic features, and all drainage infrastructure will be designed to prevent runoff or sedimentation. Therefore, the GCR is not expected to result in any significant effects on aquatic ecology.

The Turbine Delivery Routes (TDR), assessed in **EIAR Chapter 17: Traffic and Transport**, has been designed to avoid sensitive aquatic features. No road works or accommodation requirements are proposed in proximity to water crossings along the TDR. As such, the route does not involve direct interaction with watercourses, nor does it require in-stream works or modifications to riparian habitats. Consequently, no significant effects on aquatic ecology are anticipated as a result of the TDR.

The assessment also considers cumulative effects with other wind farms, agricultural activities, and permitted developments in the area (**EIAR Section 7.6**). While several wind farms exist within a 20km radius, only one (Slievereagh Wind Farm) lies within the aquatic study area. No significant cumulative effects are anticipated due to the implementation of robust mitigation measures and the absence of overlapping impacts. Agricultural pressures remain the most significant source of water quality degradation in the catchment, but the Project is expected to reduce local agricultural activity during construction, thereby potentially lowering direct inputs.

Mitigation Measures (EIAR Section 7.5)

A comprehensive suite of mitigation measures has been proposed to avoid, reduce, and remedy potential impacts. These include:

- Maintaining 50m buffer zones around watercourses and 10m around drains.
- Constructing clear-span bridges to avoid in-stream works.
- Implementing a site-wide drainage system based on Sustainable Drainage Systems (SuDS) principles.
- Installing silt fences, check dams, settlement ponds, and proprietary systems such as Siltbusters.
- Fencing off streams to prevent livestock access, in line with the European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022.
- Appointing an Ecological Clerk of Works (ECoW) to oversee compliance during construction.
- Developing a Construction and Environmental Management Plan (CEMP) and Surface Water Management Plan (SWMP) (**EIAR Appendix 2.1**).

These measures are designed to ensure that no deterioration in the ecological or chemical status of any surface water or groundwater body occurs, in compliance with the EC Environmental Objectives (Surface Waters) Regulations 2009 (as amended).

Ecological Enhancement Proposals (EIAR Section 7.5.2.3)

The Project includes ecological enhancement measures such as riparian planting, hedgerow restoration, and the creation of new woodland areas. These enhancements are expected to improve habitat quality, support biodiversity, and increase resilience to climate change. Riparian planting will stabilise banks, regulate stream temperatures, and provide habitat for aquatic and terrestrial species.

Residual and Cumulative Effects (EIAR Sections 7.6 & 7.7)

With the proposed mitigation and enhancement measures in place, the Project is not expected to result in significant adverse effects on aquatic ecology. Residual effects are considered negligible to low. The Project has been designed and will be implemented in accordance with Article 5 of the EC Environmental Objectives (Surface Waters) Regulations, which prohibits any development that would result in a deterioration in the status of a surface water body.

Monitoring (EIAR Section 7.8)

Water quality monitoring will be undertaken before, during, and after construction to verify the effectiveness of mitigation measures. Monitoring will include visual inspections, grab sampling, and biological Q-value assessments. An Environmental Manager and ECoW will oversee monitoring and ensure compliance with planning conditions and environmental legislation.

In the absence of mitigation measures, appropriately designed, implemented and managed, there is deemed to be a potential for adverse significant short-term environmental effects from the project, as listed above. However, it is considered that with the proposed mitigation (outlined in **EIAR Section 7.5** and the accompanying **EIAR Chapters 2 & 10** of the EIAR) successfully implemented, the proposed wind farm Project will result in an overall negligible to low residual effect and therefore no likely significant effects upon the aquatic ecological features that lie within the Zone of Influence for the duration of the construction, operational, and decommissioning phases.

NTS.8 ORNITHOLOGY

EIAR **Chapter 8** was prepared by RSK Biocensus. This chapter addresses potential effects from the Project on ornithological features; specifically on bird populations and their habitats

within and adjacent to the Site, and on relevant ornithological qualifying and supporting interests of nearby designated sites. Impacts from the Project are assessed during the construction, operational and decommissioning phases, both in isolation and in combination with other plans and projects.

Baseline environment

The receiving environment of the Project supports a wide variety of typical bird species of open countryside and farmland, including raptors, gulls, waders, waterbirds and non-target species. These included a total of 74 species during the breeding season and 78 species during the non-breeding season totalling 90 species across the survey period consisting of resident species, summer and winter migrants (including summer breeders) and species present during spring and autumn passage. Key ornithological features recorded during the surveys were assessed for their importance to the Site. Key ornithological features (KOFs) identified between the 2020 to 2024 surveys and desk study. KOF's of greater than Local (Lower value) importance were therefore taken forward for assessment of effects. assemblages assessed of Local (Higher value) importance to the Site for the breeding and/or wintering populations of:

- Cormorant (**Local (Higher value) importance**);
- Raptors (Kestrel and peregrine) **(Local (Higher value) importance**);
- Gulls (Black-headed gull and lesser-black backed gull) (**Local (Higher value) importance**);
- Waders (Golden plover, lapwing and snipe) (**Local (Higher value) importance**); and
- Non-target species (Meadow pipit, redwing, skylark and starling) (**Local (Higher value importance**)

In addition, relevant designated sites with features of ornithological interest were identified within the potential Zone of Influence of the Project, notably:

- Blackwater River (Cork/Waterford SAC);
- Ballyhoura Mountains SAC and IBA; and
- Kilcolman Bog SPA;

Designated sites

As the Project does not overlap with any designated sites with features of ornithological interest, there is no potential for effects from direct habitat loss within any of the designated sites identified in the desk study. Following detailed assessment, no significant use of the Site by species forming qualifying features of nearby European sites was identified, and detailed Collision Risk Modelling identified no significant effects from operational turbine

collisions on any relevant species. There is therefore no potential for significant effects on ornithological features of any European sites.

An additional eight pNHA sites were also identified, although no further details of ornithological information were identified for these sites. Therefore these sites are not considered to be of significant ornithological interest to the Project and required no further assessment of significant effects on these sites.

Construction phase

Potential effects on ornithological features identified during the construction phase of the Project are as follows:

- **direct habitat loss and fragmentation**: permanent and temporary reductions to the extent, quality and connectivity of the habitats present for birds; and
- **disturbance and displacement**: disturbance of nesting, flying, sheltering and foraging birds (e.g., from additional noise, dust, light, vibration and human activity), with the potential to cause displacement of birds into land outside of the Project; and

Following detailed assessment of effects, taking into consideration embedded mitigation within the design of the Project, the following potentially significant effects on ornithological features were identified during the construction of the Project:

- direct loss and fragmentation of habitat used by breeding and wintering non-target farmland species; and
- disturbance and displacement of breeding and wintering non-target farmland species.

Operational phase

Potential effects on ornithological features during the operational phase of the Project are as follows:

- **direct habitat loss and fragmentation**: permanent and temporary reductions to the extent, quality and connectivity of the habitats present for birds to facilitate operational maintenance;
- **disturbance and displacement**: disturbance of nesting, flying, sheltering and foraging birds (e.g., from additional noise, light, vibration, visual disturbance and human activity) potentially resulting in displacement of birds; and
- **collision risk**: bird collisions with turbines whilst flying within the Site, resulting in fatalities and injuries;

The detailed assessment of effects identified no likely significant effects on ornithological features during the operation of the Project. As such, targeted mitigation during the

operational phase over and above the embedded mitigation within the Project design will not be required.

Decommissioning phase

Potential effects on ornithological features during the decommissioning phase of the Project are as follows:

- **direct habitat loss**: permanent and temporary reductions to the extent, quality and connectivity of the habitats present for birds; and
- **disturbance and displacement**: disturbance of nesting, flying, sheltering and foraging birds (e.g., from additional noise, dust, light, vibration and human activity), potentially causing displacement; and

The detailed assessment of effects identified no potentially significant effects on Key Ornithological Features during the decommissioning phase of the Project. As such, targeted mitigation over and above the embedded mitigation within the Project design will not be required.

Mitigation, enhancement measures and residual effects (post-mitigation)

Construction phase

Detailed mitigation measures of relevance to ornithology are detailed in **EIAR Chapter 6** and **EIAR Appendix 6.2** which forms the Biodiversity and Enhancement Management Plan for the Project. This appendix ensures that the potential for adverse effects on bird populations is minimised through the implementation of best practice construction measures, retention of habitat where possible, minimisation of habitat loss and presence of an Ecological Clerk of Works during clearance of suitable habitat. The enhancement plan also provides a framework for the conservation and enhancement of ecological features (notably bird boxes, hedgerows and native woodland), to avoid potential significant adverse effects and ensure the Project is managed in the interests of bird populations present within the Site. With the implementation of the recommended mitigation measures, the construction phase residual effect will be not significant.

Operational phase

The Project is not anticipated to have a significant effect on ornithological features during the operational phase. Therefore, no specific operational phase mitigation measures required. The residual effects of the Project on ornithological features whilst it is in operation will be not significant.

Decommissioning phase

The Project is not anticipated to have a significant effect on ornithological features during the decommissioning phase. Therefore, no specific decommissioning phase mitigation measures are considered to be required. The residual effects of the Project on ornithological features during the decommissioning phase will be not significant.

NTS.9 GEOLOGY

Chapter 9 of the EIAR evaluates the effects of the Project arising from the construction, operation and decommissioning phases on Soils and Geology. The geological assessment for the Project was based on desk studies, walkover surveys and site investigations.

The process outlined in the EIAR Chapter 9 identified soils and geology receptors that could potentially be affected by the Project. Potential effects on the soils or geology environment were identified, with the following receptors and scenarios taken forward to the assessment stage for determination of appropriate mitigation. Significant Potential Effects are highlighted in bold type face.

- *Potential Effects*
  - Compaction, Erosion and of Degradation of Soils
  - Effects on Land Use
  - *Effects caused by Subsoil and Bedrock Removal*
  - *Effects of Earthworks Activities*
  - Storage and Stockpiles including Spoil Management,
  - Effects caused by Vehicular Movement - Compaction, erosion and degradation of soils arising from vehicular movement.
  - Ground Stability and Failure - Stability issues and slope failure arising from construction activities.
  - Soil and Groundwater – Pollution of Groundwater Aquifer
  - *Effects caused by Soil and Groundwater Contamination, arising from: – Hydrocarbons*, Waste water and Sanitation, Cement, Construction Spoil and General Waste.
  - Degradation of Sites of Designated Importance

During the construction, operation and decommissioning phases, best practice as described in the IWEA, EPA and Scottish Best Practice Guidelines will be followed on site. It is expected that residual effects associated with the Project will not be significant.

Specific mitigation measures, included as part of the Project design, are to be implemented throughout its lifetime, to minimise potential adverse soils and geology related effects. These mitigation measures can be summarised as follows:

- Design of site elements to minimise effects on the soils and geology environment (e.g., careful consideration of the positioning of wind turbines, foundations, areas of hard standing, as well as maximising the re-use of spoil and minimisation of spoil disposal).
- Minimisation of adverse effects of soil compaction, erosion and degradation by tight constraint and demarcation of wind farm layout.
- Avoidance of weak, sensitive soils, sloping ground and karst landforms.
- Maximisation of distance to significant sensitive receptors such as protected areas, sites of geological significance, peat bog and sensitive water features.
- Implementation of best practice principles as detailed in IWEA, EPA and SEPA Engineering Best Practice Guidance form the basis of the embedded mitigation contained within the CEMP aimed at minimising risk during Construction and Decommissioning Phases.
- Implementation of a comprehensive Pollution Control Procedures to minimise risk to the wider environment posed by the Construction, Operational and Decommissioning Phases.
- Design of specific protocols with respect to Spoil Management for incorporation into the (CEMP).

Implementation of the mitigation proposed will result in no significant residual effects to the soils and geology as a result of the Project. Regularly auditing and monitoring of these effects caused by the Project on the soils and geology environment will be provided through a comprehensive programme of on-site monitoring.

An assessment of cumulative impacts was also undertaken, and it was concluded that there are no predicted significant effects to soils and geology arising from the Project in conjunction with any other pre-existing or consented development.

NTS.10 HYDROLOGY

This chapter assesses the likely significant effects that the Project (works at the Site, along the GCR and the TDR) may have on hydrology and hydrogeology (i.e. the Water environment) and sets out the mitigation measures proposed to avoid, reduce or offset any potential significant effects that are identified.

The Project comprises solely of a 9 no. turbine wind farm, with a short Grid Connection (GC) which comprises of a 'loop in' connection to the existing 110kV overhead line (OHL) between Charleville and Killonan, and minor works along the turbine delivery route (TDR).

Regionally, the Site is located in the Shannon Estuary South surface water catchment. This area is drained by the River Maigue and its tributaries. Downstream of the Site the River Maigue flows to the north and becomes tidal at Adare, approximately 20km northeast of the Site.

The bedrock underlying the majority of the Site is classified as a Locally Important Aquifer. This bedrock is of low permeability with short groundwater flowpaths. Some areas in the centre of the Site are mapped to be underlain by a Regionally Important Karst Aquifer. However, due to the presence of low permeability soils and subsoils, the local hydrogeological regime is characterised by high rates of surface water runoff and low rates of groundwater recharge. There will be no effect on local private groundwater wells as a result of the Project.

Fluvial flood zones are mapped within the Site along the River Maigue and its tributaries. A total of 5 no. turbines and associated access tracks and hardstands are proposed in the mapped flood zones (100-year and 1,000-year flood zones). The Project includes several flood resilience proposals which will limit the potential effects of flooding. Furthermore, a quantitative analysis has shown that the Project will result in the displacement of 9,555m^3 of floodwaters during the operational phase. This equates to an increase in water level of 5 to 6mm across the floodplain. The flood risk assessment concludes that the Project will not result in any significant increase to the downstream flood risk.

Designated sites located downstream of the Project in the Lower River Shannon SAC. Following implementation of the appropriate mitigation measures as outlined in the EIAR no significant effects on this designated site will occur as a result of the Project.

Due to the nature of wind farm developments, being near surface construction activities, effects on groundwater are generally negligible and surface water is the main sensitive receptor assessed during impact assessments. The primary risk to groundwater would be from oil spillage and leakages at turbine foundations or during construction plant refuelling. These are common potential impacts to all construction sites (such as road works and industrial sites). These potential contamination sources are to be carefully managed at the Site during the construction and operational phases of the Project and measures are proposed within the EIAR to deal with these potential minor local impacts. Mitigation

measures are also prescribed to protect groundwater quality during the proposed piling works.

During each phase of the Project (construction, operation, and decommissioning) a number of activities will take place at the Site, some of which will have the potential to significantly affect the hydrological regime or water quality at the Site or downstream. These significant potential effects generally arise from sediment input from runoff and other pollutants such as hydrocarbons and cement-based compounds.

Surface water drainage measures, pollution control and other preventative measures have been incorporated into the project design to minimise significant effects on water quality and downstream designated sites. A self-imposed 50m stream buffer was used during the design of the Project, thereby avoiding sensitive hydrological features. The surface water drainage plan will be the principal means of significantly reducing sediment runoff arising from construction activities and to control runoff rates. The key surface water control measure is that there will be no direct discharge of wind farm runoff into local watercourses or into the existing site drainage network. This will be achieved by avoidance methods (i.e. stream buffers) and design methods (i.e. surface water drainage plan). Preventative measures also include fuel and concrete management and a waste management plan which will be incorporated into the Construction and Environmental Management Plan.

No significant effects to surface water (quality and flows) and groundwater (quality and quantity, and any local groundwater wells) will occur as a result of the Project provided the proposed mitigation measures are implemented. This EIAR presents proven and effective mitigation measures to mitigate the release of sediment which will reduce the concentration of suspended solids to acceptable levels. The storage and handling of hydrocarbons/ chemicals will be carried out using best practice methods which will ensure the protection of surface and groundwater quality. The proposed wind farm drainage system will be designed to slow surface water runoff from the Site by providing greater attenuation. This will ensure that the Project does not alter downstream surface water flows and will not contribute to downstream flooding.

With the implementation of the mitigation measures detailed in this EIAR there will be no change in the WFD status of the underlying groundwater body or downstream surface waterbodies as a result of the Project. The Project has been found to be fully compliant with the WFD. The Project will not result in the deterioration in the status of any SWB or GWB and will not prevent any waterbody from achieving its WFD objectives.

An assessment of potential cumulative effects associated with the Project and other developments on the hydrological and hydrogeological environment has been completed. With the implementation of the mitigation measures detailed in this EIAR, the cumulative assessment found that there will be no significant effects on the hydrological and hydrogeological environments.

No significant effects on the water environment will occur during the construction, operation or decommissioning of the Project.

NTS.11 NOISE

Chapter 11 of the EIAR presents an assessment of the noise effects of the Project.

This Section has assessed the significance of the potential effects of the Project during operation, construction, and decommissioning of the site at nearby noise sensitive receptors (residential properties).

Predicted construction noise levels at the nearest noise sensitive receptors during all months of construction are within the NRA Guidelines given as acceptable and are therefore considered as not significant. Ground vibration from rock breaking will be below the threshold of sensitivity to humans at all receptors. The effects of noise and vibration from onsite construction activities are therefore considered not significant. Noise effects during the decommissioning phase of the Project are likely to be of a similar nature to that during construction but of shorter duration.

For this assessment Baseline noise measurements were carried out continuously between 20th February and 19th March 2023, with a second measurement period completed between 29th January and 1st March 2024. The data was analysed in conjunction with onsite measured wind speed data. The background noise levels measured at these locations were deemed representative of the background noise levels in the vicinity of the Site. The predicted noise levels at each dwelling in closest proximity to the Site were calculated in accordance with The survey was carried out in accordance with ISO 1996, ETSU-R-97 and the IOA Good Practice Guide under a range of operating wind speeds standardised to 10m above ground level.

The effects of noise from the operation of the Project have been assessed using 2006 Guidelines with the methodology described in ETSU-R-97 and the IOA Good Practice Guide. Noise levels during operation of the Project have been predicted using the best practice of calculation technique.

The Project has been designed to comply with the 2006 Guidelines and noise limits attached as conditions to recent An Coimisiún Pleanála decisions. The operational noise emissions from the Project exceeds the night-time noise limit of 43dB at one sensitive receptor (H9) at wind speeds of 7m/s and greater. To mitigate the noise impact at H9 Turbines T2 and T3 shall be operated in Sound Optimised Mode SO0 during certain conditions. Sound Optimised Mode SO0 has a lower maximum Sound Power Level at hub height of 104dB, compared to the maximum Sound Power Level of 104.9 dB when the proposed turbines are operating in Mode PO6000. This curtailment strategy shall ensure compliance with the 43dB night-time limit and shall be implemented during the following conditions: the night-time period, from wind speeds of 8-12m/s and for wind blowing towards the East(from 315 degrees to 45 degrees.

There were no wind farms or operational wind turbines within 2km of the Project, therefore a cumulative assessment was not required to be undertaken.

There has been a consultation process in relation to the revision of the 2019 Wind Energy Development Guidelines. This document provided the basis for a discussion on amendments of the noise limits applicable to wind turbine developments. It is understood that there will be revisions to the draft consultation documents, however a mitigation strategy to incorporate a reduction in sound power level outputs with respect to directionality can be put in place to comply with any specific variation in noise limit levels if new more restrictive guidelines are adopted. All turbines have software incorporated so that the sound power levels can be reduced by wind direction and energy output.

The operational noise levels predicted at the nearest noise sensitive receptors are orders of magnitude below the level at which risk of hearing damage, or indeed negative health effects are possible. Therefore, the noise levels predicted at the nearest noise sensitive receptors may be deemed not significant.

Noise during construction of the Project and decommissioning will be managed to comply with best practice, legislation and guidelines current at that time so that effects are not significant.

NTS.12 LANDSCAPE AND VISUAL

Chapter 12 of the EIAR presents a Landscape and Visual Impact Assessment (LVIA) for the proposed Project. This has been carried out by a qualified and experienced landscape architect to identify the landscape and visual impacts of the Project, and whether any are considered significant. The LVIA considers separately the effects on landscape and visual

receptors, as well as the cumulative effect of the Project in combination with other wind farm developments.

The adopted LVIA Study Area covers a radius of 20km in accordance with the Wind Energy Development Guidelines (2006 – Draft Revised 2019). Notwithstanding the full 20km extent, the LVIA placed a proportionate focus on receptors and effects within the 'Central Study Area', taken to be that area up to 5km from the wind turbines, due to the increased potential for significant impacts to occur.

The landscape assessment considers potential effects on the receiving landscape with reference to a range of Landscape Character Areas (LCAs) and criteria published in various technical documents. The visual assessment considers effects upon visual receptors (as agreed through the EIA Scoping process), including scenic amenity designations, centres of population, transport routes and local community views using 28 Viewshed Reference Points (VRP) from representative / sensitive visual receptor locations. Photomontages have been prepared from each of these locations, with accompanying figures that include a wireline of the Project on its own and a wireline that shows the Project together with all other cumulative developments.

The Site in question forms a small part of a low-lying, ostensibly flat landscape used primarily for agricultural farmland. It is characterised by a series of broad pastoral fields screened by a varied network of mature vegetation. With regard to the landscape values associated with the Site, the presence of several rivers in the immediate vicinity contributes to the naturalistic values of the central Study Area. However, these river corridors are heavily enclosed by riparian and hedgerow planting and subsequently not readily visible to the casual observer. Water and road infrastructure is a feature of the immediate Study Area, including the wastewater treatment plant to the south and the N20 national road directly west of the Site. These activities all illustrate a working landscape with a high degree of human modification. Thus, the Site in question and its immediate surroundings represents a typical rural landscape principally valued more for productive and subsistence reasons rather than susceptible scenic values.

Figure NTS-4: 1 Oblique Aerial view (Google Earth) showing the landscape context of the site and its immediate surrounds (Blue stars represent turbine locations) (Ref EIAR Chapter 12 – Plate 12.1).

In the wider landscape context, a low to gently rolling terrain occupies the majority of the Study Area. Towards the south-east of the Study Area, the landform is more undulating as it encounters the foothills of the Ballyhoura Mountains. The Ballyhoura Mountains host an array of walking and mountain trails as well as heritage sites, creating a popular destination for visitors and recreationalists. Other distinctive features within the wider Study Area include Lough Gur in the north-east periphery of the Study Area celebrated for its scenic and archaeological values, Tory Hill to the north and the Adare Manor Golf Course and luxury resort to the north-west. However, these are all located a notable distance from the Project and exert little influence on the landscape character of the Site or central Study Area. The majority of the central Study Area represents a relatively unremarkable lowland farming area.

In terms of scenic amenity, a number of designated scenic routes are included within the Limerick Development Plan, particularly towards the northern part of the Study Area oriented around Tory Hill and Lough Gur. Views from these designated routes tend to focus on the landscape of the immediate setting, as opposed to offering expansive views in the direction of the Site. Similarly, there is a locally signposted viewing point from an elevated location at the northeast of Lough Gur which is predominately focussed on the lough and its near surrounds.

In terms of landscape designations, an extensive area of north Cork beginning 300m south-east of the Site is designated a 'High Value' landscape (HVL) as per the Cork County Development Plan. This is a function of the 'LCT5 – Fertile Plain with Moorland Ridge' being designated both a 'Very High' landscape value and 'Very High' landscape sensitivity. However, this LCT is only designated the median 'County' level 'Landscape Significance' as per the same guidelines indicating that other LCT's of greater significance occur within County Cork. Only the eastern half of 'LCT5' is designated as a 'High Value' landscape with the western half not having any designation despite being part of the same LCT with similar appearance and values. Indeed, it is likely the influence of the Ballyhoura range further to the south-east, that has seen the eastern portion of LCT5 assigned a HVL zoning and the western portion not. It should also be noted in this context that the Ballyhoura range already hosts an extensive wind farm, which contributes to its salient landscape character and has not prevented this landscape from being designated as a HVL. Furthermore, the 'High Value Landscape' designation encompasses a large portion of northeast Cork. Whilst some aspects of this area encompass degrees of sensitivity, such as part of the 'Golden Vale' fertile pastures, and the southern slopes of the Ballyhoura and Galtee Mountains, the vast majority of the Study Area reflects typical working rural land uses with notable levels of anthropogenic activity present. The landscape values that represent this designated, 'High Value Landscape' do not resonate with the immediate Study Area, which depicts a working rural landscape.

On balance of the reasons outlined above, the landscape sensitivity of the central Study Area is deemed to be **Medium** due to the presence of rivers adding a degree of natural amenity and in recognition of the proximity to 'High Value Landscape' zoning a short distance to the south, balanced against its more typical, productive rural qualities. The farmed and settled lowland landscape that occupies much of the wider Study Area is considered to be of a slightly lesser sensitivity – Medium-low, whilst the Ballyhoura mountains to the south-east and Lough Gur and Tory Hill to the north of the Study Area are deemed to be of a higher sensitivity - High-medium.

The proposed Project will give rise to a range of effects when considered in relation to different receptor types, which each have different levels of sensitivity. Key differentials in terms of visual receptor sensitivity relate to the occupation of the visual receptor and whether views of the surrounding landscape are an inherent part of the experience. Static residential receptors are considered generally more susceptible to changes in views over those where views are experienced transiently by those travelling through the landscape.

The rural qualities and agrarian aesthetic, together with the large expanses , lowland plains underpin the character of the Study Area and reflect the longstanding human intervention that characterises views over the landscape and contributes to its scenic qualities., the landscape sensitivity of the central Study Area is deemed to be Medium due to the presence of rivers adding a degree of natural amenity and in recognition of the proximity to 'High Value Landscape' zoning a short distance to the south, balanced against its more typical, productive rural qualities. The farmed and settled lowland landscape that occupies much of the wider Study Area is considered to be of a slightly lesser sensitivity – Medium-low, whilst the Ballyhoura mountains to the south-east and Lough Gur and Tory Hill to the north of the Study Area are deemed to be of a higher sensitivity - High-medium.

All of the existing and consented developments are located outside of the Central Study Area with a notable offset from the Project. The most notable potential for cumulative visual effects relates to Rathnacally Wind Farm c.7km to the south. However, this is only a two turbine scheme and therefore, it is highly unlikely for this to trigger any material cumulative effects. Indeed, aside from Rathnacally none of the other schemes share the common cumulative visibility pattern with the Project indicating that they have little or no potential for intervisibility even in a bare-ground scenario.

It is considered that the proposed Project will contribute to a cumulative landscape and visual impact in the order of Low in respect of the current cumulative scenario. Despite the considerable number of existing wind farm developments within the study area, the proposed Project is principally viewed distinctly separate to these.

It is important to note that in terms of the duration of landscape and visual impacts, the lifespan of the project is 35 years, after which time it will be decommissioned, and the landscape will be reinstated to prevailing conditions. Whilst the landscape and visual effects of the Project will be long-term, they are not permanent and are therefore considered reversible. It is expected that the decommissioning phase will be completed within one year and that within approximately 2-3 years there will be little evidence that a wind farm was present.

Based on the landscape, visual and cumulative assessment contained herein, it is considered that there will not be any significant effects arising from the proposed Garrane Green Energy Project. It is not considered to have the potential to generate significant landscape, visual or cumulative effects during construction, operation or decommissioning.

NTS.13 AIR AND CLIMATE

Chapter 13 assesses the effect of the Project on air quality, given the potential for dust emissions, and the likely carbon dioxide reduction effects of the Project in operation.

For nuisance dust (larger dust particles) receptors situated within 250m the Wind Farm Site infrastructure are defined as sensitive receptors based on IAQM 2024. Mitigation measures for the reduction of dust are outlined in the **EIAR Chapter 13: Air and Climate, Section 13.2.8**.

After mitigation the Project has been assessed as having the potential to result in slight, negative and temporary/short-term effects on Air Quality during construction and decommissioning.

The layout of the Project has been designed to minimise the potential environmental effects of the wind farm while utilising the maximum energy yield from the site's wind resource. The selection of breaking new ground and impacting on natural habitat has been kept to a minimum.

The Project does not contain any element, which will produce Green House Gas (GHG) emissions or odorous emissions in operation. Indeed, the Project will contribute to a net national reduction in the emissions of greenhouse and other gases resulting from the combustion of fossil fuels.

Savings of carbon dioxide arise principally from the generation of electricity from the Project, such that generation from other sources (which emit carbon dioxide|) are offset. The estimated savings depend on the assumption of which source of electricity is displaced and the savings of approximately 46,689 of CO_2 will be displaced per annum. In total, it is estimated that 1,634,117 tonnes of CO_2 will be displaced over the proposed 35-year lifetime of the Project.

Ireland aims to reduce overall greenhouse gas emissions by 51% by 2030 and achieve net-zero emissions by 2050. By 2030, the country targets generating 80% of its electricity from renewable sources. The Project will contribute 54MW of installed capacity. The cumulative effect with other Irish renewable generation is considered to be a fundamental change in the climate effects of Ireland's energy supply, which is a major, positive effect, that is significant under the EIA Regulations and will contribute to Ireland's binding emission reduction targets. Once operational, the Project will have a cumulative, long-term, and significant positive effects on the climate.

NTS.14 SHADOW FLICKER

Chapter 14 of the EIAR contains a Shadow Flicker analysis. Shadow Flicker is the effect of light levels in a sunlit room noticeably varying as a result of the shadow of a turbine blade passing a window, causing a nuisance. Industry standard software was used to model the potential for shadow flicker to occur, based on the proposed turbine locations and dimensions and the locations of residential properties.

The Study Area is defined as 10 times the widest possible potential rotor diameter within the range (10 x 150m = 1,500m). It is common practice to use a distance of ten rotor diameters as a maximum limit within which significant shadow flicker effects can occur, this is based on 2006 Guidelines which state: '*At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low*'.

Cumulative shadow flicker effects could arise if dwellings are at risk from potential shadow flicker effects as a result of more than one wind farm. While separate wind farms are not likely to cause effects simultaneously, they could increase the cumulative total hours where a receptor is affected. In this instance, there are no proposed or operational wind farm within a 2km range of the turbines that may cause cumulative effects.

The results of the shadow flicker assessment predict that the Garrane Green Energy Project has the potential to result in shadow flicker at a maximum of 73 out of 113 receptors within the study area. The Applicant is committed to ensuring that shadow flicker from the Project will not significantly impact the residential amenities of surrounding properties. The implementation of a shadow control system during periods of potential shadow flicker will ensure that adverse shadow flicker effects experienced at any sensitive receptor within the Study Area (allowing for a short period of time for the rotor to come to a stop) are mitigated against. It is therefore considered that Garrane Green Energy Project will comply with Wind Energy Development Guidelines (2006) and has due regard to the Draft Revised Wind Energy Development Guidelines (2019).

NTS.15 CULTURAL HERITAGE

Chapter 15 of the EIAR presents a baseline study of and impact assessment on the cultural heritage of the Site and associated defined 2km and 10km Study Areas. The assessment was based on programmes of desktop research, site inspections and a targeted geophysical survey carried out under licence by the National Monuments Service (NMS), Department of Housing, Local Government and Heritage. These studies were carried out to identify and record any archaeological, architectural and cultural heritage constraints that may be affected by the Project.

The significance of effect on cultural heritage constraints is considered by establishing its value/sensitivity, and how (and to what extent) it may be impacted based on the proposed design of the Project.

There are no recorded cultural heritage constraints located within the footprint of the turbines, hardstands or associated infrastructure within the Site. There are a number of recorded archaeological site located within the Site and these comprise levelled examples with no extant surface remains and ones with low surface expression. There are 53 recorded archaeological sites, seven potential archaeological sites, two protected structures and five NIAH-listed structures, located within 2km of the Site and none of the recorded archaeological sites with the surrounding 2km Study Area are of types that have associated ritual alignment attributes which may be susceptible to intrusions by wind turbines. In addition, there are no National Monuments in State Care or archaeological sites subject Preservation Orders located within the 2km Study Area.

There are two Protected Structures located within the 2km Study Area, and these comprise a farmhouse (RPS 135) located 190m to the east of the Site and a 19th century country house (RPS 391), known as Cuan Mhuire, located 1.9km to the northeast, and it is not within the environs of an Architectural Conservation Area. The National Inventory of Architectural Heritage (NIAH) does not list any structures located within the boundary of the Site. The NIAH lists five structures within the 2km Study Area which are not included in the Recorded of Protected Structures. These comprise Garroose Bridge located 535m outside the east end of the Site, a kiln site located 810m to the southwest, St Patrick's Roman Catholic Church located 1.4km to the south, a railway bridge located 1.48km to the southeast and a thatched house (NIAH 21904709) located 1.9km to the southeast**.** All of these structures are assigned a 'Regional' rating by the NIAH, as is a protected structure (RPS 391) within the Study Area which is also listed in the. A review of the NIAH Historic Gardens and Designed Landscapes Survey revealed that it does not list any of the lands located within the boundary of the Site.

The Project will, therefore, result in no direct effects on known archaeological or designated architectural heritage constraints.

There are no recorded cultural heritage constraints located within the footprint of the turbines, hardstands or associated infrastructure within the Site. There are a number of recorded archaeological site located within the Site and these comprise levelled examples with no extant surface remains and ones with low surface expression.

The turbines within the Site will be visible from a range of cultural heritage constraints retaining above ground remains located in private properties within the surrounding 2km Study Area. The Project will result in not significant to moderate, indirect, long term, adverse effects on the wider settings of constraints with above ground remains within the surrounding 2km Study Area during the operational phase.

A review of the landscape extending for 10km in all directions from the Site revealed that there are six National Monuments in State Care within this area. These include four medieval buildings in Kilmallock town, located c. 6.4km to the east, a 19th century cottage (childhood home of Eamon De Valera) located c. 3.9km to the north in Knockmore townland and a medieval church in Ardskeagh townland located 6.5km to the south , the Project is predicted to result in long term, indirect, adverse slight-moderate effects on their locations and wider settings.

None of the recorded archaeological sites with the surrounding 2km Study Area are of types that have associated ritual alignment attributes which may be susceptible to intrusions by wind turbines. In addition, there are no National Monuments in State Care or archaeological sites subject Preservation Orders located within the 2km Study Area.

The proposed locations of turbines and associated infrastructure within the Site are occupied by a combination of pasture fields and marginal lands. No surface traces of any potential unrecorded archaeological sites were noted within the footprint of these locations during the compilation of the assessment. While no surface features were noted in these areas the potential does exist for the presence of subsurface archaeological sites, features or artefacts within their locations. As the existence, nature and extent of any unrecorded subsurface archaeological remains within the Site are unknown. These site investigations will be carried out under licence by the NMS. In the event that any sub-surface archaeological remains are identified during these site investigations they will be recorded and securely cordoned off while the NMS are consulted to determine further appropriate mitigation measures, which may include preservation in situ (by avoidance) or preservation by record (archaeological excavation).

While the Project will result in slight to moderate, indirect, adverse effects on the settings of cultural heritage assets within the surrounding landscape during the operational phase, no predicted significant (direct, indirect or cumulative) effects on the Cultural Heritage resource arising from the Project have been identified. Following the application of effective mitigation measures, which included specialist archaeological inputs during the design of the Project combined with the archaeological mitigation measures identified in **EIAR Section 15.5.1**,

the Project is not predicted to result in any likely significant effects on the cultural heritage resource.

NTS.16 MATERIAL ASSETS AND OTHER ISSUES

Chapter 16 of the EIAR (Environmental Impact Assessment Report) considers a number of other issues associated with the Project, including potential effects on land use, telecommunications, electricity networks, aviation and utilities.

16.1 Land Use

The Site area is comprised of agricultural pasture grazing, farmland The Site is located on relatively level ground, at elevations ranging from 58-61m AOD in the northern side of the Site, to 63-73m AOD in the southern portion of the Site. The Site is comprised of agricultural pastures with fields typically separated by hedgerows and stonewalls. Local pockets of forestry and hedgerows are also located within the Site.

The 9 turbines will be located on agricultural pastures. The Project will have a temporary, slight, adverse effect on agricultural land use due to the removal of grazing lands during the construction phase and a long-term, slight, adverse effect on agricultural land use for the duration of the operation phase of the Project

However, no significant impacts are predicted on agricultural land use.

16.2 Telecommunications

Operators of microwave communication links were contacted during the EIA process, responses from Eir and Vodafone indicated a potential for effects with existing microwave radio links. Responses from 2rn (Trading name of RTÉ), BT Ireland, Tetra, Three, Virgin Media, Imagine Broadband, Enet and the Broadcasting Authority of Ireland. Virgin media responded on 27/07/24 and shared a drawing showing they had a cable running along the western Redline Boundary. If planning permission is granted, prior to construction the Developer with liaise with Virgin Media to ensure there will be no adverse effects on the underground cable as a result of the Project.

Following the response from Eir and Vodafone, highlighting a risk of interference to an existing cable on the western Redline Boundary, an impact assessment was carried out by Al Bridges, (**EIAR Appendix 16.1: Al Bridges Garrane Wind Farm Telecommunications Impact Assessment Report**). There are no impacts found from the assessment to the microwave radio links.

The implementation of embedded mitigation/ mitigation measures will ensure no interference with communication links. Therefore, no significant effects are predicted on telecommunications or radio reception as a result of the Project.

16.3 Electricity Networks

The nationwide electricity transmission system allows for the transport of large volumes of electricity from generation stations, including wind farms, to bulk supply points near the main population centres where it interconnects with the distribution system.

An existing overhead 110kV transmission line is present on the south of the Site, connecting Charleville 110kV substation to Killonan 110kV substation. Connection will be sought from the grid system operator by application to EirGrid. In order to connect the Project and provide the 'loop in/loop out' infrastructure, it is proposed to install c. 380m of underground 110kV electricity transmission line between the proposed Substation and the 'loop-in' connection point. The underground line (UGL) will be located fully within the Redline Boundary, across agricultural lands. Constructed and installed according to the requirements and specifications of EirGrid and ESB Networks.

The Project will contribute directly and in the long term to the electricity network by strengthening it through additional renewable energy generation.

16.4 Air Navigation

Operating wind farms have the potential to cause a variety of effects on aviation. For example, the physical height of turbines can cause obstruction to aviation and the overall performance of communications, navigation and surveillance equipment.

As standard, all structures over 150m in height are required to have lighting to warn aviation traffic. Consultation with aviation operators was undertaken and with the Irish Aviation Authority (IAA). The IAA have requested an obstacle warning light system for the Project, the provision of coordinates of each turbine and tip height, and to notify them 30 days prior to any crane operations commencing. An aeronautical lighting scheme for the Project will be agreed and installed in consultation with IAA and Department of Defence. The turbine locations will be added to aviation maps prior to construction, and all requests from the Aviation Authority carried out to ensure aviation safety protocols are followed.

16.5 Utilities

There are no gas mains located within the Site, therefore there is no potential for significant effects to occur. Areas along the Turbine Delivery Route and Construction Haul Route where gas infrastructure is present does not require any works and will remain undisturbed. Therefore, no significant effects are likely.

There is an existing industrial outflow pipeline through the Site from South to North, the pipeline is a pumped outfall pipeline for the conveyance of treated waste water from Kerry Ingredients (Ireland) Limited waste water treatment plant at Rathgoggan North, County Cork to a discharge point on the Maigue river located approximately 2km north of the waste water treatment plant site, details are available at the Limerick City and County Council website, planning reference: 17270. The proposed pipeline crossing points are located north of T3 and south-east of T9 as shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0404**. The pipeline will be crossed in 2no. locations by new access tracks. The pipe is 1.18m deep at Crossing 1 and 0.6m deep at Crossing 2 as shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0404**. In the absence of mitigation measures there is potential for the pipeline to be impacted during the construction phase. This would have a potential long-term, moderate adverse effect on soils and groundwater.

A Management Plan has been developed for the crossing of the industrial pipeline and is attached as **EIAR Appendix 2.1: CEMP - MP7 Method Statement for Crossing Industrial Pipeline**. The as-built location of the pipeline was confirmed utilising ground penetrating radar (GPR) and the Project infrastructure has maintained a separation distance from the pipeline with the exception of 2 No. crossing points. There will be excavation works associated with the access tracks crossing the industrial pipeline. The access track will be built up at the 2 No. crossing to protect the pipeline as detailed in **EIAR Section 16.9.3** and as shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0404**.

There will no effect on the water infrastructure and services during the construction phase, no effect during the operational phase and no effect during the decommissioning phase.

NTS.17 TRAFFIC AND TRANSPORT

Chapter 17 Traffic and Transport assesses the potential effects of traffic associated with the Project on the public road network and on sensitive receptors in the vicinity of the Project, describes the existing public road and junction network, identifies whether there is any potential for significant effects to arise (both in isolation and in combination with other developments) and outlines the mitigation measures that will be implemented to negate any

potential significant effects that might arise. The assessment will consider the potential effects of traffic generated by the Project during the following phases:

- Construction of the Project,
- Construction of proposed Grid Connection.
- Transportation of turbine components on the public road network for two separate route options between Shannon Foynes Port or the Port of Galway (turbine blades only) and the Project.
- Enabling works for the transportation of turbine components on the public road network for two separate route options between Shannon Foynes Port or the Port of Galway (turbine blades only) and the Project.
- Operation and maintenance of the Project.
- Decommissioning of the Project.

The assessment has been carried out in accordance with EPA Guidelines 2022 and is supported by a Traffic and Transport Assessment (TTA), Traffic Management Plan (TMP) and Turbine Delivery Route Assessment. The environmental effects of Development traffic have been assessed in **Chapter 13: Air Quality** and **Chapter 11: Noise and Vibration**.

It is proposed to construct a temporary site access on the N20 to be used only during the delivery of turbine components using abnormal load vehicles. Access to the site for general construction traffic and operational traffic will be from a site entrance on the L1537 Local Road. On completion of the Project construction the temporary N20 site entrance will be reinstated. The temporary access is required due to the geometry of the regional and local roads not being suitable for abnormal load vehicles to access the site via the main site entrance on the L1537. The selection of a temporary site access on the N20 is discussed in **EIAR Chapter 3 – Section 3.6.4**.

Delivery of turbine components at Site Entrance 1 will take place outside peak traffic times on the N20. The proposed temporary access on the N20 will be used for turbine delivery only. All general construction traffic will access the site Via the L1537 local road. Traffic management and speed reduction measures during enabling works and turbine delivery under Garda escort at the site entrance are discussed in the TMP (**EIAR Appendix 17.2**). The temporary N20 entrance will be Fully reinstated following construction. Details of the reinstatement are shown in the Junction Design Report (**EIAR Appendix 17.6**) and on the planning drawings.

A Road Safety Audit has been carried out for the Project and is included in **EIAR Appendix 17.5**. The findings of the Road Safety Audit have been considered in the design of the Project.

Turbine Delivery Haul route Assessments have been carried out for the Project and are included in **EIAR Appendix 17.3** and **EIAR Appendix 17.4**.

The grid connection works will be carried out within the boundary of the Project and will not be carried out on the public road network.

The assessment takes account of proposed mitigation measures embedded in the design and implementation during the construction, operation and decommissioning of the Project. The potential effects of the project are considered to be Moderate on the local road network and Slight / Moderate on the national and regional road network during the construction of the Project. The potential effects of the project on traffic during the operation of the Project are considered to be Not Significant on the public road network. The potential effects of the Project on traffic and transport during the decommissioning of the Project are considered to be Moderate on the local road network and Slight / Moderate on the national and regional road network.

NTS.18 INTERACTIONS OF THE FOREGOING

The purpose of this Chapter is to identify significant interactions and interdependencies in the existing environment and set out the likely interactions of, and between effects predicted as a result of the Project. **Chapter 18** of the EIAR provides a summary of the interactions and interdependencies between the existing environment and set out the likely interactions of, and between effects predicted as a result of the Project. This includes significant effects from each EIAR chapter and also summarises the mitigation measures proposed to reduce either the likelihood or magnitude of these effects to an acceptable level.

Table 18.2 outlines interactions between environmental aspects. Technical assessments have assessed pathways, both direct and indirect that can magnify effects through the interaction or accumulation of effects. Effects have been cross-referenced between chapter topics. Potential interactions (both positive and negative) have been considered for the construction, operational and decommissioning phases of each of the different environmental aspects of the Project.

All environmental factors are interrelated to some extent. Having studied the interaction of potential impacts during the construction, operational and decommissioning phases of the

Project, it has been determined that no amplification effect is anticipated. The Project will have some positive impacts on an international, national, regional and local level. It is important to note that the landscape and visual impacts are almost entirely reversible upon decommissioning of the Project.

Table 18.1: Summary matrix of Interactions of Effects during Construction, Operational and Decommissioning Phases (Source: Adapted from EIAR Guidelines, 2022)

	Population & Human Health		Planning Policy		Biodiversity		Aquatic Ecology		Ornithology		Soils & Geology		Hydrology and Hydrogeology		Noise		Landscape & Visual		Material Assets		Cultural Heritage		Traffic & Transportation		Shadow Flicker		Air And Climate	
	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper
Population & Human Health																												
Planning Policy																												
Biodiversity																												
Aquatic Ecology																												
Ornithology																												
Soils & Geology																												
Hydrology & Hydrogeology																												
Noise																												
Landscape & Visual																												
Material Assets																												
Cultural Heritage																												
Traffic & Transportation																												
Shadow Flicker																												
Air & Climate																												

Note: Const. = Construction phase; Oper = Operational phase Decom. = Decommissioning

Interaction or inter-relationship

No interaction or inter-relationship